

APPENDIX C

SOUTH DAKOTA LANDFIRE REPORT

THIS PAGE INTENTIONALLY LEFT BLANK

Descriptions of Ecological Systems for Modeling of LANDFIRE Biophysical Settings

Ecological Systems of location US State SD ; Excluding Aggregates

10 October 2008

Descriptions provided to TNC and LANDFIRE by NatureServe

About this document

This document contains brief definitions of the NatureServe terrestrial ecological systems currently identified as occurring in location US State SD ; Excluding Aggregates. Terrestrial ecological systems concepts form the basis for three map products from the inter-agency Landfire effort. First, they define the map legend for mapping Existing Vegetation Type (EVT); i.e., the current location of vegetative components of each terrestrial ecological system are mapped in that layer. Second, Environmental Site Potential (ESP) is a spatial model of environments that constrain the possible locations where a given ecological system could occur, without including natural disturbance regime as a factor. Third, Biophysical Settings (BpS) provide another spatial model depicting the probable location of each ecological system type, assuming the inclusion of natural disturbance regimes as a factor.

This ecological systems classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Most of the following types will be further described, quantitatively modeled, and mapped for LANDFIRE. Comments and suggestions regarding the contents of this subset may be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC, <mary_russo@natureserve.org>.



SAVING THE LAST GREAT PLACES ON EARTH

NatureServe is a non-profit organization dedicated to providing the scientific knowledge that forms the basis for effective conservation.

Citation:

The following citation should be used to reference this document and in any published materials which reference ecological system and/or International Vegetation Classification (IVC) and association data:

NatureServe. 2008. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 10 October 2008.

© NatureServe 2008

Restrictions on Use: Permission to use, copy and distribute these data is hereby granted under the following conditions:

1. The above copyright notice must appear in all documents and reports;
2. Any use must be for informational purposes only and in no instance for commercial purposes;
3. Some data may be altered in format for analytical purposes, however the data should still be referenced using the citation above.

Any rights not expressly granted herein are reserved by NatureServe. Except as expressly provided above, nothing contained herein shall be construed as conferring any license or right under any NatureServe copyright.

Information Warranty Disclaimer: All data are provided as is without warranty as to the currentness, completeness, or accuracy of any specific data. The absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. NatureServe hereby disclaims all warranties and conditions with regard to these data, including but not limited to all implied warranties and conditions of merchantability, fitness for a particular purpose, and non-infringement. In no event shall NatureServe be liable for any special, indirect, incidental, consequential damages, or for damages of any kind arising out of or in connection with the use of these data. Because the data in the NatureServe Central Databases are continually being updated, it is advisable to refresh data at least once a year after receipt.

NatureServe
1101 Wilson Blvd, 15th floor
Arlington, VA 22209
703-908-1800
www.natureserve.org

TABLE OF CONTENTS

FOREST AND WOODLAND.....	2
1310 North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)	2
1179 Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)	4
1048 Northwestern Great Plains Highland White Spruce Woodland (CES303.957)	6
1011 Rocky Mountain Aspen Forest and Woodland (CES306.813)	7
1049 Rocky Mountain Foothill Limber Pine-Juniper Woodland (CES306.955)	10
1013 Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667)	12
UPLAND SHRUBLAND.....	14
1085 Northwestern Great Plains Shrubland (CES303.662)	14
1086 Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)	16
1094 Western Great Plains Sandhill Steppe (CES303.671)	18
SAVANNA AND SHRUB-STEPPE.....	20
Eastern Great Plains Quartzite Rocky Outcrop (CES205.697)	20
UPLAND GRASSLAND AND HERBACEOUS.....	21
1132 Central Mixedgrass Prairie (CES303.659)	21
1412 North-Central Interior Sand and Gravel Tallgrass Prairie (CES202.695)	24
1420 Northern Tallgrass Prairie (CES205.686)	26
1141 Northwestern Great Plains Mixedgrass Prairie (CES303.674)	27
1147 Western Great Plains Foothill and Piedmont Grassland (CES303.817)	31
1148 Western Great Plains Sand Prairie (CES303.670)	33
WOODY WETLANDS AND RIPARIAN.....	36
North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)	36
North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)	38
Northwestern Great Plains Floodplain (CES303.676)	40
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)	42
Rocky Mountain Subalpine-Montane Riparian Shrubland (CES306.832)	46
Rocky Mountain Subalpine-Montane Riparian Woodland (CES306.833)	50
Western Great Plains Floodplain (CES303.678)	53
HERBACEOUS WETLAND.....	55
1488 Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687)	55
North-Central Interior Freshwater Marsh (CES202.899)	57
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)	59
Western Great Plains Closed Depression Wetland (CES303.666)	63
Western Great Plains Open Freshwater Depression Wetland (CES303.675)	65
Western Great Plains Saline Depression Wetland (CES303.669)	68
MIXED UPLAND AND WETLAND.....	70
1482 Great Plains Prairie Pothole (CES303.661)	70
North-Central Interior Floodplain (CES202.694)	72
Northwestern Great Plains Riparian (CES303.677)	75
1385 Western Great Plains Wooded Draw and Ravine (CES303.680)	77
SPARSELY VEGETATED.....	79
1341 Northwestern Great Plains Canyon (CES303.658)	79
Western Great Plains Badlands (CES303.663)	81

FOREST AND WOODLAND

1310 NORTH-CENTRAL INTERIOR DRY-MESIC OAK FOREST AND WOODLAND (CES202.046)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Udic; F-Patch/Low Intensity; Quercus - Carya

Non-Diagnostic Classifiers: Footslope; Glaciated uplands; Kame moraine; Lakeplain; Moraine; Temperate [Temperate Continental]; Mesotrophic Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2310; ESLF 4116; ESP 1310

CONCEPT

Summary: This system is found throughout the glaciated regions of the Midwest, typically in gently rolling landscapes. It can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone (ca. 1800). It is distinguished from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests. Forest cover can range from a dense to moderately open canopy and there is commonly a dense shrub layer. Fire-resistant oak species, in particular *Quercus macrocarpa*, *Quercus rubra*, and/or *Quercus alba*, dominate the overstory. *Carya* spp., including *Carya ovata*, *Carya cordiformis*, and *Carya alba* (= *Carya tomentosa*), are diagnostic in portions of the range of this system. Depending on site location and overstory canopy density, the understory may include species such as *Corylus americana*, *Amelanchier* spp., *Maianthemum stellatum*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Trillium grandiflorum*, *Aralia nudicaulis*, and *Urtica dioica*.

Occasionally, prairie grasses such as *Andropogon gerardii* and *Panicum virgatum* may be present. Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains. Periodic drought, intensified by local conditions, such as slope, southern exposure, or sandy soil, also inhibit growth of mesophytic trees. Extensive conversion for agriculture has fragmented this system. Continued fire suppression has also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

Similar Ecological Systems:

- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DESCRIPTION

Environment: This system can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone (ca. 1800). It is distinguished from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests.

Vegetation: Forest cover can range from a dense to moderately open canopy and there is commonly a dense shrub layer. Fire-resistant oak species, in particular *Quercus macrocarpa*, *Quercus rubra*, and/or *Quercus alba*, dominate the overstory. *Carya* spp., including *Carya ovata*, *Carya cordiformis*, and *Carya alba* (= *Carya tomentosa*), are diagnostic in portions of the range of this system. Depending on site location and overstory canopy density, the understory may include species such as *Corylus americana*, *Amelanchier* spp., *Maianthemum stellatum*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Trillium grandiflorum*, *Aralia nudicaulis*, and *Urtica dioica*. Occasionally, prairie grasses such as *Andropogon gerardii* and *Panicum virgatum* may be present. Fire suppression likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains.

Dynamics: Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains. Periodic drought, intensified by local conditions like slope, southern exposure, or sandy soil, also inhibit growth of mesophytic trees. Extensive conversion for agriculture has fragmented these systems. Continued fire suppression has

also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* Forest (CEGL005010, GNR)
- *Quercus alba* - (*Carya ovata*) / *Carex pensylvanica* Glaciated Woodland (CEGL002134, G1Q)
- *Quercus alba* - (*Quercus velutina*) - *Carya ovata* / *Ostrya virginiana* Forest (CEGL002011, G3)
- *Quercus alba* - *Quercus macrocarpa* - *Quercus rubra* / *Corylus americana* Woodland (CEGL002142, G3G4)
- *Quercus alba* - *Quercus rubra* - *Acer saccharum* - *Carya cordiformis* / *Lindera benzoin* Forest (CEGL002058, G3?)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068, G4?)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* / *Cornus florida* Unglaciated Forest (CEGL002066, G4?)
- *Quercus bicolor* - (*Quercus macrocarpa*, *Quercus stellata*) Woodland (CEGL005181, G1)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Panicum virgatum* Woodland (CEGL002052, G1G2)
- *Quercus macrocarpa* / *Corylus americana* - *Amelanchier alnifolia* Woodland (CEGL000556, G3)
- *Quercus rubra* - *Quercus alba* - (*Quercus velutina*, *Acer rubrum*) / *Viburnum acerifolium* Forest (CEGL002462, GNR)
- *Tilia americana* - (*Quercus macrocarpa*) / *Ostrya virginiana* Forest (CEGL002012, G3)

Alliances:

- *Acer saccharum* - *Tilia americana* - (*Quercus rubra*) Forest Alliance (A.220)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus macrocarpa* - *Quercus* (*alba*, *ellipsoidalis*, *velutina*) Woodland Alliance (A.619)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Range: Found throughout the glaciated regions of the Midwest.

Divisions: 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI

Map Zones: 38:C, 39:C, 40:C, 41:?, 42:C, 43:C, 44:C, 47:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 221H:CC, 222H:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222Ua:CCC, 222Ue:CCC, 223G:CC, 251B:CC, 251C:CC, 251D:CC, 251H:CC

TNC Ecoregions: 35:C, 36:C, 44:?, 45:C, 46:C, 47:?, 48:C

SOURCES

References: Abrams 1992, Archambault et al. 1989, Archambault et al. 1990, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722663#references

Description Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen, mod. J. Drake

Version: 18 Jul 2006

Concept Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1179 NORTHWESTERN GREAT PLAINS - BLACK HILLS PONDEROSA PINE WOODLAND AND SAVANNA (CES303.650)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]; F-Patch/Medium Intensity; Needle-Leaved Tree; *Pinus ponderosa* with grassy understory; *Pinus ponderosa* with shrubby understory

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2179; ESLF 4280; ESP 1179

CONCEPT

Summary: This system occurs throughout the Great Plains Division along areas that border the Rocky Mountain Division and into the central Great Plains. The expansion of this system into the central Great Plains may be due to fire suppression. These can be physiognomically variable, ranging from very sparse patches of trees on drier sites, to nearly closed-canopy forest stands on north slopes or in draws where available soil moisture is higher. This system occurs primarily on gentle to steep slopes along escarpments, buttes, canyons, rock outcrops or ravines and can grade into one of the Great Plains canyon systems or the surrounding prairie system. Soils typically range from well-drained loamy sands to sandy loams formed in colluvium, weathered sandstone, limestone, scoria or eolian sand. This system is primarily dominated by *Pinus ponderosa* but may include a sparse to relatively dense understory of *Juniperus scopulorum*, *Thuja*, or *Cercocarpus* with just a few scattered trees. Deciduous trees are an important component in some areas (western Dakotas, Black Hills) and are sometimes codominant with the pines, including *Fraxinus pennsylvanica*, *Betula papyrifera*, *Quercus macrocarpa*, *Ulmus americana*, *Acer negundo*, and *Populus tremuloides*. Along the Missouri Breaks in north-central Montana, woodlands dominated by *Pseudotsuga menziesii* are in similar ecological settings as *Pinus ponderosa* in the Great Plains and are included in this system. In the breaks where it occurs, *Pseudotsuga menziesii* has a very open canopy over grassy undergrowth, predominantly composed of *Pseudoroegneria spicata*, with little to no shrubs present. Important or common shrub species with ponderosa pine can include *Arctostaphylos uva-ursi*, *Mahonia repens*, *Yucca glauca*, *Symphoricarpos* spp., *Prunus virginiana*, *Juniperus communis*, *Juniperus horizontalis*, *Amelanchier alnifolia*, *Rhus trilobata*, and *Physocarpus monogynus*. The herbaceous understory can range from sparse to a dense layer with species typifying the surrounding prairie system, with mixedgrass species common, such as *Andropogon gerardii*, *Bouteloua curtipendula*, *Carex inops* ssp. *heliophila*, *Carex filifolia*, *Danthonia intermedia*, *Koeleria macrantha*, *Nassella viridula*, *Oryzopsis asperifolia*, *Pascopyrum smithii*, *Piptatherum micranthum*, and *Schizachyrium scoparium*. Timber cutting and other disturbances have degraded many examples of this system within the Great Plains, however, some good examples may occur along the Pine Ridge escarpment and Pine Ridge district of the Nebraska National Forest in Nebraska.

Classification Comments: In this Great Plains region, what were previously called Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958), Southern Rocky Mountain Ponderosa Pine Woodland (CES303.648) and Southern Rocky Mountain Ponderosa Pine Savanna (CES306.826) are now included in this new system. Physiognomically, this is a variable system, with everything from sparse woodlands on breaks and scoria bluffs to dense closed-canopy stands in the Black Hills included.

Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648) is now defined to occur in the montane zones of the Bighorns (USFS section M331B) and Laramie Range (USFS section M331I) and to the west and south of these mountains. It will also occur in other isolated mountain ranges of central Wyoming, but not in eastern Wyoming. It does not occur farther north than Wyoming; all Montana ponderosa pine woodlands are placed into either this Northwest Great Plains system or into Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030), as appropriate. The southern extent is hard to determine, but farther south in Colorado, there is more *Juniperus*, *Pinus edulis*, and *Quercus gambelii*. This system certainly occurs in New Mexico, but stands at the Black Mesa in western Oklahoma and in southeastern Colorado may also be viewed as having the southwestern affinities.

In the Pine Escarpments of Nebraska, pine communities can range from open canopies with grassy understories to more closed canopies. Included within these areas are also several rocky outcrops, which probably should be included within the system as they are often intermingled with the savanna. The more closed-canopy examples may be more similar to Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648) but are included in this system for now.

Similar Ecological Systems:

- Northern Rocky Mountain Foothill Conifer Wooded Steppe (CES306.958)
- Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)
- Southern Rocky Mountain Ponderosa Pine Savanna (CES306.649)
- Southern Rocky Mountain Ponderosa Pine Woodland (CES306.648)

Related Concepts:

- Interior Ponderosa Pine: 237 (Eyre 1980) Intersecting

DESCRIPTION

Dynamics: Marriot and Faber-Langendoen (2000) report different fire regimes for ponderosa pine communities in the Black Hills,

with their "Dry Group" more typically having frequent surface fires and the "Mesic Group" having infrequent catastrophic fires (every 100-200 years). The Dry Group of associations includes lower elevation foothill savanna associations, and the mesic group somewhat higher elevation, north-slope, swale associations. K. Kindscher (pers. comm. 2007) believes that almost all of the stands in Nebraska were there at the time of settlement and are not a result of pine expansion due to fire suppression; in addition, at least some have disappeared, such as the one in southern Nebraska (Franklin County). It is possible, however, that some areas of this system have expanded in size due to fire suppression, but this needs substantiation.

MEMBERSHIP

Associations:

- *Pinus ponderosa* / *Carex inops* ssp. *heliophila* Woodland (CEGL000849, G3G4)
- *Pinus ponderosa* / *Juniperus horizontalis* Woodland (CEGL000860, G3?)
- *Pinus ponderosa* / *Oryzopsis asperifolia* Woodland (CEGL002123, G3G4Q)
- *Pinus ponderosa* / *Pascopyrum smithii* Woodland (CEGL000188, G3G4)
- *Pinus ponderosa* / *Physocarpus monogynus* Forest (CEGL000190, G3)
- *Pinus ponderosa* / *Prunus virginiana* Forest (CEGL000192, G3G4)
- *Pinus ponderosa* / *Quercus macrocarpa* Woodland (CEGL000873, G3)
- *Pinus ponderosa* / *Schizachyrium scoparium* Woodland (CEGL000201, G3G4)
- *Pinus ponderosa* / *Symphoricarpos occidentalis* Forest (CEGL000204, G3)

Alliances:

- *Pinus ponderosa* Forest Alliance (A.124)
- *Pinus ponderosa* Woodland Alliance (A.530)

SPATIAL CHARACTERISTICS

Spatial Summary: These ponderosa pine occurrences are typically found in the matrix of the Great Plains grassland systems. They are often surrounded by mixedgrass or tallgrass prairie, in places where available soil moisture is higher or soils are more coarse and rocky. In some cases, these woodlands or savannas may occur where fire suppression has allowed trees to become established (in areas where deciduous trees are more abundant (Girard et al. 1987)). These are typically not in the same setting as Rocky Mountain ponderosa pine, where ponderosa pine forms woodlands at lower treeline and grades into mixed montane conifer systems at higher elevations (it did not make sense to keep Black Hills ponderosa woodlands with the Rocky Mountain system, so they are included here).

Floristically, these pine stands have a graminoid component that is strongly related to mixedgrass or tallgrass Great Plains floristics. The shrub component is not very diagnostic, as most of the important shrubs are commonly also important in Rocky Mountain ponderosa pine or Douglas-fir systems.

DISTRIBUTION

Range: This system is found in central and eastern Montana, the western Dakotas, eastern Wyoming (east of the Bighorns), the Black Hills, and south into the Sand Hills of Nebraska and northeastern Colorado (north of Pawnee National Grasslands to Cedar Point near Limon and south). In Montana, it occurs along the Missouri River breaks, around the Little Belts and Snowy mountains, in south-central Montana between the Bighorns and the Black Hills (along the Tongue and Powder rivers), and other areas of eastern Montana. In Wyoming, it is found around the Black Hills and Bear Lodge Mountains, and in isolated areas of eastern Wyoming on bluffs and rock outcrops, and along "breaks." Whether this system occurs in Kansas is uncertain.

Divisions: 303:C; 306:C

Nations: US

Subnations: CO, KS?, MT, ND, NE, SD, WY

Map Zones: 20:C, 29:C, 30:C, 31:C, 33:C, 39:?, 40:?

USFS Ecomap Regions: 331C:C?, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 332A:C?, 332B:C?, 332C:CC, 332D:C?, 332E:C?, M334A:CC

TNC Ecoregions: 25:C, 26:C, 27:C, 33:C, 34:?

SOURCES

References: Bock and Bock 1984, Girard 1985, Girard et al. 1987, Girard et al. 1989, Hansen and Hoffman 1988, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Thilenius 1972, Western Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.797971#references

Description Author: M.S. Reid

Version: 25 Jan 2007

Concept Author: M.S. Reid

Stakeholders: Midwest, West

ClassifResp: West

1048 NORTHWESTERN GREAT PLAINS HIGHLAND WHITE SPRUCE WOODLAND (CES303.957)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Temperate [Temperate Continental]; *Picea glauca*

Non-Diagnostic Classifiers: Montane [Montane]; Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2048; ESLF 4235; ESP 1048

CONCEPT

Summary: This uncommon system is limited to relatively high-elevation outliers of montane environments in the northwestern Great Plains. Best known areas of this system are small portions of the Black Hills of Wyoming and South Dakota and the Cypress Upland of southern Alberta and Saskatchewan. These highland areas have a cooler climate than surrounding mixedgrass prairie. In the Black Hills, these woodlands occur as small or large patches within the ponderosa pine matrix, from about 1740 to 2135 m (5700-7000 feet); at lower elevations, they are restricted to north-facing slopes. At the higher elevations, they are found on level or gently sloping areas. In other locations, this woodland system is limited to sideslopes and depressions, likely adjoining riparian zones, where snow is well-retained. Soils vary widely from deep to quite shallow. *Picea glauca* is the characteristic conifer, but other trees can include *Pinus ponderosa*, *Populus tremuloides*, and *Betula papyrifera*. Undergrowth shrubs typically include *Arctostaphylos uva-ursi*, *Juniperus communis*, *Linnaea borealis*, *Symphoricarpos albus*, and *Vaccinium scoparium*. Disturbance regimes are not well-documented for this system, but likely include periodic windthrow as well as fire spreading from adjacent, lower elevation woodlands and grasslands.

MEMBERSHIP

Associations:

- *Picea glauca* / *Linnaea borealis* Forest (CEGL000382, G2G3)
- *Picea glauca* / *Vaccinium scoparium* Forest (CEGL000383, G1G2)
- *Picea glauca* Alluvial Black Hills Forest (CEGL002057, G2G3)

Alliances:

- *Picea glauca* Forest Alliance (A.167)
- *Picea glauca* Temporarily Flooded Forest Alliance (A.172)

DISTRIBUTION

Range: This system is limited to relatively high-elevation outliers of montane environments in the northwestern Great Plains. Best known areas of this system are small portions of the Black Hills of Wyoming and South Dakota and the Cypress Upland of southern Alberta and Saskatchewan. It may also occur in very small stands of the Bighorn Mountains of north-central Wyoming and south-central Montana.

Divisions: 303:C; 306:C

Nations: CA, US

Subnations: AB, MT?, SD, SK, WY

Map Zones: 29:C, 30:?, 31:?

USFS Ecomap Regions: M331B:CP, M334A:CC

TNC Ecoregions: 25:C, 26:C

SOURCES

References: Comer et al. 2003, ESWG 1995, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Rogers 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722724#references

Description Author: P. Comer, mod. M.S. Reid

Version: 25 Jan 2007

Concept Author: P. Comer

Stakeholders: Canada, Midwest, West

ClassifResp: West

1011 ROCKY MOUNTAIN ASPEN FOREST AND WOODLAND (CES306.813)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; F-Patch/Medium Intensity; F-Landscape/Medium Intensity; Broad-Leaved Deciduous Tree; *Populus tremuloides*

Non-Diagnostic Classifiers: Montane [Upper Montane]; Montane [Montane]; Temperate [Temperate Continental]; Mesotrophic Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2011; ESLF 4104; ESP 1011

CONCEPT

Summary: This widespread ecological system is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front and in mountain "islands" in Montana (Big Snowy and Highwood mountains), and the Black Hills of South Dakota. In California, this system is only found on the east side of the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondly, it is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. In California, *Symphiotrichum spathulatum* (= *Aster occidentalis*) is a common forb. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus*, *Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests. It differs from Northwestern Great Plains Aspen Forest and Parkland (CES303.681), which is limited to plains environments.

Classification Comments: The scattered occurrences in Trans-Pecos of Texas are of interest as they represent disjunct outliers of the type occurring under highly limited circumstances.

Similar Ecological Systems:

- Northwestern Great Plains Aspen Forest and Parkland (CES303.681)--is limited to plains environments.

Related Concepts:

- Aspen Woodland (411) (Shiflet 1994) Broader
- Aspen: 217 (Eyre 1980) Broader

DESCRIPTION

Environment: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 15 inches and typically greater than 20 inches, except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or large snow drifts. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondly, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable, sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Vegetation: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but never codominant include *Abies concolor*, *Abies lasiocarpa*, *Picea engelmannii*, *Picea pungens*, *Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors like disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.

Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, *Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus glaucus*, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa*

comata. Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Delphinium* spp., *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual *Bromus tectorum* are often common in occurrences disturbed by grazing.

Dynamics: Occurrences in this ecological system often originate, and are likely maintained, by stand-replacing disturbances such as crown fire, disease and windthrow, or clearcutting by man or beaver. The stems of these thin-barked, clonal trees are easily killed by ground fires, but they can quickly and vigorously resprout in densities of up to 30,000 stems per hectare (Knight 1993). The stems are relatively short-lived (100-150 years), and the occurrence will succeed to longer-lived conifer forest if undisturbed. Occurrences are favored by fire in the conifer zone (Mueggler 1988). With adequate disturbance a clone may live many centuries. Although *Populus tremuloides* produces abundant seeds, seedling survival is rare because of the long moist conditions required to establish are rare in the habitats that it occurs in. Superficial soil drying will kill seedlings (Knight 1993).

MEMBERSHIP

Associations:

- *Ceanothus velutinus* Shrubland (CEGL002167, GNR)
- *Populus tremuloides* - Conifer / *Spiraea betulifolia* - *Symphoricarpos albus* Forest (CEGL005911, G3?)
- *Populus tremuloides* / *Acer glabrum* Forest (CEGL000563, G1G2)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Bromus carinatus* Forest (CEGL000566, G3G5)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000567, G4)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / Mixed Graminoid Forest (CEGL002816, GNR)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000568, G5)
- *Populus tremuloides* / *Amelanchier alnifolia* - *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (CEGL000569, G5)
- *Populus tremuloides* / *Amelanchier alnifolia* / *Pteridium aquilinum* Forest (CEGL000565, G2G3)
- *Populus tremuloides* / *Amelanchier alnifolia* / Tall Forbs Forest (CEGL000570, G3G5)
- *Populus tremuloides* / *Amelanchier alnifolia* / *Thalictrum fendleri* Forest (CEGL000571, G3G4)
- *Populus tremuloides* / *Amelanchier alnifolia* Forest (CEGL000564, G4)
- *Populus tremuloides* / *Artemisia tridentata* / *Monardella odoratissima* - *Kelloggia galioides* Forest (CEGL003146, GNR)
- *Populus tremuloides* / *Artemisia tridentata* Forest (CEGL000572, G3G4)
- *Populus tremuloides* / *Bromus carinatus* Forest (CEGL000573, G5)
- *Populus tremuloides* / *Calamagrostis rubescens* Forest (CEGL000575, G5?)
- *Populus tremuloides* / *Carex geyeri* Forest (CEGL000579, G4)
- *Populus tremuloides* / *Carex rossii* Forest (CEGL000580, G5)
- *Populus tremuloides* / *Carex siccata* Forest (CEGL000578, G4)
- *Populus tremuloides* / *Ceanothus velutinus* Forest (CEGL000581, G2)
- *Populus tremuloides* / *Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides* / *Festuca thurberi* Forest (CEGL000585, G4)
- *Populus tremuloides* / *Heracleum maximum* Forest (CEGL000595, G3)
- *Populus tremuloides* / *Heracleum sphondylium* Forest (CEGL000586, G4Q)
- *Populus tremuloides* / *Hesperostipa comata* Forest (CEGL000608, G2G4)
- *Populus tremuloides* / Invasive Perennial Grasses Forest (CEGL003748, GNA)
- *Populus tremuloides* / *Juniperus communis* / *Carex geyeri* Forest (CEGL000588, G4G5)
- *Populus tremuloides* / *Juniperus communis* / *Lupinus argenteus* Forest (CEGL000589, G3G4)
- *Populus tremuloides* / *Juniperus communis* Forest (CEGL000587, G4)
- *Populus tremuloides* / *Ligusticum filicinum* Forest (CEGL000591, G4Q)
- *Populus tremuloides* / *Lonicera involucrata* Forest (CEGL000592, G3)
- *Populus tremuloides* / *Lupinus argenteus* Forest (CEGL000593, GNR)
- *Populus tremuloides* / *Mahonia repens* Forest (CEGL000594, G3)
- *Populus tremuloides* / *Monardella odoratissima* Forest (CEGL003145, G3)
- *Populus tremuloides* / *Prunus virginiana* Forest (CEGL000596, G3G4)
- *Populus tremuloides* / *Pteridium aquilinum* Forest (CEGL000597, G4)
- *Populus tremuloides* / *Quercus gambelii* / *Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides* / *Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides* / *Rosa woodsii* Forest (CEGL003149, GNR)
- *Populus tremuloides* / *Rubus parviflorus* Forest (CEGL000602, G2)
- *Populus tremuloides* / *Rudbeckia occidentalis* Forest (CEGL000603, GNRQ)
- *Populus tremuloides* / *Salix scouleriana* Forest (CEGL000604, G4)
- *Populus tremuloides* / *Sambucus racemosa* Forest (CEGL000605, G2G3)
- *Populus tremuloides* / *Shepherdia canadensis* Forest (CEGL000606, G3G4)
- *Populus tremuloides* / *Spiraea betulifolia* Forest (CEGL000607, G4Q)
- *Populus tremuloides* / *Symphoricarpos albus* / *Elymus glaucus* Woodland (CEGL000946, G3)
- *Populus tremuloides* / *Symphoricarpos albus* Forest (CEGL000609, G3?)
- *Populus tremuloides* / *Symphoricarpos occidentalis* Forest [Provisional] (CEGL005848, GNR)

- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Bromus carinatus* Forest (CEGL000611, G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Calamagrostis rubescens* Forest (CEGL000612, G3G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Carex rossii* Forest (CEGL000613, G3G4)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Festuca thurberi* Forest (CEGL000614, G3?)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / Tall Forbs Forest (CEGL000615, G3G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Thalictrum fendleri* Forest (CEGL000616, G5)
- *Populus tremuloides* / *Symphoricarpos oreophilus* / *Wyethia amplexicaulis* Forest (CEGL000617, G4Q)
- *Populus tremuloides* / *Symphoricarpos oreophilus* Forest (CEGL000610, G5)
- *Populus tremuloides* / Tall Forbs Forest (CEGL000618, G5)
- *Populus tremuloides* / *Thalictrum fendleri* Forest (CEGL000619, G5)
- *Populus tremuloides* / *Urtica dioica* Forest [Provisional] (CEGL005849, G2G3)
- *Populus tremuloides* / *Vaccinium myrtillus* Forest (CEGL000620, G3)
- *Populus tremuloides* / *Wyethia amplexicaulis* Forest (CEGL000622, G3)

Alliances:

- *Ceanothus velutinus* Shrubland Alliance (A.787)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Populus tremuloides* Woodland Alliance (A.610)

SPATIAL CHARACTERISTICS

Size: This system is not actually very extensive in the Oregon Cascades and probably non-existent in the Coast Ranges. It is not very extensive in western Washington either. Most patches may be too small to map. Many may be relict stands from another climate, just barely hanging on. In the Cascades this system occurs as a small-patch type, not large-patch.

Adjacent Ecological Systems:

- Rocky Mountain Bigtooth Maple Ravine Woodland (CES306.814)

DISTRIBUTION

Range: This system is more common in the central and southern Rocky Mountains extending south to the Sacramento Mountains, however, it occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada, as well as west into California. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Very small occurrences may be found in a few scattered locations of the Trans-Pecos of Texas.

Divisions: 204:C; 206:P; 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, TX, UT, WA, WY

Map Zones: 1:C, 3:C, 6:C, 7:C, 8:?, 9:C, 10:C, 12:C, 13:?, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:P, 25:C, 26:C, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315H:PP, 321A:CC, 322A:CC, 331A:CC, 331F:CC, 331G:CC, 331I:C?, 331J:CC, 331K:CP, 331N:CP, 332F:??, 341A:CC, 341B:CC, 341C:CC, 341D:CC, 341E:CC, 341F:CC, 341G:CC, 342A:CC, 342B:CC, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342I:CP, 342J:CC, M242B:CP, M242C:CC, M242D:CC, M261D:CC, M261E:CC, M261G:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CP, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CP, M333D:CC, M334A:CC, M341A:CC, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 81:P

SOURCES

References: Bartos 1979, Bartos and Campbell 1998, Bartos and Mueggler 1979, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, DeByle and Winokur 1985, DeVelice et al. 1986, Henderson et al. 1977, Hess and Wasser 1982, Johnston and Hendzel 1985, Keammerer 1974a, Mueggler 1988, Neely et al. 2001, Powell 1988a, Tuhy et al. 2002, Youngblood and Mauk 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722860#references

Description Author: M.S. Reid, mod. G. Kittel

Version: 20 Apr 2006

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, Southeast, West

ClassifResp: West

1049 ROCKY MOUNTAIN FOOTHILL LIMBER PINE-JUNIPER WOODLAND (CES306.955)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Forest and Woodland (Treed); Very Shallow Soil; Mineral: W/ A-Horizon <10 cm; Sand Soil Texture; Aridic; Long Disturbance Interval; F-Patch/High Intensity; Needle-Leaved Tree; *Pinus flexilis*, *Juniperus scopulorum*, *J. osteosperma*

Non-Diagnostic Classifiers: Escarpment; Montane [Lower Montane]; Hillslope bedrock outcrop; Ridgetop bedrock outcrop; Ridge/Summit/Upper Slope; Sideslope; Temperate [Temperate Continental]; Loam Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2049; ESLF 4236; ESP 1049

CONCEPT

Summary: This ecological system occurs in foothill and lower montane zones in the Rocky Mountains from northern Montana south to central Colorado and on escarpments across Wyoming extending out into the western Great Plains. Elevation ranges from 1000-2400 m. It occurs generally below continuous forests of *Pseudotsuga menziesii* or *Pinus ponderosa* and can occur in large stands well within the zone of continuous forests in the northeastern Rocky Mountains. It is restricted to shallow soils and fractured bedrock derived from a variety of parent material, including limestone, sandstone, dolomite, granite and colluvium. Soils have a high rock component (typically over 50% cover) and are coarse- to fine-textured, often gravelly and calcareous. Slopes are typically moderately steep to steep. At higher elevations, it is limited to the most xeric aspects on rock outcrops, and at lower elevations to the relatively mesic north aspects. Fire is infrequent and spotty because rocky substrates prevent a continuous vegetation canopy needed to spread. Vegetation is characterized by an open-tree canopy or patchy woodland that is dominated by either *Pinus flexilis*, *Juniperus osteosperma*, or *Juniperus scopulorum*. *Pinus edulis* is not present. A sparse to moderately dense short-shrub layer, if present, may include a variety of shrubs, such as *Arctostaphylos uva-ursi*, *Artemisia nova*, *Artemisia tridentata*, *Cercocarpus ledifolius*, *Cercocarpus montanus*, *Dasiphora fruticosa ssp. floribunda*, *Ericameria nauseosa*, *Juniperus horizontalis*, *Purshia tridentata*, *Rhus trilobata*, *Rosa woodsii*, *Shepherdia canadensis* (important in Montana stands), *Symphoricarpos albus*, or *Symphoricarpos oreophilus*. Herbaceous layers are generally sparse, but range to moderately dense, and are typically dominated by perennial graminoids such as *Bouteloua gracilis*, *Festuca idahoensis*, *Festuca campestris*, *Danthonia intermedia*, *Leucopoa kingii*, *Hesperostipa comata*, *Koeleria macrantha*, *Piptatherum micranthum*, *Poa secunda*, or *Pseudoroegneria spicata*. Within this ecological system, there may be small patches of grassland or shrubland composed of some of the above species. In Wyoming, some limber pine stands are found up to 2440 m (8000 feet) elevation and are still included in this system.

Related Concepts:

- Limber Pine: 219 (Eyre 1980) Intersecting
- Rocky Mountain Juniper: 220 (Eyre 1980) Intersecting

MEMBERSHIP

Associations:

- *Juniperus osteosperma* / *Artemisia tridentata ssp. wyomingensis* Woodland (CEGL000730, G5?)
- *Juniperus osteosperma* / *Cercocarpus ledifolius* Woodland (CEGL000734, G3?)
- *Juniperus osteosperma* / *Cercocarpus montanus* Woodland (CEGL000735, G2G3)
- *Juniperus osteosperma* / *Pseudoroegneria spicata* Woodland (CEGL000738, G4)
- *Juniperus scopulorum* - *Cercocarpus ledifolius* Woodland (CEGL000744, G3?)
- *Juniperus scopulorum* / *Artemisia nova* Woodland (CEGL000742, G2?)
- *Juniperus scopulorum* / *Artemisia tridentata* Woodland (CEGL000743, G3Q)
- *Juniperus scopulorum* / *Cercocarpus montanus* Woodland (CEGL000745, G2)
- *Juniperus scopulorum* / *Piptatherum micranthum* Woodland (CEGL000747, G3G4)
- *Juniperus scopulorum* / *Pseudoroegneria spicata* Woodland (CEGL000748, G4)
- *Juniperus scopulorum* / *Purshia tridentata* Woodland (CEGL000749, G2)
- *Juniperus scopulorum* / *Schizachyrium scoparium* Woodland (CEGL000750, G2)
- *Krascheninnikovia lanata* / *Phlox* spp. Dwarf-shrubland (CEGL001325, G3Q)
- *Pinus edulis* - *Juniperus osteosperma* / *Amelanchier utahensis* Woodland (CEGL002329, GNR)
- *Pinus flexilis* / *Cercocarpus ledifolius* Woodland (CEGL000804, G4)
- *Pinus flexilis* / *Festuca campestris* Woodland (CEGL000806, G3)
- *Pinus flexilis* / *Festuca idahoensis* Woodland (CEGL000805, G5)
- *Pinus flexilis* / *Juniperus communis* Woodland (CEGL000807, G5)
- *Pinus flexilis* / *Juniperus osteosperma* Woodland (CEGL000808, G3)
- *Pinus flexilis* / *Juniperus scopulorum* Woodland (CEGL000809, G3)

- *Pinus flexilis* / *Leucopoa kingii* Woodland (CEGL000810, G3)
- *Pinus flexilis* / *Pseudoroegneria spicata* Woodland (CEGL000813, G4?)
- *Pinus flexilis* Scree Woodland (CEGL000815, G3Q)

Alliances:

- *Juniperus osteosperma* Woodland Alliance (A.536)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Krascheninnikovia lanata* Dwarf-shrubland Alliance (A.1104)
- *Pinus edulis* - (*Juniperus* spp.) Woodland Alliance (A.516)
- *Pinus flexilis* Woodland Alliance (A.540)

DISTRIBUTION

Range: This system occurs in foothill and lower montane zones in the Rocky Mountains from northern Montana south to central Colorado and on escarpments across Wyoming, extending out into the western Great Plains. Elevation ranges from 1000-2400 m. This system may also occur in southeastern Idaho, though it would not be common there. It is also very likely to occur north into Canada along the Front Range of Alberta, in similar ecological settings.

Divisions: 303:C; 306:C

Nations: CA?, US

Subnations: AB?, CO, MT, ND, SD, WY

Map Zones: 16:C, 19:C, 20:C, 21:P, 22:C, 28:C, 29:C, 30:C, 31:?, 33:C, 40:?

USFS Ecomap Regions: 331D:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CP, 331N:CC, 332C:CC, 342A:CC, 342E:CC, 342F:CC, 342G:CC, M242D:PP, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331I:CC, M331J:CC, M332D:CC, M334A:??

TNC Ecoregions: 8:C, 9:C, 10:C, 20:C, 25:P, 26:C, 27:C

SOURCES

References: Anderson 1999b, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2003, DeVelice and Lesica 1993, Hansen and Hoffman 1988, Knight 1994, Knight et al. 1987, Steele et al. 1983, Thilenius et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722726#references

Description Author: G. Jones, K. Schulz, mod. G. Kittel

Version: 20 Apr 2006

Concept Author: G. Jones, K. Schulz

Stakeholders: Canada, Midwest, West

ClassifResp: West

1013 WESTERN GREAT PLAINS DRY BUR OAK FOREST AND WOODLAND (CES303.667)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Lowland]; Forest and Woodland (Treed); F-Landscape/Medium Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2013; ESLF 4106; ESP 1013

CONCEPT

Summary: This system is dominated by *Quercus macrocarpa* and is found in upland areas in the northern part of the Western Great Plains. It often occurs as small to large patches on buttes, escarpments, and in foothill zones, usually on northerly-facing slopes. Other species, such as *Tilia americana* (not in the Dakotas), *Populus tremuloides*, *Juniperus virginiana*, and *Fraxinus* spp., may be present. The herbaceous layer can vary from sparsely to moderately vegetated and is composed of prairie grasses or woodland *Carex* spp. Shrub associates can include *Prunus virginiana*, *Corylus cornuta*, *Amelanchier alnifolia*, or *Symphoricarpos* spp. Historically, higher cover of grass species occurred as these stands were more open due to more frequent fires. Few good examples of this system likely remain because of past timber harvesting and heavy grazing. Where it occurs at elevations above 915 m (3000 feet), *Pinus ponderosa* woodlands are probably adjacent.

Classification Comments: Stands of bur oak can also be included within Central Mixedgrass Prairie (CES303.659); however, that system would only include small patches or single trees protected by fire. Any stands of bur oak or more substantial woodlands should be included within this system.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)

Related Concepts:

- Bur Oak: 236 (Eyre 1980) Broader

DESCRIPTION

Environment: This system is found in upland areas throughout the northern part of the Western Great Plains. Soils are predominately dry to mesic.

Vegetation: This system is typified by the predominance of *Quercus macrocarpa* constituting at least 10% of the vegetation cover in any given example of this system. Other species, such as *Tilia americana*, *Juniperus virginiana*, and *Fraxinus* spp., may be also present. Understory vegetation can range from sparsely vegetated to more dense and usually exemplifies the surrounding prairie grassland vegetation.

Dynamics: This system is primarily driven by fire. Fire suppression within this system can lead to more closed canopies and a decrease in the cover of grass species in the understory. Grazing, conversion to agriculture, and past timber harvesting can impact this system. Overgrazing can also lead to a decrease in understory species, and timber harvesting can completely eliminate examples of this system.

MEMBERSHIP

Associations:

- *Populus tremuloides* - *Quercus macrocarpa* / *Aralia nudicaulis* Forest (CEGL002065, GNRQ)
- *Quercus macrocarpa* - *Populus tremuloides* / *Corylus* spp. Woodland (CEGL002139, G4?)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Corylus americana* - *Amelanchier alnifolia* Woodland (CEGL000556, G3)
- *Quercus macrocarpa* / *Corylus cornuta* Woodland (CEGL002137, G2G3)
- *Tilia americana* - (*Quercus macrocarpa*) / *Ostrya virginiana* Forest (CEGL002012, G3)

Alliances:

- *Acer saccharum* - *Tilia americana* - (*Quercus rubra*) Forest Alliance (A.220)
- *Populus tremuloides* Forest Alliance (A.274)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)

DISTRIBUTION

Range: This system is found throughout the northern part of the Western Great Plains Division. In Wyoming, it occurs in the Bear Lodge Mountains and around Devils Tower National Monument. In North Dakota, it is found in the Killdeer Mountains, and it may occur in the Pine Ridge region of Nebraska.

Divisions: 303:C

Nations: US

Subnations: MT, ND, NE?, SD, WY

Map Zones: 29:C, 30:C, 31:C, 33:C, 38:?, 39:C, 40:C

USFS Ecomap Regions: 251B:CC, 251G:CC, 251H:C?, 331C:CC, 331E:CC, 331F:CC, 331M:CP, 332B:CC, 332C:CC, 332D:CC, 332E:CC, M334A:CC

TNC Ecoregions: 25:P, 26:C, 27:C, 33:C, 34:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Girard et al. 1989, Tolstead 1947

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722991#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz

Version: 01 Oct 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, West

ClassifResp: Midwest

UPLAND SHRUBLAND

1085 NORTHWESTERN GREAT PLAINS SHRUBLAND (CES303.662)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Temperate [Temperate Continental]; Ustic; G-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2085; ESLF 5262; ESP 1085

CONCEPT

Summary: This ecological system ranges from South Dakota into southern Canada on moderately shallow to deep, fine to sandy loam soils. These sites are typically more mesic than most of the surrounding area. This system may be located along upper terraces of rivers and streams, gently inclined slopes near breaklands, and upland sandy loam areas throughout its range. This system is dominated by shrub species such as *Amelanchier alnifolia*, *Rhus trilobata*, *Symphoricarpos* spp., *Shepherdia argentea*, *Crataegus douglasii*, *Elaeagnus commutata*, *Dasiphora fruticosa* ssp. *floribunda*, and dwarf-shrubs such as *Juniperus horizontalis*. Midgrasses such as *Festuca* spp., *Koeleria macrantha*, and *Pseudoroegneria spicata* and species such as *Carex filifolia* can co-occur. This system differs from Northwestern Great Plains Mixedgrass Prairie (CES303.674) in that it contains greater than 10% cover in conjunction with topographic relief (breaks) of natural shrub species. Fire and grazing constitute the primary dynamics affecting this system; drought can also impact this system. This system may include areas of Northwestern Great Plains Mixedgrass Prairie (CES303.674) where fire suppression has allowed for a greater cover of shrub species. This system is similar to Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994) but occurs in the grassland matrix of the Great Plains, whereas the Rocky Mountain system occurs adjacent to the lower treeline of generally forested mountains and highlands. Floristically their shrub composition is similar, but associated grasses and forbs will differ somewhat given their respective adjacent vegetation types.

Classification Comments: This may not be a separate system from the prairie matrix. Those areas that have increased shrub cover due to fire suppression should be considered part of Northwestern Great Plains Mixedgrass Prairie (CES303.674). More information from Canada is probably needed to fully define this system.

Similar Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Southwestern Great Plains Canyon (CES303.664)

Related Concepts:

- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. Some *Artemisia cana* ssp. *cana* shrublands occur in this ecological system if they are not associated with stream terraces.

DESCRIPTION

Environment: Climate and growing season length for the region this system occurs are intermediate to the shortgrass regions to the west and the tallgrass regions to the east with a shorter growing season with semi-arid moisture conditions. This system occurs on sites more mesic than most of the surrounding area such as upper river terraces, gently inclined slopes, and upland sandy areas. Soils range from shallow to deep and fine to sandy loams.

Vegetation: This system is dominated by shrub and dwarf-shrub species such as *Amelanchier alnifolia*, *Rhus trilobata*, *Symphoricarpos* spp., *Dasiphora fruticosa* ssp. *floribunda*, and *Juniperus horizontalis*. Mid grasses such as *Festuca* spp., *Koeleria macrantha*, and *Pseudoroegneria spicata* can also occur. This system differs from Northwestern Great Plains Mixedgrass Prairie (CES303.674) in that it contains greater than 60% cover of natural shrub species.

Dynamics: Fire and grazing constitute the primary dynamics affecting this system. Drought can also impact this system. Conversion to agriculture can impact this system, and its range has probably been decreased by human activities.

MEMBERSHIP

Associations:

- *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065, G3G4Q)
- *Amelanchier alnifolia* Shrubland (CEGL002183, GNR)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL002198, G3G4)
- *Elaeagnus commutata* / *Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Juniperus horizontalis* / *Schizachyrium scoparium* Dwarf-shrubland (CEGL001394, G4)
- *Rhus trilobata* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001457, G3Q)
- *Rhus trilobata* / *Carex filifolia* Shrub Herbaceous Vegetation (CEGL001504, G3)

- *Rhus trilobata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001505, G2?)
- *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Rhus trilobata* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL001506, G3)
- *Sarcobatus vermiculatus* / *Artemisia tridentata* Shrubland (CEGL001359, G4)

Alliances:

- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Canyon (CES303.658)
- Northwestern Great Plains Mixedgrass Prairie (CES303.674)

Adjacent Ecological System Comments: This system may include areas of Northwestern Great Plains Mixedgrass Prairie (CES303.674) where fire suppression has allowed for a greater cover of shrub species.

DISTRIBUTION

Range: This system extends from South Dakota into southern Canada, west into the foothills of north-central Montana. The U.S. range corresponds to Bailey et al. (1994) sections Northeast Glaciated Plains (332A), Western Glaciated Plains (332B), North Central Glaciated Plains - extreme western part (251B), and in Canada to the Moist Mixed Grassland and Fescue Grassland.

Divisions: 303:C

Nations: CA, US

Subnations: AB?, MB, MT, ND, SD, SK, WY?

Map Zones: 20:C, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331K:CC, 331L:CC, 331M:CP, 331N:CC, 342F:CC, M334A:CC

TNC Ecoregions: 26:C, 34:C, 66:P, 67:P

SOURCES

References: Bailey et al. 1994, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722996#references

Description Author: S. Menard and K. Kindscher, mod. G. Kittel and M.S. Reid

Version: 26 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

1086 ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL SHRUBLAND (CES306.822)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane [Lower Montane]; Lowland [Foothill]; Shrubland (Shrub-dominated); Very Shallow Soil; Aridic; Intermediate Disturbance Interval [Periodicity/Polycyclic Disturbance]

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Foothill(s); Gulch; Midslope; Ridge; Temperate [Temperate Continental]; Mineral: W/ A-Horizon <10 cm; Canyon; Colluvial slope

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2086; ESLF 5263; ESP 1086

CONCEPT

Summary: This ecological system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the Intermountain West region. These shrublands occur between 1500 and 2900 m elevation and are usually associated with exposed sites, rocky substrates, and dry conditions, which limit tree growth. It is common where *Quercus gambelii* is absent, such as the northern Colorado Front Range and in drier foothills and prairie hills. This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818) but may include mesic montane shrublands where *Quercus gambelii* does not occur. *Cercocarpus montanus* dominates pure stands in parts of Wyoming and Colorado. Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs, including *Amelanchier utahensis*, *Cercocarpus montanus*, *Purshia tridentata*, *Rhus trilobata*, *Ribes cereum*, *Symphoricarpos oreophilus*, or *Yucca glauca*. Grasses are represented as species of *Muhlenbergia*, *Bouteloua*, *Hesperostipa*, and *Pseudoroegneria spicata*. Fires play an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. *Cercocarpus montanus* requires a disturbance such as fire to reproduce, either by seed sprout or root-crown sprouting. Fire suppression may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth. In Wyoming, stands where *Cercocarpus montanus* is a component of mixed shrublands are placed in Northern Rocky Mountain Montane-Foothill Deciduous Shrubland (CES306.994).

Classification Comments: Some reviewers have requested that this system be renamed in such a way as to more strongly indicate that it is dominated primarily by *Cercocarpus montanus*. However, while *Cercocarpus montanus* is an important shrub in this system, it is not the only dominant, and in many occurrences is not found at all.

Similar Ecological Systems:

- Rocky Mountain Gambel Oak-Mixed Montane Shrubland (CES306.818)

Related Concepts:

- Littleleaf Mountain-Mahogany (417) (Shiflet 1994) Intersecting
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting
- Snowbush (420) (Shiflet 1994) Intersecting. CEAVEL dominated, CAN to CA to CO
- True Mountain-Mahogany (416) (Shiflet 1994) Finer

MEMBERSHIP

Associations:

- *Amelanchier (utahensis, alnifolia) - Cercocarpus montanus* Shrubland (CEGL001070, G2?)
- *Amelanchier utahensis / Pseudoroegneria spicata* Shrubland (CEGL001069, G2G3)
- *Amelanchier utahensis* Shrubland (CEGL001067, G4)
- *Artemisia frigida / Bouteloua gracilis* Dwarf-shrubland [Provisional] (CEGL002782, GNR)
- *Artemisia nova / Leymus salinus* Shrub Herbaceous Vegetation (CEGL001421, G1G2Q)
- *Bromus inermis - (Pascopyrum smithii)* Semi-natural Herbaceous Vegetation (CEGL005264, GNA)
- *Cercocarpus montanus - Artemisia tridentata* Shrubland (CEGL005805, GNR)
- *Cercocarpus montanus - Rhus trilobata / Andropogon gerardii* Shrubland (CEGL002912, G2G3)
- *Cercocarpus montanus / Achnatherum scribneri* Shrubland (CEGL002913, G3)
- *Cercocarpus montanus / Bouteloua curtipendula* Shrubland (CEGL001086, G5)
- *Cercocarpus montanus / Elymus lanceolatus ssp. lanceolatus* Shrubland (CEGL001087, GU)
- *Cercocarpus montanus / Garrya flavescens* Shrubland (CEGL001088, GNR)
- *Cercocarpus montanus / Hesperostipa comata* Shrubland (CEGL001092, G2)
- *Cercocarpus montanus / Hesperostipa neomexicana* Shrubland (CEGL002911, G2G3)
- *Cercocarpus montanus / Muhlenbergia emersleyi* Shrub Herbaceous Vegetation (CEGL001500, G4)
- *Cercocarpus montanus / Muhlenbergia montana* Shrubland (CEGL002914, GU)
- *Cercocarpus montanus / Muhlenbergia pauciflora* Shrubland (CEGL001089, GNR)

- *Cercocarpus montanus* / *Pseudoroegneria spicata* Shrubland (CEGL001090, G4)
- *Cercocarpus montanus* / *Rhus trilobata* var. *trilobata* Shrubland (CEGL001091, GNRQ)
- *Cercocarpus montanus* Shale Shrubland [Provisional] (CEGL002798, GNR)
- *Cercocarpus montanus* var. *paucidentatus* / *Petrophyton caespitosum* Shrubland (CEGL004589, G3?)
- *Prunus virginiana* - (*Prunus americana*) Shrubland (CEGL001108, G4Q)
- *Purshia tridentata* / *Artemisia frigida* / *Hesperostipa comata* Shrubland (CEGL001055, G1G2)
- *Purshia tridentata* / *Muhlenbergia montana* Shrubland (CEGL001057, G2)
- *Rhus trilobata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001505, G2?)
- *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Rhus trilobata* Rocky Mountain Shrub Herbaceous Vegetation (CEGL002910, G2)
- *Ribes cereum* / *Leymus ambiguus* Shrubland (CEGL001124, G2)
- *Spiraea betulifolia* Shrubland (CEGL005835, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Symphoricarpos oreophilus* Shrubland (CEGL002951, GNR)

Alliances:

- *Amelanchier utahensis* Shrubland Alliance (A.916)
- *Artemisia frigida* Dwarf-shrubland Alliance (A.2565)
- *Artemisia nova* Shrub Herbaceous Alliance (A.1567)
- *Bromus inermis* Semi-natural Herbaceous Alliance (A.3561)
- *Cercocarpus montanus* Shrub Herbaceous Alliance (A.1538)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Purshia tridentata* Shrubland Alliance (A.825)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Ribes cereum* Shrubland Alliance (A.923)
- *Spiraea betulifolia* Shrubland Alliance (A.2636)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Symphoricarpos oreophilus* Shrubland Alliance (A.2530)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Canyon (CES303.658)

DISTRIBUTION

Range: This system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern New Mexico, extending north into Wyoming, and west into the Intermountain West region.

Divisions: 303:C; 306:C

Nations: US

Subnations: CO, MT, NE?, NM, SD, WY

Map Zones: 15:C, 16:C, 18:C, 21:P, 22:C, 23:C, 25:C, 26:C, 27:C, 28:C, 29:C, 30:?, 31:P, 33:C, 34:P

USFS Ecomap Regions: 313A:CC, 313B:CC, 315A:CC, 315B:CC, 315H:CP, 321A:CC, 331B:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 341B:CC, 341C:CC, 342E:CC, 342F:CC, 342G:CC, M313B:CC, M331A:CP, M331B:CP, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332G:??, M334A:??, M341B:CC

TNC Ecoregions: 10:C, 20:C, 21:C, 25:C, 26:C, 27:C

SOURCES

References: Comer et al. 2003, Dick-Peddie 1993, Hess 1981, Hess and Wasser 1982, Hoffman and Alexander 1987, Marriott and Faber-Langendoen 2000, Mueggler and Stewart 1980, Muldavin 1994, Muldavin et al. 2000b, Neely et al. 2001, Roughton 1972, Thilenius et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722851#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, West

ClassifResp: West

1094 WESTERN GREAT PLAINS SANDHILL STEPPE (CES303.671)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Shrubland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Sand Soil Texture; Ustic; F-Landscape/Medium Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2094; ESLF 5271; ESP 1094

CONCEPT

Summary: This system is found mostly in south-central areas of the Western Great Plains Division ranging from southwestern Wyoming and southwestern Nebraska up into the Nebraska Sandhill region, south through eastern Colorado, and New Mexico to central Texas, although some examples may reach as far north as the Badlands of South Dakota. The climate is semi-arid to arid for much of the region in which this system occurs. This system is found on somewhat excessively to excessively well-drained, deep sandy soils that are often associated with dune systems and ancient floodplains. In some areas, this system may actually occur as a result of overgrazing in Western Great Plains Tallgrass Prairie (CES303.673) or Western Great Plains Sand Prairie (CES303.670). Typically, this system is characterized by a sparse to moderately dense woody layer dominated by *Artemisia filifolia*, but other characteristic species may be present, including *Amorpha canescens*, *Prosopis glandulosa* (southern stands), *Prunus angustifolia*, *Prunus pumila* var. *besseyi* (northern stands), *Rhus trilobata*, and *Yucca glauca*. Associated herbaceous species can vary with geography, amount and season of precipitation, disturbance, and soil texture. The herbaceous layer typically has a moderate to dense canopy but may include stands with sparse understory. Several mid- to tallgrass species characteristic of sand substrates are usually present to dominant, such as *Andropogon hallii*, *Calamovilfa gigantea*, *Calamovilfa longifolia*, *Schizachyrium scoparium*, *Sporobolus cryptandrus*, *Sporobolus giganteus*, or *Hesperostipa comata*.

In the southern range of this system, *Quercus havardii* may also be present to dominant and represents one succession pathway that develops over time following a disturbance. *Quercus havardii* is able to resprout following a fire and thus may persist for long periods of time once established forming extensive clones. Edaphic and climatic factors are the most important dynamic processes for this type, with drought and extreme winds impacting this system significantly in some areas. Because *Quercus havardii* is able to resprout rapidly following fire, fire tends to cause structural changes in the vegetation, and compositional shifts are less significant in most cases. Overgrazing can lead to decreasing dominance of some of the grass species such as *Andropogon hallii*, *Calamovilfa gigantea*, and *Schizachyrium scoparium*. In the western extent of this system in the shortgrass prairie, more xeric mid- and shortgrass species such as *Hesperostipa comata*, *Sporobolus cryptandrus* and *Bouteloua gracilis* often dominate the herbaceous layer.

Classification Comments: This system is minor in the sandhills region of western Nebraska which is dominated by sand prairie. It may overlap in concept with East-Central Texas Plains Xeric Sandyland (CES205.897). This system was modeled Monahans and Mescalero Sands of Texas and New Mexico during Landfire workshops, but probably needs significant review because of the complexity of the relationship among tallgrass, shin oak, and sandsage types. This type is probably best represented in mapzone 34.

Similar Ecological Systems:

- East-Central Texas Plains Xeric Sandyland (CES205.897)
- Western Great Plains Sand Prairie (CES303.670)
- Western Great Plains Tallgrass Prairie (CES303.673)

Related Concepts:

- Blue Grama - Sideoats Grama - Black Grama (707) (Shiflet 1994) Intersecting
- Bluestem -Dropseed (708) (Shiflet 1994) Broader
- Sand Bluestem - Little Bluestem Dunes (720) (Shiflet 1994) Finer
- Sand Sagebrush - Mixed Prairie (722) (Shiflet 1994) Equivalent
- Sand Shinnery Oak (730) (Shiflet 1994) Finer
- Sandsage Prairie (605) (Shiflet 1994) Broader

DESCRIPTION

Environment: This system is found primarily in semi-arid to arid areas of the Western Great Plains Division. It occurs on somewhat excessively to excessively well-drained and deep sandy soils. This system is often found associated with dune systems and/or ancient floodplains but may occur in soils derived from sandstone residuum.

Vegetation: This system is distinguished by a sparse to moderately dense shrub layer dominated by *Artemisia filifolia*. Graminoid species, such as *Andropogon hallii*, *Schizachyrium scoparium*, *Sporobolus cryptandrus*, *Calamovilfa gigantea*, *Hesperostipa comata*, and *Bouteloua* spp., can also be found within this system. Other shrub species, such as *Yucca glauca*, *Rhus trilobata*, and *Prunus angustifolia*, may be present. *Quercus havardii* and *Prosopis glandulosa* may also be present in the southern extent of this system.

Dynamics: Fire and grazing constitute the most important processes impacting this system. Burning shrublands reduces cover of *Artemisia filifolia* for several years resulting in grassland patches that form a mosaic pattern with shrublands. Composition of

grasslands depends on precipitation and management. Drought stress can also influence this system in some areas.

MEMBERSHIP

Associations:

- *Artemisia filifolia* / *Andropogon hallii* Shrubland (CEGL001459, G3?)
- *Artemisia filifolia* / *Bouteloua (curtipendula, gracilis)* Shrubland (CEGL002176, GNR)
- *Artemisia filifolia* / *Calamovilfa longifolia* Shrubland (CEGL002177, G2G3)
- *Artemisia filifolia* / *Schizachyrium scoparium - Andropogon hallii* Shrubland (CEGL002178, GNR)
- *Artemisia filifolia* / *Sporobolus cryptandrus* Shrubland (CEGL002179, GNR)
- *Prunus angustifolia* / *Schizachyrium scoparium* Shrubland (CEGL002180, GNA)
- *Quercus havardii* / *Sporobolus cryptandrus - Schizachyrium scoparium* Shrubland (CEGL002171, G3)

Alliances:

- *Artemisia filifolia* Shrubland Alliance (A.816)
- *Prunus angustifolia* Shrubland Alliance (A.1884)
- *Quercus havardii* Shrubland Alliance (A.780)

DISTRIBUTION

Range: This system is found primarily within the south-central areas of the Western Great Plains Division ranging from the Nebraska Sandhills south into central Texas. However, examples of this system can be found as far north as the Badlands in South Dakota.

Divisions: 303:C

Nations: US

Subnations: CO, KS, NE, NM, OK, SD?, TX

Map Zones: 25:?, 26:C, 27:C, 28:?, 31:C, 33:C, 34:C, 38:C

USFS Ecomap Regions: 315A:CC, 315B:CC, 315F:CC, 321A:CC, 331B:CC, 331C:CC, 331H:CC, 331I:CC, 332E:CC, 332F:CC, M313B:PP

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C

SOURCES

References: Comer et al. 2003, Ramaley 1939b, Sims et al. 1976, Tolstead 1942

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722987#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz and L. Elliott

Version: 10 Apr 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

SAVANNA AND SHRUB-STEPPE

EASTERN GREAT PLAINS QUARTZITE ROCKY OUTCROP (CES205.697)

CLASSIFIERS

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

National Mapping Codes: ESLF 3194

CONCEPT

Summary: This system is found along outcrops of Sioux quartzite in Minnesota and South Dakota. It is found on rocky, level or hilly areas within the Northern Tallgrass Prairie (TNC Ecoregion 35) of Minnesota and South Dakota. It is characterized by a mosaic of rocky outcrops that are sparsely vegetated with scattered succulents and other vegetation such as *Opuntia fragilis*, *Opuntia macrorhiza*, *Escobaria vivipara* (= *Coryphantha vivipara*), and *Lomatium orientale*, as well as *Selaginella rupestris*, *Talinum parviflorum*, *Woodsia ilvensis*, and a variety of spring- and summer-blooming annuals. Soil development is minimal and restricted to patches.

Classification Comments: This system may not hold together as a system separate from a larger, surrounding system. These rocky outcrops were split from quartzite glades found in the Baraboo Hills region of Wisconsin (CES202.699). Distribution into Manitoba needs further review.

DESCRIPTION

Environment: Soil development is minimal. Most vegetation present grows in shallow, dry soil that collects in small depressions on sloping rock faces. The outcrops are composed primarily of Sioux quartzite, granite and gneiss. Extreme drought and great fluctuations in the temperature of the ground surface occur within this system (MNNHP 1993).

Vegetation: This system contains a sparse vegetation layer, with scattered succulents and many annuals, including *Opuntia fragilis*, *Opuntia macrorhiza*, *Escobaria vivipara* (= *Coryphantha vivipara*), and *Lomatium orientale*, as well as *Selaginella rupestris*, *Talinum parviflorum*, *Woodsia ilvensis*, and a variety of spring- and summer-blooming annuals (MNNHP 1993).

Dynamics: Fire appears to be important in maintaining this system. Trees and shrubs invade in the absence of fire. *Juniperus virginiana* is an invader throughout the range of this type, displacing the herbs, lichens, and mosses that characterize the system (MNNHP 1993).

MEMBERSHIP

Associations:

- Quartzite - Granite Rock Outcrop Sparse Vegetation (CEGL002298, G3?)

Alliances:

- Rock Outcrop Sparsely Vegetated Alliance (A.1838)

DISTRIBUTION

Range: This system is found in a very restricted area within Minnesota and South Dakota along outcrops of Sioux quartzite.

Divisions: 205:C

Nations: CA?, US

Subnations: MB?, MN, ND, SD

Map Zones: 39:C, 40:?

USFS Ecomap Regions: 251Ba:CCC

TNC Ecoregions: 35:C

SOURCES

References: Midwestern Ecology Working Group n.d., MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.800696#references

Description Author: S.E. Menard

Version: 11 Apr 2007

Concept Author: S.E. Menard

Stakeholders: Canada, Midwest

ClassifResp: Midwest

UPLAND GRASSLAND AND HERBACEOUS

1132 CENTRAL MIXEDGRASS PRAIRIE (CES303.659)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Temperate [Temperate Continental]; Shallow Soil; Loam Soil Texture; Silt Soil Texture; Ustic; F-Landscape/Medium Intensity; G-Landscape/High Intensity; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2132; ESLF 7104; ESP 1132

CONCEPT

Summary: This mixedgrass prairie system ranges from South Dakota into the Rolling Plains and the western Edwards Plateau of Texas. It is bordered by the shortgrass prairie on its western edge and the tallgrass prairie to the east. The loessal regions in west-central Kansas and central Nebraska, the Red Hills region of south-central Kansas and northern Oklahoma are all located within this system. Because of its proximity to other ecoregions, this system contains elements from both shortgrass and tallgrass prairies, which combine to form the mixedgrass prairie ecological system throughout its range. The distribution, species richness and productivity of plant species within the mixedgrass ecological system is controlled primarily by environmental conditions, in particular soil moisture and topography. Grazing and fire are important dynamic processes in this system. The relative dominance of the various grass and forb species within different associations in the system also can strongly depend on the degree of natural or human disturbance. This system can contain grass species such as *Bouteloua curtipendula*, *Schizachyrium scoparium*, *Andropogon gerardii*, *Hesperostipa comata*, *Sporobolus heterolepis*, and *Bouteloua gracilis*, although the majority of the associations within the region are dominated by *Pascopyrum smithii* or *Schizachyrium scoparium*. Numerous forb and sedge species (*Carex* spp.) can also occur within the mixedgrass system in the Western Great Plains. Although forbs do not always significantly contribute to the canopy, they can be very important. Some dominant forb species include *Ambrosia psilostachya*, *Echinacea angustifolia*, and *Lygodesmia juncea*. Oak species such as *Quercus macrocarpa* can occur also in areas protected from fire due to topographic position. This can cause an almost oak savanna situation in certain areas, although fire suppression may allow for a more closed canopy and expansion of bur oak beyond those sheltered areas. In those situations, further information will be needed to determine if those larger areas with a more closed canopy of bur oak should be considered part of Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667). Likewise, within the mixedgrass system, small seeps may occur, especially during the wettest years. Although these are not considered a separate system, the suppression of fire within the region has enabled the invasion of both exotics and some shrub species such as *Juniperus virginiana* and also allowed for the establishment of *Pinus ponderosa* in some northern areas.

Classification Comments: This system is found primarily in the Central Mixed-grass Prairie (TNC Ecoregion 33); it becomes more restricted to mesic lowlands sites to the west and southwest in the shortgrass prairie region of Texas (S. Menard pers. comm. 2005). This is probably a reference to the Llano Estacado region rather than the Southern Shortgrass Prairie (TNC Ecoregion 28) (J. Teague pers. obs 2005). The Central Mixed-grass Prairie (TNC Ecoregion 33) should be extended south to include the Rolling Plains of Texas; being separated from the Southern Shortgrass Prairie (TNC Ecoregion 28) by the Caprock Escarpment (L. Elliott pers. comm. 2005).

Similar Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)
- Western Great Plains Dry Bur Oak Forest and Woodland (CES303.667)
- Western Great Plains Mesquite Woodland and Shrubland (CES303.668)
- Western Great Plains Sand Prairie (CES303.670)

Related Concepts:

- Blue Grama - Western Wheatgrass (704) (Shiflet 1994) Finer
- Bluestem - Grama (709) (Shiflet 1994) Broader
- Bluestem - Grama Prairie (604) (Shiflet 1994) Finer

DESCRIPTION

Environment: Differences in topography and soil characteristics also occur across the range of this system. It is often characterized by rolling to extremely hilly landscapes with soils developed from loess, shale, limestone or sandstone parent material. Mollisol soils are most prevalent and range from silt loams and silty clay loams with sandy loams possible on the western edge of the range. The Red Hills region of Kansas and Oklahoma, which contains examples of this system, contains somewhat unique soil characteristics and has developed from a diversity of sources including red shale, red clay, sandy shale, siltstone, or sandstone. These soils have developed a characteristic reddish color from the primary material. These soils can consist of silt, loam, or clay and can have textures ranging from a fine sandy loam to a more clayey surface.

Vegetation: This system contains elements from both Western Great Plains Shortgrass Prairie (CES303.672) and Western Great

Plains Tallgrass Prairie (CES303.673). This system typically contains grass species such as *Bouteloua curtipendula*, *Schizachyrium scoparium*, *Andropogon gerardii*, *Hesperostipa comata*, *Sporobolus heterolepis*, and *Bouteloua gracilis*, although the majority of the associations within the region are dominated by *Pascopyrum smithii* or *Schizachyrium scoparium*. Isolated patches of *Quercus macrocarpa* also can occur.

Dynamics: Fire and grazing are the primary processes occurring within the system. The diversity in this mixedgrass system likely reflects both the short- and long-term responses of the vegetation to these often concurrent disturbance regimes. Fire suppression and overgrazing can lead to the invasion of this system by woody species such as *Juniperus virginiana* and *Pinus ponderosa*. Likewise, fire suppression may lead to a more closed canopy of bur oak.

MEMBERSHIP

Associations:

- *Artemisia tridentata* ssp. *wyomingensis* / Mixed Grasses Shrub Herbaceous Vegetation (CEGL001534, G5)
- *Bothriochloa ischaemum* var. *songarica* Herbaceous Vegetation (CEGL004915, GNA)
- *Bouteloua gracilis* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Buchloe dactyloides* Modified Herbaceous Vegetation (CEGL004948, GNA)
- *Cornus drummondii* - (*Rhus glabra*, *Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Cynodon dactylon* Herbaceous Vegetation (CEGL004701, GNA)
- *Hesperostipa comata* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL002037, G5)
- *Hesperostipa comata* - *Carex filifolia* Herbaceous Vegetation (CEGL001700, G4)
- *Hesperostipa comata* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001701, G4)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Vegetation (CEGL002253, GNR)
- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL002238, G3?)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Bouteloua curtipendula* Great Plains Herbaceous Vegetation (CEGL004066, G2)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* Forest (CEGL003628, GNA)
- *Krascheninnikovia lanata* / *Bouteloua gracilis* Dwarf-shrub Herbaceous Vegetation (CEGL001321, G4)
- *Panicum obtusum* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001573, GNRQ)
- *Pascopyrum smithii* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001578, G5)
- *Pascopyrum smithii* - *Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (CEGL002034, G4)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Pleuraphis mutica* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL002272, G4?)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Poa pratensis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation (CEGL005265, GNA)
- *Quercus macrocarpa* / Mixedgrass Loam Wooded Herbaceous Vegetation (CEGL002163, G1Q)
- *Quercus macrocarpa* / Mixedgrass Sand Wooded Herbaceous Vegetation (CEGL002162, G1)
- *Quercus macrocarpa* / Mixedgrass Shale Wooded Herbaceous Vegetation (CEGL002164, G1Q)
- *Rhus lanceolata* - *Baccharis neglecta* Ruderal Shrubland (CEGL004212, GNA)
- *Sarcobatus vermiculatus* / *Sporobolus airoides* Shrubland (CEGL001368, G3?)
- *Schizachyrium scoparium* - (*Sorghastrum nutans*) - *Sporobolus compositus* var. *compositus* - *Liatris mucronata* Herbaceous Vegetation (CEGL004211, GNR)
- *Schizachyrium scoparium* - *Bouteloua (curtipendula, gracilis)* - *Carex filifolia* Herbaceous Vegetation (CEGL001681, G3G4)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Bouteloua gracilis* Central Plains Herbaceous Vegetation (CEGL002246, G2G4)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Nassella leucotricha* Herbaceous Vegetation (CEGL004070, GNR)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Chalkflat Herbaceous Vegetation (CEGL002247, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Loess Mixedgrass Herbaceous Vegetation (CEGL002036, G3?)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Red Hills Herbaceous Vegetation (CEGL002248, G2Q)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Western Great Plains Herbaceous Vegetation (CEGL001594, G3)
- *Schizachyrium scoparium* - *Lesquerella gordonii* - *Castilleja purpurea* var. *citrina* Herbaceous Vegetation (CEGL002252, G2?)
- *Yucca glauca* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:

- *Artemisia tridentata* ssp. *wyomingensis* Shrub Herbaceous Alliance (A.1527)
- *Bothriochloa ischaemum* Herbaceous Alliance (A.1210)
- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Buchloe dactyloides* Herbaceous Alliance (A.1276)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Cynodon dactylon* Herbaceous Alliance (A.1279)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Alliance (A.3523)
- *Hilaria belangeri* - *Bouteloua curtipendula* Herbaceous Alliance (A.1214)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Krascheninnikovia lanata* Dwarf-shrub Herbaceous Alliance (A.1565)
- *Panicum obtusum* Herbaceous Alliance (A.1238)

- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Pleuraphis mutica* Herbaceous Alliance (A.1249)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Poa pratensis* Semi-natural Herbaceous Alliance (A.3562)
- *Quercus macrocarpa* Wooded Medium-Tall Herbaceous Alliance (A.1505)
- *Rhus lanceolata* - *Baccharis neglecta* Successional Shrubland Alliance (A.2024)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

DISTRIBUTION

Range: This system is found throughout the central and southern areas of the western Great Plains ranging from southern South Dakota into the Rolling Plains and western Edwards Plateau of Texas.

Divisions: 205:C; 303:C

Nations: US

Subnations: CO, KS, ND, NE, OK, SD, TX

Map Zones: 27:P, 30:C, 31:C, 32:C, 33:C, 34:C, 35:C, 38:C, 39:P, 43:P

USFS Ecomap Regions: 223A:??, 251A:CP, 251B:CC, 251E:CP, 251F:CC, 251G:CC, 251H:CC, 255A:??, 315F:CC, 331B:CC, 331C:CC, 331E:CC, 331F:CC, 331H:CC, 331I:CC, 331M:CP, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 27:P, 28:P, 29:C, 32:C, 33:C, 36:C, 37:P

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999, Weaver and Albertson 1956, Weaver and Bruner 1948

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722999#references

Description Author: S. Menard and K. Kindscher

Version: 27 Sep 2005

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

1412 NORTH-CENTRAL INTERIOR SAND AND GRAVEL TALLGRASS PRAIRIE (CES202.695)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Esker; Kame; Lakeplain; Moraine; Outwash plain; Outwash terrace; Herbaceous; Glaciated; Sand Soil Texture; F-Patch/High Intensity; W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2412; ESLF 7125; ESP 1412

CONCEPT

Summary: This system is found in the northern Midwest, particularly in Minnesota, Wisconsin, Michigan, and possibly ranging into Ontario. It is often found on glacial features such as kames, eskers, moraines, lakeplains (though excluding the Great Lakes lakeplain) and sandplains, and along eolian dunes. In contrast to the deeper, richer soils supporting other tallgrass systems in the region, the underlying soils in this system tend to be more shallow, sandy, rocky, and/or gravelly outwash soils. Organic content is significantly lower. Grassland species such as *Schizachyrium scoparium*, *Andropogon gerardii*, and *Bouteloua* spp., varying in cover from sparse to moderately dense, dominate this system. *Hesperostipa spartea* and *Sporobolus heterolepis* are also common components of this system. Woody species more tolerant of droughty conditions may be found in some examples. The most common trees are *Pinus banksiana*, *Quercus ellipsoidalis*, *Quercus macrocarpa*, and *Populus tremuloides*. Fire and drought are the major dynamics influencing this system. If fire and periodic drought are not present, woody species begin to invade this system, especially in the eastern parts of its distribution. Wind can also play a role, especially on examples found on sandplains and/or eolian dunes.

DESCRIPTION

Environment: This system is often found on glacial features such as kames, eskers, moraines, lakeplains (though excluding the Great Lakes lakeplain) and sandplains, and along eolian dunes. In contrast to the deeper, richer soils supporting other tallgrass systems in the region, the underlying soils in this system tend to be more shallow, sandy, rocky, and/or gravelly outwash soils. Organic content is significantly lower.

Vegetation: Grassland species such as *Schizachyrium scoparium*, *Andropogon gerardii*, and *Bouteloua* spp., varying in cover from sparse to moderately dense, dominate this system. *Hesperostipa spartea* and *Sporobolus heterolepis* are also common components of this system. Woody species more tolerant of droughty conditions may be found in some examples. The most common trees are *Pinus banksiana*, *Quercus ellipsoidalis*, *Quercus macrocarpa*, and *Populus tremuloides*.

Dynamics: Fire and drought are the major dynamics influencing this system. If fire and periodic drought are not present, woody species begin to invade this system, especially in the eastern parts of its distribution. Wind can also play a role, especially on examples found on sandplains and/or eolian dunes.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Calamagrostis canadensis* Sand Herbaceous Vegetation (CEGL005177, G2G3)
- *Andropogon gerardii* - *Sorghastrum nutans* - *Schizachyrium scoparium* - *Aletris farinosa* Herbaceous Vegetation (CEGL005096, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Gravel Herbaceous Vegetation (CEGL002215, G3)
- *Schizachyrium scoparium* - *Bouteloua* spp. - *Hesperostipa spartea* Gravel Herbaceous Vegetation (CEGL002499, G2G3)
- *Schizachyrium scoparium* - *Danthonia spicata* - *Carex pensylvanica* - (*Viola pedata*) Herbaceous Vegetation (CEGL002318, G2G3)
- *Schizachyrium scoparium* - *Hesperostipa spartea* - *Bouteloua (curtipendula, gracilis)* Sand Herbaceous Vegetation (CEGL005204, G2G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Andropogon gerardii* - *Lespedeza capitata* Sand Herbaceous Vegetation (CEGL002210, G3)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - (*Sporobolus cryptandrus*) Herbaceous Alliance (A.1224)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the northern Midwest possibly ranging into Ontario.

Divisions: 202:C; 205:P

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, MO, ND, ON, SD, WI

Map Zones: 39:C, 40:C, 41:P, 42:C, 43:P, 49:P, 50:C, 51:C, 52:C

USFS Ecomap Regions: 212Ha:CCC, 212Hb:CCC, 212Hc:CCC, 212Hd:CCC, 212He:CCC, 212Hf:CCC, 212Hg:CCC, 212Hh:CCP, 212Hi:CCC, 212Hk:CCC, 212Hm:CCP, 212K:CP, 212M:CP, 212N:CP, 212Tb:CCC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jf:CCP, 222Jg:CCC, 222Jh:CCC, 222Ji:CCP, 222K:CC, 222L:CC, 222M:CC, 222N:CC, 222R:CP, 222Ua:CCC, 222Ud:CCP, 222Ue:CCP, 251A:CC, 251B:CC

TNC Ecoregions: 35:C, 36:P, 45:C, 46:C, 47:C, 48:C

SOURCES

References: Comer et al. 2003, MNNHP 1993, Thompson 1940

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722964#references

Description Author: S. Menard, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, Southeast
ClassifResp: Midwest

1420 NORTHERN TALLGRASS PRAIRIE (CES205.686)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Glaciated plains; Herbaceous; Glaciated; Deep Soil; Loam Soil Texture; F-Landscape/Low Intensity; G-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2420; ESLF 7133; ESP 1420

CONCEPT

Summary: This system is found primarily in the Northern Tallgrass ecoregion ranging along the Red River basin in Minnesota and the Dakotas to Lake Manitoba in Canada. It constitutes the northernmost extension of the "true" prairies. Similar to Central Tallgrass Prairie (CES205.683), this system is dominated by tallgrass species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum*. However, the soils in this region are not as rich nor deep, and thus this system does not have as much species diversity as grasslands to the south. This system is often found on well-drained, drier soils and can grade into Eastern Great Plains Tallgrass Aspen Parkland (CES205.688) to the north and east. Grazing and fire influenced this system historically. Much of this system has been converted to agriculture with very few unaltered and highly fragmented examples remaining.

Similar Ecological Systems:

- Central Tallgrass Prairie (CES205.683)

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Panicum virgatum*) - *Muhlenbergia richardsonis* Herbaceous Vegetation (CEGL002199, G3G4)
- *Andropogon gerardii* - *Hesperostipa spartea* - *Sporobolus heterolepis* Herbaceous Vegetation (CEGL002202, G2G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Hesperostipa spartea* - (*Pascopyrum smithii*) Herbaceous Vegetation (CEGL002377, G3?)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Loess Mixedgrass Herbaceous Vegetation (CEGL002036, G3?)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Eastern Great Plains Tallgrass Aspen Parkland (CES205.688)

Adjacent Ecological System Comments: It can grade into Eastern Great Plains Tallgrass Aspen Parkland (CES205.688) to the north and east.

DISTRIBUTION

Range: Found primarily in the Northern Tallgrass ecoregion ranging along the Red River basin in Minnesota and the Dakotas to Lake Manitoba in Canada.

Divisions: 205:C

Nations: CA, US

Subnations: IA, MB, MN, ND, SD

Map Zones: 39:C, 40:C, 41:?, 42:C

USFS Ecomap Regions: 222N:CC, 251A:CC, 251B:CC, 251G:CC, 251H:C?, 332B:CC, 332D:CC

TNC Ecoregions: 35:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722973#references

Description Author: S. Menard

Version: 05 Mar 2003

Concept Author: S. Menard

Stakeholders: Canada, Midwest

ClassifResp: Midwest

1141 NORTHWESTERN GREAT PLAINS MIXEDGRASS PRAIRIE (CES303.674)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Herbaceous; Glaciated; Shallow Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2141; ESLF 7114; ESP 1141

CONCEPT

Summary: This system extends from northern Nebraska into southern Canada and westward through the Dakotas to the Rocky Mountain Front in Montana and probably Wyoming, on both glaciated and non-glaciated substrates. Soil texture (which ultimately effects water available to plants) is the defining environmental descriptor; soils are primarily fine and medium-textured and do not include sands, sandy soils, or sandy loams. This system occurs on a wide variety of landforms (e.g., mesatops, stream terraces) and in proximity to a diversity of other systems. Most usually it is found in association with Western Great Plains Sand Prairie (CES303.670) which occupies the coarser-textured substrates. In various locales the topography where this system occurs is broken by many glacial pothole lakes, and this system may be proximate to Great Plains Prairie Pothole (CES303.661). On the eastern Montana plains, mixedgrass prairie is by far the predominant system. Here it occurs continuously for hundreds of square kilometers, interrupted only by riparian areas or sand prairies, which are associated with gentle rises, eroded ridges or mesas derived from sandstone. Historically, this system covered approximately 38 million ha in Nebraska, North and South Dakota, and Canada; now it covers approximately 270,000 square km in this region. The growing season and rainfall are intermediate to drier units to the southwest and mesic tallgrass regions to the east. Graminoids typically comprising the greatest canopy cover include *Pascopyrum smithii*, *Nassella viridula*, and *Festuca* spp. In Montana these include *Festuca campestris* and *Festuca idahoensis*. Other commonly dominant species in Montana are *Bouteloua gracilis*, *Hesperostipa comata*, and *Carex filifolia*, while *Festuca campestris* and *Festuca idahoensis* may be more abundant in the north and foothill/montane grassland transition areas. Remnants of *Hesperostipa curtisetata*-dominated vegetation are found in northernmost Montana and North Dakota associated with the most productive sites (largely plowed to cereal grains); this species, usually in association with *Pascopyrum smithii*, is much more abundant in Canada. Sites with a strong component of *Nassella viridula* indicate a more favorable moisture balance and perhaps a favorable grazing regime as well because this is one of the most palatable of the mid-grasses. *Hesperostipa comata* is also an important component and becomes increasingly so as improper grazing regimes favor it at the expense of (usually) *Pascopyrum smithii*; progressively more destructive grazing can result in the loss of *Pascopyrum smithii* from the system followed by drastic reduction in *Hesperostipa comata* and ultimately the dominance of *Bouteloua gracilis* (or *Poa secunda* and other short graminoids) and/or a lawn of *Selaginella densa*. *Koeleria macrantha*, at least in Montana and southern Canada, is the most pervasive grass; if it has high cover, past intensive grazing is the presumed reason. Shrub species such as *Symphoricarpos* spp. and *Artemisia frigida* and *Artemisia cana* also occur. Fire and grazing constitute the primary dynamics affecting this system. Drought can also impact this system, in general favoring the shortgrass component at the expense of the mid-grasses. With intensive grazing, cool-season exotics such as *Poa pratensis*, *Bromus inermis*, and *Bromus japonicus* can increase in dominance; both of the rhizomatous grasses have been shown to markedly depress species diversity. Shrub species such as *Juniperus virginiana* can also increase in dominance with fire suppression. This system is one of the most disturbed grassland systems in Nebraska, North and South Dakota, and Canada.

Classification Comments: This system was edited to expand the concept for central Montana mixedgrass prairie and to exclude specifically sandy soil grasslands, which are placed into Western Great Plains Sand Prairie (CES303.670). This system is similar to Central Mixedgrass Prairie (CES303.659) and can contain elements of Great Plains tallgrass and shortgrass systems. However, it differs from Central Mixedgrass Prairie (CES303.659) in that the cooler climate in this region allows natural cool-season grasses to be more important (greater than 50% cover). Cover of native, nongrazing-induced shrubs typically does not exceed 25% in conjunction with topographic relief (breaks); otherwise the stand would be considered part of Northwestern Great Plains Shrubland (CES303.662). Additional review and commentary by Canadian, Dakotan, and Nebraskan ecologists is needed to flesh out the compositional variation and range of distribution for this important grassland system. In Wyoming, this system transitions into Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland (CES306.040) in the foothills of the northern Wyoming mountains where *Pascopyrum smithii* communities finger up into foothills. If *Festuca idahoensis*, *Carex rossii*, *Artemisia nova*, or *Artemisia tripartita* ssp. *rupicola* occur, then the example is not this system.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)
- Northwestern Great Plains Shrubland (CES303.662)

Related Concepts:

- *Elymus lanceolatus* - *Nassella viridula* Herbaceous Vegetation (MTNHP 2002b) Finer
- Fescue Grassland (613) (Shiflet 1994) Intersecting
- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. This mixedgrass prairie ecological system can have a sage component where disturbed/grazed.

- Wheatgrass (610) (Shiflet 1994) Finer
- Wheatgrass - Bluestem - Needlegrass (606) (Shiflet 1994) Intersecting
- Wheatgrass - Grama (609) (Shiflet 1994) Finer
- Wheatgrass - Grama - Needlegrass (608) (Shiflet 1994) Finer
- Wheatgrass - Needlegrass (607) (Shiflet 1994) Finer
- Wheatgrass - Saltgrass - Grama (615) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: Given the system's rather extensive geographic range, it not surprising to find it occurring on a wide variety of landforms (e.g., mesatops, stream terraces) and in proximity to a diversity of other systems. Climate and growing season length for the region this system occurs are intermediate to the shortgrass regions to the west and southwest and the tallgrass regions to the east with a shorter growing season and less humid climate compared to the range of Central Mixedgrass Prairie (CES303.659). Moisture conditions are semi-arid. This system occurs on soils derived primarily from fine-textured sedimentary rocks and deposits, but other rock types are included so long as their weathering products are not coarse-textured, namely not sands, sandy soils, or sandy loams and relatively stable. It is found primarily on planar to gently rolling topography but is found on broken topography hillslopes as well.

Vegetation: This system contains greater than 50% cover of natural, cool-season grasses such as *Festuca* spp., *Pascopyrum smithii*, *Elymus lanceolatus*, *Hesperostipa comata*, *Hesperostipa curtieta*, and *Nassella viridula*. *Hesperostipa comata* becomes increasingly important where improper grazing regimes have favored it at the expense of (usually) *Pascopyrum smithii*; progressively more destructive grazing can result in the loss of *Pascopyrum smithii* from the system followed by drastic reduction in *Hesperostipa comata* and ultimately the dominance of *Bouteloua gracilis* (or *Poa secunda* and other short graminoids) and/or a lawn of *Selaginella densa*. *Koeleria macrantha*, at least in Montana and southern Canada, is the most pervasive grass; if it has high cover, past intensive grazing is the presumed reason. Shrub species such as *Symphoricarpos* spp. and *Artemisia frigida* also occur. Cover of native, nongrazing-induced shrubs typically does not exceed 25% in conjunction with topographic relief (breaks); otherwise the stand would be considered part of Northwestern Great Plains Shrubland (CES303.662). Cool-season exotics such as *Poa pratensis*, *Bromus inermis*, and *Bromus japonicus* can increase in dominance with overgrazing; both of the above-named rhizomatous grasses are sufficiently aggressive to outcompete natives regardless of disturbance regime. Likewise, shrub species such as *Juniperus virginiana* can also increase in dominance with fire suppression.

Dynamics: Fire and grazing constitute the primary dynamics affecting this system. Drought can also impact this system. It should be acknowledged that this system occurs within the very same biotope as Inter-Mountain Basins Big Sagebrush Steppe (CES304.778) or Inter-Mountain Basins Big Sagebrush Shrubland (CES304.777), the only difference being that fire has not been present where the sagebrush systems occur, a purely stochastic outcome. Heavy grazing causes cool-season exotics such as *Poa pratensis* and *Bromus inermis* to increase in dominance. Conversion to agriculture also impacts this system; however, the degree of agricultural alteration of this system is highly variable by geographic region with Montana (and Wyoming??) having experienced much less impact than the estimated 75% percent of the Nebraska-Dakota-south-central Canada region, where this system has been heavily altered. In Montana, this system is the major sustainer of livestock grazing with overall far less than half of it having been lost to agriculture; several Montana counties have more than 90% of this system remaining intact, though impacted by grazing to varying degrees.

MEMBERSHIP

Associations:

- *Agropyron cristatum* - (*Pascopyrum smithii*, *Hesperostipa comata*) Semi-natural Herbaceous Vegetation (CEGL005266, GNA)
- *Amelanchier alnifolia* / *Pseudoroegneria spicata* - Bunchgrass Shrubland (CEGL001065, G3G4Q)
- *Amelanchier alnifolia* Shrubland (CEGL002183, GNR)
- *Artemisia cana* ssp. *cana* / *Pascopyrum smithii* Shrub Herbaceous Vegetation (CEGL001556, G4)
- *Artemisia tridentata* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001530, G4Q)
- *Artemisia tridentata* ssp. *vaseyana* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001531, G3Q)
- *Betula pumila* - *Salix* spp. Prairie Fen Shrubland (CEGL002189, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca campestris* Shrub Herbaceous Vegetation (CEGL001503, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Festuca idahoensis* Shrub Herbaceous Vegetation (CEGL001502, G4)
- *Dasiphora fruticosa* ssp. *floribunda* / *Schizachyrium scoparium* Shrub Herbaceous Vegetation (CEGL002198, G3G4)
- *Elaeagnus commutata* / *Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Elymus lanceolatus* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001746, G1)
- *Elymus lanceolatus* - *Koeleria macrantha* Herbaceous Vegetation (CEGL002237, GNR)
- *Euphorbia esula* Herbaceous Vegetation (CEGL005268, GNA)
- *Festuca altaica* - (*Hesperostipa* spp., *Achnatherum* spp.) Herbaceous Vegetation (CEGL002436, GNR)
- *Festuca campestris* - *Festuca idahoensis* Herbaceous Vegetation (CEGL005875, G3)
- *Festuca campestris* - *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001629, G4)
- *Festuca campestris* Herbaceous Vegetation [Provisional] (CEGL001627, G3Q)
- *Festuca idahoensis* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001610, G3)
- *Hesperostipa curtieta* - *Elymus lanceolatus* Herbaceous Vegetation (CEGL002253, GNR)
- *Hesperostipa curtieta* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL003789, G3G4?)
- *Hesperostipa neomexicana* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001709, G3?)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708, G3)

- *Juniperus horizontalis* / *Schizachyrium scoparium* Dwarf-shrubland (CEGL001394, G4)
- *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Bouteloua curtipendula* Great Plains Herbaceous Vegetation (CEGL004066, G2)
- *Pascopyrum smithii* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL001579, G4)
- *Pascopyrum smithii* - *Hesperostipa comata* Central Mixedgrass Herbaceous Vegetation (CEGL002034, G4)
- *Pascopyrum smithii* - *Nassella viridula* Herbaceous Vegetation (CEGL001583, G3G4)
- *Pascopyrum smithii* Herbaceous Vegetation (CEGL001577, G3G5Q)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Poa pratensis* - (*Pascopyrum smithii*) Semi-natural Herbaceous Vegetation (CEGL005265, GNA)
- *Pseudoroegneria spicata* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001663, G3)
- *Pseudoroegneria spicata* - *Bouteloua gracilis* Herbaceous Vegetation (CEGL001664, G4)
- *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675, G4)
- *Schizachyrium scoparium* - *Carex inops* ssp. *heliophila* Herbaceous Vegetation (CEGL001682, G3)
- *Schizachyrium scoparium* - *Muhlenbergia cuspidata* Herbaceous Vegetation (CEGL001683, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)

Alliances:

- (*Cirsium arvense*, *Euphorbia esula*, *Melilotus* spp.) - Mixed Forbs Herbaceous Alliance (A.3564)
- *Agropyron cristatum* Semi-natural Herbaceous Alliance (A.3563)
- *Amelanchier alnifolia* Shrubland Alliance (A.913)
- *Artemisia cana* ssp. *cana* Shrub Herbaceous Alliance (A.2554)
- *Artemisia tridentata* Shrub Herbaceous Alliance (A.1521)
- *Artemisia tridentata* ssp. *vaseyana* Shrub Herbaceous Alliance (A.1526)
- *Betula pumila* - (*Salix* spp.) Saturated Shrubland Alliance (A.1021)
- *Dasiphora fruticosa* ssp. *floribunda* Shrub Herbaceous Alliance (A.1534)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Eleocharis* (*palustris*, *macrostachya*) Seasonally Flooded Herbaceous Alliance (A.1422)
- *Elymus lanceolatus* - *Koeleria macrantha* Herbaceous Alliance (A.3520)
- *Elymus lanceolatus* Herbaceous Alliance (A.1242)
- *Festuca altaica* Herbaceous Alliance (A.1250)
- *Festuca campestris* Herbaceous Alliance (A.1255)
- *Festuca idahoensis* Herbaceous Alliance (A.1251)
- *Hesperostipa curtisetata* - *Elymus lanceolatus* Herbaceous Alliance (A.3523)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Juniperus horizontalis* Dwarf-shrubland Alliance (A.1080)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Poa pratensis* Semi-natural Herbaceous Alliance (A.3562)
- *Pseudoroegneria spicata* - *Bouteloua gracilis* Herbaceous Alliance (A.1239)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Schizachyrium scoparium* Herbaceous Alliance (A.1240)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Great Plains Prairie Pothole (CES303.661)
- Northwestern Great Plains Shrubland (CES303.662)
- Western Great Plains Sand Prairie (CES303.670)
- Western Great Plains Shortgrass Prairie (CES303.672)
- Western Great Plains Tallgrass Prairie (CES303.673)

Adjacent Ecological System Comments: Across much of the western portion of its range, this system exists intimately associated with Western Great Plains Sand Prairie (CES303.670), at least as we have redefined Western Great Plains Sand Prairie). This system may be proximate to Great Plains Prairie Pothole (CES303.661) at various locations across its distribution.

DISTRIBUTION

Range: This system extends from northern Nebraska into southern Canada, and west to central Montana. The U.S. range corresponds to Bailey et al. (1994) sections 331D, 331E, 331F (mostly), 331G, 332A, 332B, and perhaps minor extensions into 251B, and in Canada to the Moist Mixed Grassland and Fescue Grassland.

Divisions: 205:P; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, NE, SD, SK, WY

Map Zones: 20:C, 22:C, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CC, 331N:CC, 332B:CC, 332C:CC, 332D:CC, 342A:CP, 342F:CC, 342G:CC, M331A:CP, M331B:CC, M331I:CC, M331J:C?, M334A:CC
TNC Ecoregions: 26:C, 34:C, 66:P, 67:C

SOURCES

References: Bailey et al. 1994, Barbour and Billings 1988, Comer et al. 2003, Ricketts et al. 1999, Weaver 1954

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722984#references

Description Author: S. Menard and K. Kindscher, mod. G. Kittel, S. Cooper, M.S. Reid

Version: 27 Apr 2006

Concept Author: S. Menard and K. Kindscher, mod. S. Cooper and G. Kittel

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

1147 WESTERN GREAT PLAINS FOOTHILL AND PIEDMONT GRASSLAND (CES303.817)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Lowland [Foothill]; Toeslope/Valley Bottom; Clay Soil Texture; Aridic; Short Disturbance Interval [Periodicity/Irregular Disturbance]; F-Patch/Low Intensity; Graminoid

Non-Diagnostic Classifiers: Short (50-100 yrs) Persistence; Herbaceous; Temperate [Temperate Continental]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2147; ESLF 7120; ESP 1147

CONCEPT

Summary: This ecological system typically occurs between 1600 and 2200 m in elevation. It is best characterized as a mixedgrass to tallgrass prairie on mostly moderate to gentle slopes, usually at the base of foothill slopes, e.g., the hogbacks of the Rocky Mountain Front Range where it typically occurs as a relatively narrow elevational band between montane woodlands and shrublands and the shortgrass steppe and mixedgrass prairie, but extends east on the Front Range piedmont alongside the Chalk Bluffs near the Colorado-Wyoming border, out into the Great Plains on the Palmer Divide, and on piedmont slopes below mesas and foothills in northeastern New Mexico. A combination of increased precipitation from orographic rain, temperature, and soils limits this system to the lower elevation zone with approximately 40 cm of precipitation/year. It is maintained by frequent fire and associated with well-drained clay soils. Usually occurrences of this system have multiple plant associations that may be dominated by *Andropogon gerardii*, *Schizachyrium scoparium*, *Muhlenbergia montana*, *Nassella viridula*, *Pascopyrum smithii*, *Sporobolus cryptandrus*, *Bouteloua gracilis*, *Hesperostipa comata*, or *Hesperostipa neomexicana*. In Wyoming, typical grasses found in this system include *Pseudoroegneria spicata*, *Schizachyrium scoparium*, *Hesperostipa neomexicana*, *Hesperostipa comata*, and species of *Poa*. Typical adjacent ecological systems include foothill shrublands, ponderosa pine savannas, juniper savannas, as well as shortgrass prairie.

Classification Comments: Need to incorporate northern Rockies information. How does this differ from Northwestern Great Plains Mixedgrass Prairie (CES303.674) which seems pretty similar? In southeastern Wyoming, it is mostly in mapzone 33, along bluffs.

Related Concepts:

- Bluestem - Grama Prairie (604) (Shiflet 1994) Intersecting. This ecological system overlaps this SRM type along the Wyoming-Colorado-New Mexico eastern foothills of the Rocky Mtns.
- Grama - Feathergrass (716) (Shiflet 1994) Finer
- Sideoats Grama - New Mexico Feathergrass - Winterfat (724) (Shiflet 1994) Finer
- Sideoats Grama - Sumac - Juniper (735) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Schizachyrium scoparium* Western Great Plains Herbaceous Vegetation (CEGL001463, G2?)
- *Andropogon gerardii* - *Sorghastrum nutans* Western Great Plains Herbaceous Vegetation (CEGL001464, G2)
- *Andropogon gerardii* - *Sporobolus heterolepis* Western Foothills Herbaceous Vegetation (CEGL001465, G2)
- *Bouteloua gracilis* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001754, G5)
- *Bouteloua gracilis* - *Bouteloua hirsuta* Herbaceous Vegetation (CEGL001755, G3G4)
- *Bouteloua gracilis* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001756, G4)
- *Bouteloua gracilis* Herbaceous Vegetation (CEGL001760, G4Q)
- *Bouteloua hirsuta* - *Bouteloua curtipendula* Herbaceous Vegetation (CEGL001764, G4)
- *Bouteloua hirsuta* - *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001766, GNRQ)
- *Hesperostipa comata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001703, G2?)
- *Hesperostipa comata* Colorado Front Range Herbaceous Vegetation (CEGL001702, G1G2)
- *Hesperostipa neomexicana* Herbaceous Vegetation (CEGL001708, G3)
- *Nassella viridula* Herbaceous Vegetation (CEGL001713, GU)
- *Poliomintha incana* / *Bouteloua gracilis* Shrubland (CEGL001339, G2?)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Pseudoroegneria spicata* - *Pascopyrum smithii* Herbaceous Vegetation (CEGL001675, G4)
- *Pseudoroegneria spicata* - *Poa secunda* Herbaceous Vegetation (CEGL001677, G4?)
- *Pseudoroegneria spicata* Herbaceous Vegetation (CEGL001660, G2)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Western Great Plains Herbaceous Vegetation (CEGL001594, G3)
- *Schizachyrium scoparium* - *Muhlenbergia cuspidata* Herbaceous Vegetation (CEGL001683, G3?)
- *Yucca glauca* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001499, G4Q)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)

- *Bouteloua gracilis* Herbaceous Alliance (A.1282)
- *Bouteloua hirsuta* Herbaceous Alliance (A.1285)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Hesperostipa comata* Bunch Herbaceous Alliance (A.1270)
- *Hesperostipa neomexicana* Herbaceous Alliance (A.1272)
- *Nassella viridula* Herbaceous Alliance (A.1261)
- *Poliomintha incana* Shrubland Alliance (A.862)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- *Schizachyrium scoparium* Bunch Herbaceous Alliance (A.1266)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

DISTRIBUTION

Range: This mixedgrass prairie ecological system occurs in the narrow to broad transition band between the Rocky Mountains and the Shortgrass Steppe where increased soil moisture from orographic lifting and local topography favor tall and mid-height grasses. The band is restricted to the Rocky Mountain foothills and piedmont and adjacent plains, extending farther east on the Palmer Divide, north alongside the Chalk Bluffs near the Colorado-Wyoming border, and south on and below mesas and escarpments in southeastern Colorado, northeastern New Mexico, and the panhandles of Oklahoma and Texas. These grassland also occur around the edges of the Black Hills uplift, where *Schizachyrium scoparium* is the dominant grass.

Divisions: 303:C; 306:C

Nations: US

Subnations: AZ?, CO, NM, OK, SD, TX, WY

Map Zones: 19:?, 21:?, 22:C, 24:?, 25:C, 26:P, 27:C, 28:C, 29:C, 30:P, 31:P, 33:C, 34:?

USFS Ecomap Regions: 315A:CC, 315B:CC, 315H:CC, 331B:CC, 331C:CC, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 342F:CC, M313A:CP, M313B:CC, M331F:CC, M331G:CC, M331I:CC, M341A:CC

TNC Ecoregions: 10:C, 20:C, 21:C, 24:C, 25:P, 26:P, 27:C, 28:P

SOURCES

References: Anderson 1999a, Comer et al. 2003, Hess and Wasser 1982, Lauenroth and Milchunas 1992, Mast et al. 1997, Mast et al. 1998, Neely et al. 2001, Opler and Krizek 1984, Weaver and Albertson 1956

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722856#references

Description Author: NatureServe Western Ecology Team

Version: 26 Jan 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Midwest, Southeast, West

ClassifResp: West

1148 WESTERN GREAT PLAINS SAND PRAIRIE (CES303.670)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Lowland [Lowland]; Herbaceous; Sand Soil Texture; Ustic; G-Landscape/Low Intensity; W-Patch/High Intensity

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2148; ESLF 7121; ESP 1148

CONCEPT

Summary: The sand prairies constitute a very unique system within the western Great Plains. These sand prairies are often considered part of the tallgrass or mixedgrass regions in the western Great Plains but can contain elements from Western Great Plains Shortgrass Prairie (CES303.672), Central Mixedgrass Prairie (CES303.659), and Northwestern Great Plains Mixedgrass Prairie (CES303.674). The largest expanse of sand prairies (approximately 5 million ha) can be found in the Sandhills of north-central Nebraska and southwestern South Dakota. These areas are relatively intact. The primary use of this system has been grazing (not cultivation), and areas such as the Nebraska Sandhills can experience less degeneration than other prairie systems. Although greater than 90% of the Sandhills region is privately owned, the known fragility of the soils and the cautions used by ranchers to avoid poor grazing practices have allowed for fewer significant changes in the vegetation of the Sandhills compared to other grassland systems. The unifying and controlling feature for this system is that coarse-textured soils predominate and the dominant grasses are well-adapted to this condition. Soils in the sand prairies can be relatively undeveloped and are highly permeable. Soil texture and drainage along with a species' rooting morphology, photosynthetic physiology, and mechanisms to avoid transpiration loss are highly important in determining the composition of the sand prairies. In the northwestern portion of its range, stand size corresponds to the area of exposed caprock sandstone, and small patches predominate, but large patches are also found embedded in the encompassing Northwestern Great Plains Mixedgrass Prairie (CES303.674). Another important feature is their susceptibility to wind erosion. Blowouts and sand draws are some of the unique wind-driven disturbances in the sand prairies, particularly the Nebraska Sandhills. In most of eastern Montana, substrates supporting this system have weathered in place from sandstone caprock; thus the solum is relatively thin, and the wind-sculpted features present further east, particularly in Nebraska, do not develop. Graminoid species dominate the sand prairies, although relative dominance can change due to impacts of wind disturbance. *Andropogon hallii* and *Calamovilfa longifolia* are the most common species, but other grass and forb species such as *Hesperostipa comata*, *Carex inops* ssp. *heliophila*, and *Panicum virgatum* may be present. Apparently only *Calamovilfa longifolia* functions as a dominant throughout the range of the system. In the western extent, *Hesperostipa comata* becomes more dominant, and *Andropogon hallii* is less abundant but still present. Communities of *Artemisia cana* ssp. *cana* are included here in central and eastern Montana. Patches of *Quercus havardii* can also occur within this system in the southern Great Plains. Fire and grazing constitute the other major dynamic processes that can influence this system.

Classification Comments: This system was edited to expand the concept to include sandy portions of the mixedgrass prairie of the Montana plains. Although in terms of potentially dominant graminoids there is virtually a complete overlap between the eastern and western extremities of the system, there is a distinct shift from west to east from midgrass species dominance, most notably *Hesperostipa comata*, to tallgrass species dominance, including prominently *Andropogon gerardii* and *Andropogon hallii*. Prevailing patch size also shifts from smaller to larger moving west to east. Current thinking is to include this variation within this system, but with more information and input from other Great Plains ecologists in the U.S. and Canada, this concept is subject to change, including the possibility of creating a new system.

Similar Ecological Systems:

- Central Mixedgrass Prairie (CES303.659)
- Western Great Plains Sandhill Steppe (CES303.671)
- Western Great Plains Shortgrass Prairie (CES303.672)
- Western Great Plains Tallgrass Prairie (CES303.673)

Related Concepts:

- Blue Grama - Sideoats Grama - Black Grama (707) (Shiflet 1994) Intersecting
- Bluestem - Prairie Sandreed (602) (Shiflet 1994) Finer
- Bluestem - Dropseed (708) (Shiflet 1994) Broader
- Grama - Bluestem (714) (Shiflet 1994) Finer. soil texture ranges from sand to clay loam? Inclusions?
- Prairie Sandreed - Needlegrass (603) (Shiflet 1994) Finer. This SRM type is found in the more northerly and northwest portions of this ecological system (as far west as central Montana).
- Sand Bluestem - Little Bluestem Dunes (720) (Shiflet 1994) Finer
- Sand Bluestem - Little Bluestem Plains (721) (Shiflet 1994) Finer
- Wheatgrass - Grama - Needlegrass (608) (Shiflet 1994) Intersecting. Sandy portions of this SRM type are included in this ecological system.

DESCRIPTION

Environment: The distribution, species richness and productivity of plant species within the sand prairie ecological system are controlled primarily by environmental conditions, in particular the temporal and spatial distribution of soil moisture and topography. Soils in the sand prairies can be relatively undeveloped and are highly permeable. Soil texture and drainage along with a species' rooting morphology, photosynthetic physiology, and mechanisms to avoid transpiration loss are highly important in determining the composition and distribution of communities/associations within the sand prairies. Another important aspect of soils in the sand prairies is their susceptibility to wind erosion. Blowouts and sand draws are some of the unique wind-driven disturbances in the sand prairies, particularly the Nebraska Sandhills, which can profoundly impact vegetation composition and succession within this system. This tallgrass system is found primarily on sandy and sandy loam soils that can be relatively undeveloped and highly permeable as compared to Western Great Plains Tallgrass Prairie (CES303.673), which occurs on deeper loams. This system is usually found in areas with a rolling topography and can occur on ridges, midslopes and/or lowland areas within a region. It often occurs on moving sand dunes, especially within the Sandhills region of Nebraska and South Dakota. In Montana, occurrences are intimately associated with Northwestern Great Plains Mixedgrass Prairie (CES303.674), usually occupying higher positions in local landscapes due to the fact that sandy members of some formations (that are predominantly marine shales) constitute the highest (and most weathering-resistant) points in the landscape.

Vegetation: This system is distinguished by the dominance of graminoids such as *Andropogon hallii* and *Calamovilfa longifolia*. Other graminoids such as *Hesperostipa comata*, *Carex inops ssp. heliophila*, and *Panicum virgatum* may be present. Characteristic forbs differ by region, but species of *Psoraleidium* and *Pediemelum* are a common feature. *Penstemon haydenii* is endemic to the sand prairie system and of special conservation concern because of its probable decline due to grazing and fire suppression. Very diffuse patches of *Rhus trilobata* are found on shallow sandy soils, often associated with breaklands; other shrubs occasionally occurring include *Artemisia cana ssp. cana*, *Betula occidentalis*, *Juniperus horizontalis*, and *Yucca glauca*. Many of the warm-season graminoids extend at least to the Rocky Mountain Front as dominant components on appropriate sites or as a response to disturbance. All the characteristic species mentioned for Nebraska and South Dakota are also found in Montana stands (and possibly Wyoming and perhaps the rest of the states cited). Some of the communities cited as part of the concept in Nebraska and South Dakota are only marginally present in Montana, but others are found throughout Montana's Great Plains region. In the southern range of this system, patches of *Quercus havardii* can also occur.

Dynamics: The distribution, species richness and productivity of plant species within the sand prairie ecological system are controlled primarily by environmental conditions, in particular the temporal and spatial distribution of soil moisture and topography. Another important aspect of this system is its susceptibility to wind erosion. Blowouts and sand draws are some of the unique wind-driven disturbances in the sand prairies, particularly the Nebraska Sandhills, which can profoundly impact vegetation composition and succession within this system. Fire and grazing constitute the other major disturbances that can influence this system. Overgrazing, fire and trampling that leads to the removal of vegetation within those areas susceptible to blowouts can either instigate a blowout or perpetuate one already occurring. Overgrazing can also lead to significant erosion.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum virgatum* Sandhills Herbaceous Vegetation (CEGL002023, G3?)
- *Andropogon hallii* - *Calamovilfa gigantea* Herbaceous Vegetation (CEGL004016, G2G3)
- *Andropogon hallii* - *Calamovilfa longifolia* Herbaceous Vegetation (CEGL001467, G4G5)
- *Andropogon hallii* - *Carex inops ssp. heliophila* Herbaceous Vegetation (CEGL001466, G3)
- *Artemisia cana ssp. cana* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001555, G3Q)
- *Artemisia cana ssp. cana* / *Hesperostipa comata* Shrub Herbaceous Vegetation (CEGL001553, G3)
- *Betula occidentalis* - *Juniperus horizontalis* / *Calamovilfa longifolia* Shrubland (CEGL002184, GNR)
- *Calamovilfa longifolia* - *Carex inops ssp. heliophila* Herbaceous Vegetation (CEGL001471, G3)
- *Calamovilfa longifolia* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001473, G3)
- *Carex interior* - *Eleocharis elliptica* - *Thelypteris palustris* Herbaceous Vegetation (CEGL002390, G1G2)
- *Hesperostipa comata* - *Bouteloua gracilis* - *Carex filifolia* Herbaceous Vegetation (CEGL002037, G5)
- *Hesperostipa comata* - *Carex filifolia* Herbaceous Vegetation (CEGL001700, G4)
- *Pseudoroegneria spicata* - *Achnatherum hymenoides* Herbaceous Vegetation (CEGL001674, G3G4)
- *Pseudoroegneria spicata* - *Hesperostipa comata* Herbaceous Vegetation (CEGL001679, G4)
- *Quercus havardii* / *Sporobolus cryptandrus* - *Schizachyrium scoparium* Shrubland (CEGL002171, G3)
- *Rhus trilobata* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL001457, G3Q)
- *Rhus trilobata* / *Pseudoroegneria spicata* Shrub Herbaceous Vegetation (CEGL001120, G4)
- *Schizachyrium scoparium* - *Aristida basiramea* - *Sporobolus cryptandrus* - *Eragrostis trichodes* Herbaceous Vegetation (CEGL005221, GNR)
- *Yucca glauca* / *Calamovilfa longifolia* Shrub Herbaceous Vegetation (CEGL002675, G4)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon hallii* Herbaceous Alliance (A.1193)
- *Artemisia cana ssp. cana* Shrub Herbaceous Alliance (A.2554)
- *Betula occidentalis* Shrubland Alliance (A.914)
- *Calamovilfa longifolia* Herbaceous Alliance (A.1201)

- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Hesperostipa comata* - *Bouteloua gracilis* Herbaceous Alliance (A.1234)
- *Pseudoroegneria spicata* Herbaceous Alliance (A.1265)
- *Quercus havardii* Shrubland Alliance (A.780)
- *Rhus trilobata* Shrub Herbaceous Alliance (A.1537)
- *Schizachyrium scoparium* - (*Sporobolus cryptandrus*) Herbaceous Alliance (A.1224)
- *Yucca glauca* Shrub Herbaceous Alliance (A.1540)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)

DISTRIBUTION

Range: This system is found throughout the Western Great Plains Division. The largest and most intact example of this system is found within the Sandhills region of Nebraska and South Dakota. However, it is also common (though occurring in predominantly small patches) farther west into central and eastern Montana. Its western extent in Wyoming is still to be determined, but it does occur in mapzone 29 on weathered-in-place sandy soils, where *Calamovilfa longifolia* is found, along with *Artemisia cana*.

Divisions: 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, NM?, OK, SD, TX?, WY

Map Zones: 20:C, 27:P, 29:C, 30:C, 31:C, 33:C, 34:C, 38:C, 39:C, 40:C

USFS Ecomap Regions: 251F:CC, 251H:CC, 255A:PP, 315A:CC, 315B:CC, 315F:CC, 321A:??, 331B:CC, 331C:CC, 331D:CC, 331E:CC, 331F:CC, 331G:CC, 331H:CC, 331K:CC, 331L:CC, 331M:CP, 331N:C?, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C, 34:C

SOURCES

References: Barbour and Billings 1988, Comer et al. 2003, Tolstead 1942

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722988#references

Description Author: S. Menard and K. Kindscher, mod. M.S. Reid

Version: 27 Apr 2006

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

WOODY WETLANDS AND RIPARIAN

NORTH-CENTRAL INTERIOR SHRUB-GRAMINOID ALKALINE FEN (CES202.702)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Alkaline Water; Saturated Soil; Fen; Shrubland (Shrub-dominated); Woody-Herbaceous; Herbaceous; Seepage-Fed Sloping; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9184

CONCEPT

Summary: This fen system is found in the glaciated portions of the Midwest and southern Canada. Examples of this system can be located on level to sloping seepage areas, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. Groundwater flows through marls and shallow peat soils, and groundwater is typically minerotrophic and slightly alkaline. Examples of this system contain a core fen area of graminoids surrounded by shrubs with a fairly continuous sphagnum moss layer. Herbaceous and shrub cover is variable with little to no tree cover. Characteristic species include prairie grasses such as *Andropogon gerardii* and *Spartina pectinata* with prairie forbs and sedges (*Carex* spp.). Common shrub species include *Dasiphora fruticosa* ssp. *floribunda*, *Cornus* spp., and *Salix* spp. Alterations in wetland hydrology and agricultural development can threaten examples of this system.

Similar Ecological Systems:

- Laurentian-Acadian Alkaline Fen (CES201.585)
- North-Central Interior and Appalachian Rich Swamp (CES202.605)

DESCRIPTION

Environment: Examples of this system can be located on level to sloping seepage areas, in pitted outwash or in kettle lakes associated with kettle-kame-moraine topography. Groundwater flows through marls and shallow peat soils, and groundwater is typically minerotrophic and slightly alkaline.

Vegetation: Examples of this system contain a core fen area of graminoids surrounded by shrubs with a fairly continuous sphagnum moss layer. Herbaceous and shrub cover is variable with little to no tree cover. Characteristic species include prairie grasses such as *Andropogon gerardii* and *Spartina pectinata* with prairie forbs and sedges (*Carex* spp.). Common shrub species include *Dasiphora fruticosa* ssp. *floribunda*, *Cornus* spp., and *Salix* spp.

Dynamics: Alterations in wetland hydrology and agricultural development can threaten examples of this system.

MEMBERSHIP

Associations:

- *Carex lasiocarpa* - *Carex oligosperma* / *Sphagnum* spp. Herbaceous Vegetation (CEGL002265, G3G4)
- *Cladium mariscoides* - (*Carex lasiocarpa*, *Hypericum kalmianum*, *Oligoneuron riddellii*, *Eleocharis elliptica*) Herbaceous Vegetation (CEGL005104, G2?)
- *Cornus amomum* - *Salix* spp. - *Toxicodendron vernix* - *Rhamnus lanceolata* Fen Shrubland (CEGL005087, G2G3)
- *Cornus racemosa* / *Carex (sterilis, aquatilis, lacustris)* Shrub Herbaceous Vegetation (CEGL006123, G2G3)
- *Cornus* spp. - *Salix* spp. - *Vaccinium corymbosum* - *Rhamnus alnifolia* - *Toxicodendron vernix* Shrubland (CEGL005083, G4?)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex interior* - *Carex flava* - *Sarracenia purpurea* Shrub Herbaceous Vegetation (CEGL005140, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex sterilis* - *Andropogon gerardii* - *Arnoglossum plantagineum* Shrub Herbaceous Vegetation (CEGL005139, G3G4)
- *Symplocarpus foetidus* Herbaceous Vegetation (CEGL002385, G4?)
- *Vaccinium corymbosum* - *Gaylussacia baccata* - *Photinia melanocarpa* / *Calla palustris* Shrubland (CEGL005085, G2G3)

Alliances:

- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Cladium mariscoides* Seasonally Flooded Herbaceous Alliance (A.1368)
- *Cornus sericea* - *Photinia melanocarpa* - *Toxicodendron vernix* Saturated Shrubland Alliance (A.1016)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex (flava, interior, lasiocarpa, sterilis)* Saturated Shrub Herbaceous Alliance (A.1562)
- *Symplocarpus foetidus* - *Calla palustris* Saturated Herbaceous Alliance (A.1694)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is found in the northern Midwest and southern Canada.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, ND, OH, ON, PA, SD, WI

Map Zones: 39:C, 40:C, 41:C, 42:C, 43:C, 49:C, 50:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 221F:CC, 222H:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jf:CCP, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222M:CC, 222U:CP, 251B:CC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:P

SOURCES

References: Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722958#references

Description Author: S. Menard, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, East, Midwest

ClassifResp: Midwest

NORTH-CENTRAL INTERIOR WET MEADOW-SHRUB SWAMP (CES202.701)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Lakeshore]; Broad-Leaved Shrub; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Shallow (<15 cm) Water; Moderate (100-500 yrs) Persistence; Herbaceous; Depressional [Pond]; Isolated Wetland [Partially Isolated]; Muck

National Mapping Codes: ESLF 9185

CONCEPT

Summary: This system is found throughout the northern Midwest ranging into southern Canada. It is typically found on glacial potholes, river valleys, ponds, channels in glacial outwash, and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent species surrounded by a zone of wet meadow. The emergent marsh zone within this system contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate the core of this system. Wet meadows can surround the emergent marsh core along wet mineral soils or shallow peat with the water table typically just below the surface for most of the growing season. The vegetation in this zone of the system is dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. This system also can contain a zone of wet prairie species such as *Spartina pectinata*. Shrub swamps can also be associated with the wet meadows within this system. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*. Trees are generally absent and, if present, are scattered. Fire originating in adjacent uplands, as well as hydrology, can influence this system. In the absence of fire, drought and/or ditching can increase the proportion of shrubs compared to the wet meadow or prairie species.

Classification Comments: If examples of these associations are found within a medium to large floodplain, they should be considered part of North-Central Interior Floodplain (CES202.694). The freshwater marsh component was removed from this system to create a new system, North-Central Interior Freshwater Marsh (CES202.899).

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- Laurentian-Acadian Shrub-Herbaceous Wetland Systems (CES201.642)
- Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

DESCRIPTION

Environment: This system is typically found on glacial potholes, river valleys, ponds, channels in glacial outwash, and on lakeplains. It contains a deep to shallow area of freshwater marsh dominated by emergent species surrounded by a zone of wet meadow. The emergent marsh zone within this system contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season.

Vegetation: Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate the core of this system. Wet meadows can surround the emergent marsh core along wet mineral soils or shallow peat with the water table typically just below the surface for most of the growing season. The vegetation in this zone of the system is dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. This system also can contain a zone of wet prairie species such as *Spartina pectinata*. Shrub swamps can also be associated with the wet meadows within this system. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*. Trees are generally absent and, if present, are scattered.

Dynamics: Fire originating in adjacent uplands, as well as hydrology, can influence this system. In the absence of fire, drought and/or ditching can increase the proportion of shrubs compared to the wet meadow or prairie species.

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex aquatilis* - *Carex* spp. Herbaceous Vegetation (CEGL002262, G4?)
- *Carex atherodes* Herbaceous Vegetation (CEGL002220, G3G5)
- *Carex crinita* - *Osmunda* spp. / *Physocarpus opulifolius* Seep Herbaceous Vegetation (CEGL002392, G2)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002027, G3?)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* - *Lythrum alatum* - (*Oxypolis rigidior*) Herbaceous Vegetation (CEGL002224, G3?)

- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* Sand Herbaceous Vegetation (CEGL005178, G3?)
- *Spiraea tomentosa* - *Salix humilis* / *Andropogon gerardii* - *Panicum virgatum* Shrubland (CEGL005069, G1Q)

Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex atherodes* Seasonally Flooded Herbaceous Alliance (A.1396)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Corylus americana* - (*Spiraea tomentosa*, *Malus ioensis*) Shrubland Alliance (A.897)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

DISTRIBUTION

Range: This system is found in the northern Midwest and southern Canada.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, MO, ND, OH, ON, SD, WI

Map Zones: 39:C, 40:C, 41:C, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 212Hb:CCP, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:?

SOURCES

References: Comer and Albert 1997, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722959#references

Description Author: S. Menard, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, Southeast
ClassifResp: Midwest

NORTHWESTERN GREAT PLAINS FLOODPLAIN (CES303.676)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Long (>25 yrs) Flooding Interval; Floodplain; Forest and Woodland (Treed); Riverine / Alluvial

National Mapping Codes: ESLF 9159

CONCEPT

Summary: This ecological system is found in the floodplains of medium and large rivers of the northwestern Great Plains, ranging from the Dakotas Mixedgrass Prairie west through the Northern Great Plains Steppe and north into Canada. This system occurs in the upper Missouri River Basin and includes parts of the Niobrara, White, Cheyenne, Little Missouri, Yellowstone, Powder, Bighorn, Milk, and Musselshell rivers. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. These are the perennial big rivers of the region with hydrologic dynamics largely driven by snowmelt in the mountains, rather than local precipitation events. Dominate communities within this system range from floodplain forests to wet meadows to gravel/sand flats, however, they are linked by underlying soils and flooding regime. Dominant species are *Populus balsamifera ssp. trichocarpa* or *Populus deltoides* and *Salix* spp. *Fraxinus pennsylvanica*, *Salix amygdaloides*, and *Ulmus americana* are common in some stands. If present, common shrub species include *Amorpha fruticosa*, *Cornus drummondii*, *Cornus sericea*, *Symphoricarpos occidentalis*, *Salix exigua*, *Salix interior*, and *Salix planifolia*. Grass cover underneath the trees is an important part of this system and is a mix of cool-season graminoid species, including *Carex pellita* (= *Carex lanuginosa*), *Elymus lanceolatus*, *Pascopyrum smithii*, and *Schoenoplectus* spp., with warm-season species such as *Panicum virgatum*, *Schizachyrium scoparium*, and *Spartina pectinata*. This system is often subjected to heavy grazing and/or agriculture and can be heavily degraded. In Montana, most occurrences are now degraded to the point where the cottonwood overstory is the only remaining natural component; undergrowth is dominated by *Bromus inermis*, or a complex of pasture grasses. Another factor is that groundwater depletion and lack of fire have created additional species changes. In most cases, the majority of the wet meadow and prairie communities may be extremely degraded or extirpated from the system.

Classification Comments: This system needs to be more clearly delineated from Northwestern Great Plains Riparian (CES303.677). The component plant association list is incomplete. All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956).

Similar Ecological Systems:

- Western Great Plains Floodplain (CES303.678)

Related Concepts:

- Bluestem Prairie (601) (Shiflet 1994) Intersecting

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Juncus* spp. - *Carex* spp. Sandhills Herbaceous Vegetation (CEGL002028, G3G4)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Cornus drummondii* - *Amorpha fruticosa* - *Cornus sericea* Shrubland (CEGL005220, G4?)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) / *Symphoricarpos occidentalis* Forest (CEGL002088, G4?)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix* (*exigua*, *interior*) Woodland (CEGL000659, G3G4)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Cornus sericea* Forest (CEGL000657, G2G3)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Salix exigua* Temporarily Flooded Shrubland (CEGL001197, G5)
- *Salix interior* Temporarily Flooded Shrubland (CEGL008562, G4G5)
- *Salix planifolia* Shrubland (CEGL001224, G4)
- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Spartanium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata* - *Carex* spp. Herbaceous Vegetation (CEGL001477, G3?)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)

Alliances:

- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Temporarily Flooded Forest Alliance (A.308)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found in the northwestern Great Plains, north of the North Platte River through southern Canada. It is found in eastern Montana along the upper Missouri, Yellowstone, Bighorn, Milk, and Musselshell rivers; in northern Nebraska and the Dakotas on the Niobrara, upper Missouri, White, Cheyenne, and Little Missouri rivers; and in Canada on the Saskatchewan River.

Divisions: 205:P; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, NE, SD, SK, WY?

Map Zones: 20:C, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:C?, 331E:C?, 331F:CC, 331G:CP, 331K:CC, 331L:CC, 331M:CC

TNC Ecoregions: 26:C, 34:C, 66:P, 67:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722982#references

Description Author: S. Menard, K. Kindscher, mod. M.S. Reid and K.A. Schulz

Version: 23 Jan 2008

Concept Author: S. Menard, K. Kindscher, NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

ROCKY MOUNTAIN LOWER MONTANE-FOOTHILL RIPARIAN WOODLAND AND SHRUBLAND (CES306.821)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence; Montane [Lower Montane]; Riverine / Alluvial; Mineral: W/ A-Horizon <10 cm; Unconsolidated

Non-Diagnostic Classifiers: Circumneutral Water; Floodplain; Forest and Woodland (Treed); Shrubland (Shrub-dominated); Stream terrace (undifferentiated); Valley bottom; Temperate [Temperate Continental]; Braided channel or stream; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9156

CONCEPT

Summary: This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevational range from approximately 900 to 2800 m. This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Dominant trees may include *Acer negundo*, *Populus angustifolia*, *Populus deltoides*, *Populus fremontii*, *Pseudotsuga menziesii*, *Picea pungens*, *Salix amygdaloides*, or *Juniperus scopulorum*. Dominant shrubs include *Acer glabrum*, *Alnus incana*, *Betula occidentalis*, *Cornus sericea*, *Crataegus rivularis*, *Forestiera pubescens*, *Prunus virginiana*, *Rhus trilobata*, *Salix monticola*, *Salix drummondiana*, *Salix exigua*, *Salix irrorata*, *Salix lucida*, *Shepherdia argentea*, or *Symphoricarpos* spp. Exotic trees of *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests. In the Wyoming Basins, the high-elevation *Populus angustifolia*-dominated rivers are included here, including along the North Platte, Sweetwater, and Laramie rivers. In these situations, *Populus angustifolia* is extending down into the sage steppe zone of the basins.

Classification Comments: This system is physiognomically diverse; because of relatively rapid spatial and temporal shifts in structure and composition, it was too complex to split into different, structurally defined systems (e.g., a shrubland system and a woodland system). This riparian system has been applied to the Green, Yampa, and Colorado rivers (upstream of the Grand Canyon) on the Colorado Plateau. Within and below the Grand Canyon is classified as North American Warm Desert Riparian Woodland and Shrubland (CES302.753). More research is needed to determine if creating a Colorado Plateau riparian woodland and shrubland system is ecologically justified.

Related Concepts:

- Aspen: 217 (Eyre 1980) Intersecting
- Blue Spruce: 216 (Eyre 1980) Intersecting. Blue spruce commonly occurs in riparian zones
- Cottonwood - Willow: 235 (Eyre 1980) Broader
- Riparian (422) (Shiflet 1994) Broader

DESCRIPTION

Environment: This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. It is found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. It may also occur in upland areas of mesic swales and hillslopes below seeps and springs.

The climate of this system is continental with typically cold winters and hot summers. Surface water is generally high for variable periods. Soils are typically alluvial deposits of sand, clays, silts and cobbles that are highly stratified with depth due to flood scour and deposition. Highly stratified profiles consist of alternating layers of clay loam and organic material with coarser sand or thin layers of sandy loam over very coarse alluvium. Soils are fine-textured with organic material over coarser alluvium. Some soils are more developed due to a slightly more stable environment and greater input of organic matter.

Dynamics: This ecological system contains early-, mid- and late-seral riparian plant associations. It also contains non-obligate riparian species. Cottonwood communities are early-, mid- or late-seral, depending on the age class of the trees and the associated species of the occurrence (Kittel et al. 1999b). Cottonwoods, however, do not reach a climax stage as defined by Daubenmire (1952). Mature cottonwood occurrences do not regenerate in place, but regenerate by "moving" up and down a river reach. Over time a healthy riparian area supports all stages of cottonwood communities (Kittel et al. 1999b).

MEMBERSHIP

Associations:

- *Acer negundo* - *Celtis laevigata* var. *reticulata* Woodland (CEGL002599, GNR)
- *Acer negundo* - *Ostrya knowltonii* Woodland [Provisional] (CEGL002342, GNR)
- *Acer negundo* - *Populus angustifolia* / *Cornus sericea* Forest (CEGL000627, G2)
- *Acer negundo* / *Betula occidentalis* Woodland (CEGL000936, G1G2)
- *Acer negundo* / *Brickellia grandiflora* Woodland [Provisional] (CEGL002692, GNR)
- *Acer negundo* / *Cornus sericea* Forest (CEGL000625, G3?)
- *Acer negundo* / Disturbed Understory Woodland (CEGL002693, GNR)
- *Acer negundo* / *Equisetum arvense* Forest (CEGL000626, G2?)
- *Acer negundo* / *Prunus virginiana* Forest (CEGL000628, G3)
- *Acer negundo* / *Quercus gambelii* Woodland (CEGL002797, GNR)
- *Acer negundo* / *Rhus trilobata* Woodland (CEGL002750, GNR)
- *Agrostis* (*gigantea*, *stolonifera*) Semi-natural Herbaceous Vegetation (CEGL001558, GNA)
- *Betula occidentalis* / *Purshia tridentata* / *Hesperostipa comata* Shrubland (CEGL001084, G1)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Cirsium arvense* - Weedy Forbs Great Plains Herbaceous Vegetation (CEGL005260, GNA)
- *Conyza canadensis* Semi-natural Herbaceous Vegetation (CEGL002800, GNA)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Elaeagnus angustifolia* Semi-natural Woodland (CEGL005269, GNA)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Elymus repens* Semi-natural Herbaceous Vegetation (CEGL005868, GNA)
- *Equisetum* (*arvense*, *variegatum*) Herbaceous Vegetation (CEGL005148, GNR)
- *Equisetum hyemale* Herbaceous Vegetation (CEGL002760, G3)
- *Equisetum laevigatum* Herbaceous Vegetation (CEGL002241, GNR)
- *Forestiera pubescens* Shrubland (CEGL001168, G1G2)
- *Fraxinus anomala* Woodland (CEGL002752, GUQ)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Juniperus scopulorum* / *Cornus sericea* Woodland (CEGL000746, G4)
- *Juniperus scopulorum* Temporarily Flooded Woodland [Placeholder] (CEGL002777, G1)
- *Juniperus scopulorum* Woodland (CEGL003550, GNR)
- *Leymus cinereus* - *Distichlis spicata* Herbaceous Vegetation (CEGL001481, G3)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Phragmites australis* Western North America Temperate Semi-natural Herbaceous Vegetation (CEGL001475, G5)
- *Pinus ponderosa* / *Alnus incana* Woodland (CEGL002638, G2)
- *Pinus ponderosa* / *Cornus sericea* Woodland (CEGL000853, G3)
- *Pinus ponderosa* / *Crataegus douglasii* Woodland (CEGL000855, G1)
- *Pinus ponderosa* / *Juglans major* Woodland (CEGL000858, G2)
- *Pinus ponderosa* Temporarily Flooded Woodland [Provisional] (CEGL002766, G3)
- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Vegetation (CEGL003081, GNA)
- *Populus angustifolia* - *Juniperus scopulorum* Woodland (CEGL002640, G2G3)
- *Populus angustifolia* - *Picea pungens* / *Alnus incana* Woodland (CEGL000934, G3)
- *Populus angustifolia* - *Pinus ponderosa* Woodland (CEGL000935, G4Q)
- *Populus angustifolia* - *Populus deltoides* - *Salix amygdaloides* Forest (CEGL000656, GUQ)
- *Populus angustifolia* - *Pseudotsuga menziesii* Woodland (CEGL002641, G3)
- *Populus angustifolia* / *Acer grandidentatum* Forest (CEGL000646, G2G3)
- *Populus angustifolia* / *Alnus incana* Woodland (CEGL002642, G3)
- *Populus angustifolia* / *Betula occidentalis* Woodland (CEGL000648, G3)
- *Populus angustifolia* / *Cornus sericea* Woodland (CEGL002664, G4)
- *Populus angustifolia* / *Crataegus rivularis* Woodland (CEGL002644, G2?)
- *Populus angustifolia* / Invasive Perennial Grasses Semi-natural Woodland (CEGL003749, GNA)
- *Populus angustifolia* / *Lonicera involucrata* Forest (CEGL000650, GUQ)
- *Populus angustifolia* / *Prunus virginiana* Woodland (CEGL000651, G2Q)
- *Populus angustifolia* / *Quercus gambelii* Woodland [Provisional] (CEGL002804, GNR)
- *Populus angustifolia* / *Rhus trilobata* Woodland (CEGL000652, G3)
- *Populus angustifolia* / *Rosa woodsii* Forest (CEGL000653, G2G3)
- *Populus angustifolia* / *Salix* (*monticola*, *drummondiana*, *lucida*) Woodland (CEGL002645, G3)
- *Populus angustifolia* / *Salix drummondiana* - *Acer glabrum* Woodland (CEGL002646, G2?)
- *Populus angustifolia* / *Salix exigua* Woodland (CEGL000654, G4)
- *Populus angustifolia* / *Salix irrorata* Woodland (CEGL002647, G2)
- *Populus angustifolia* / *Salix ligulifolia* - *Shepherdia argentea* Woodland (CEGL000655, G1)
- *Populus angustifolia* / *Symphoricarpos* (*albus*, *occidentalis*, *oreophilus*) Woodland (CEGL002648, G2Q)
- *Populus angustifolia* Sand Dune Forest (CEGL002643, G1)

- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Artemisia tridentata* Woodland (CEGL005966, G2G3)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix* (*exigua*, *interior*) Woodland (CEGL000659, G3G4)
- *Populus deltoides* / *Symphoricarpos occidentalis* Woodland (CEGL000660, G2G3)
- *Populus deltoides* ssp. *wislizeni* / *Acer negundo* Woodland (CEGL002336, GNR)
- *Populus deltoides* ssp. *wislizeni* / Disturbed Understory Woodland (CEGL003810, GNR)
- *Populus deltoides* ssp. *wislizeni* / *Rhus trilobata* Woodland (CEGL000940, G2)
- *Populus fremontii* - *Salix gooddingii* Woodland (CEGL000944, G2)
- *Populus fremontii* / *Acer negundo* Forest (CEGL000662, G2Q)
- *Populus fremontii* / *Artemisia tridentata* Woodland (CEGL005365, GNR)
- *Populus fremontii* / *Betula occidentalis* Wooded Shrubland (CEGL002981, GNR)
- *Populus fremontii* / *Equisetum* spp. Woodland [Provisional] (CEGL003775, GNR)
- *Populus fremontii* / *Ericameria nauseosa* Woodland (CEGL002465, GNR)
- *Populus fremontii* / *Leymus triticoides* Woodland (CEGL002756, GNR)
- *Populus fremontii* / Mesic Forbs Woodland (CEGL002470, GNR)
- *Populus fremontii* / Mesic Graminoids Woodland (CEGL002473, GNR)
- *Populus fremontii* / *Salix exigua* Forest (CEGL000666, GNR)
- *Populus fremontii* / *Salix geyeriana* Woodland (CEGL000943, G3?)
- *Pseudotsuga menziesii* / *Betula occidentalis* Woodland (CEGL002639, G3?)
- *Pseudotsuga menziesii* / *Cornus sericea* Woodland (CEGL000899, G4)
- *Rhus trilobata* Intermittently Flooded Shrubland (CEGL001121, G3)
- *Salix amygdaloides* Woodland (CEGL000947, G3)
- *Salix eastwoodiae* / *Carex aquatilis* Shrubland (CEGL001195, G2)
- *Salix eastwoodiae* / *Carex utriculata* Shrubland (CEGL001196, G2?)
- *Salix eastwoodiae* Shrubland (CEGL001194, G2Q)
- *Salix exigua* - *Salix ligulifolia* Shrubland (CEGL002655, G2G3)
- *Salix exigua* - *Salix lucida* ssp. *caudata* Shrubland (CEGL001204, G2)
- *Salix exigua* / *Agrostis stolonifera* Shrubland (CEGL001199, GNA)
- *Salix exigua* / Barren Shrubland (CEGL001200, G5)
- *Salix exigua* / *Elymus X pseudorepens* Shrubland (CEGL001198, G3)
- *Salix exigua* / *Equisetum arvense* Shrubland (CEGL001201, G3?)
- *Salix exigua* / Mesic Forbs Shrubland (CEGL001202, G2)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)
- *Salix exigua* Temporarily Flooded Shrubland (CEGL001197, G5)
- *Salix gooddingii* / *Salix exigua* Woodland [Provisional] (CEGL003778, GNR)
- *Salix irrorata* Shrubland (CEGL001214, GNR)
- *Salix lasiolepis* - *Cornus sericea* / *Rosa woodsii* Shrubland (CEGL003453, G2G3)
- *Salix lasiolepis* / Barren Ground Shrubland (CEGL001216, G3?)
- *Salix lasiolepis* / *Rosa woodsii* / Mixed Herbs Shrubland (CEGL001217, G3Q)
- *Salix ligulifolia* Shrubland (CEGL001218, G2G3)
- *Salix lutea* Shrubland (CEGL003780, GNR)
- *Shepherdia argentea* Shrubland (CEGL001128, G3G4)
- *Spartina gracilis* Herbaceous Vegetation (CEGL001588, GU)
- *Spartina pectinata* Western Herbaceous Vegetation (CEGL001476, G3?)
- *Tamarix* spp. Temporarily Flooded Semi-natural Shrubland (CEGL003114, GNA)

Alliances:

- (*Cirsium arvense*, *Euphorbia esula*, *Melilotus* spp.) - Mixed Forbs Herbaceous Alliance (A.3564)
- *Acer negundo* Seasonally Flooded Forest Alliance (A.341)
- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer negundo* Temporarily Flooded Woodland Alliance (A.642)
- *Agrostis stolonifera* Seasonally Flooded Herbaceous Alliance (A.1405)
- *Betula occidentalis* Intermittently Flooded Shrubland Alliance (A.936)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Conyza canadensis* Seasonally Flooded Herbaceous Alliance (A.2657)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Elaeagnus angustifolia* Semi-natural Woodland Alliance (A.3566)
- *Eleocharis* (*palustris*, *macrostachya*) Seasonally Flooded Herbaceous Alliance (A.1422)
- *Elymus repens* Herbaceous Alliance (A.2658)
- *Equisetum* (*arvense*, *variegatum*, *hyemale*) Semipermanently Flooded Herbaceous Alliance (A.3539)

- *Equisetum laevigatum* Semipermanently Flooded Herbaceous Alliance (A.2648)
- *Forestiera pubescens* Temporarily Flooded Shrubland Alliance (A.969)
- *Fraxinus anomala* Temporarily Flooded Woodland Alliance (A.2511)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Juniperus scopulorum* Temporarily Flooded Woodland Alliance (A.563)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Leymus cinereus* Intermittently Flooded Herbaceous Alliance (A.1329)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Pinus ponderosa* Temporarily Flooded Woodland Alliance (A.565)
- *Poa pratensis* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1382)
- *Populus angustifolia* Temporarily Flooded Forest Alliance (A.310)
- *Populus angustifolia* Temporarily Flooded Woodland Alliance (A.641)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Populus fremontii* Seasonally Flooded Woodland Alliance (A.654)
- *Populus fremontii* Temporarily Flooded Forest Alliance (A.313)
- *Populus fremontii* Temporarily Flooded Woodland Alliance (A.644)
- *Pseudotsuga menziesii* Temporarily Flooded Woodland Alliance (A.568)
- *Rhus trilobata* Intermittently Flooded Shrubland Alliance (A.938)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix amygdaloides* Temporarily Flooded Woodland Alliance (A.645)
- *Salix eastwoodiae* Seasonally Flooded Shrubland Alliance (A.1005)
- *Salix gooddingii* Temporarily Flooded Woodland Alliance (A.640)
- *Salix irrorata* Temporarily Flooded Shrubland Alliance (A.976)
- *Salix lasiolepis* Temporarily Flooded Shrubland Alliance (A.977)
- *Salix ligulifolia* Temporarily Flooded Shrubland Alliance (A.978)
- *Salix lutea* Temporarily Flooded Shrubland Alliance (A.980)
- *Shepherdia argentea* Temporarily Flooded Shrubland Alliance (A.960)
- *Spartina gracilis* Seasonally Flooded Herbaceous Alliance (A.1407)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Tamarix* spp. Semi-natural Temporarily Flooded Shrubland Alliance (A.842)

DISTRIBUTION

Range: This system is found throughout the lower montane Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 m. It is also found in the island mountain ranges of central and eastern Montana.

Divisions: 304:C; 306:C

Nations: US

Subnations: AZ, CO, ID, MT, NM, NV, OR, SD, UT, WY

Map Zones: 8:?, 9:C, 13:C, 15:C, 16:C, 17:P, 18:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:C, 29:C, 33:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:CC, 315H:CC, 321A:CC, 331B:CC, 331D:CP, 331F:CC, 331G:CC, 331H:CC, 331I:CC, 331J:CC, 331K:C?, 331N:CP, 341A:CC, 341B:CC, 341C:CC, 341F:CC, 342A:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342J:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332G:CC, M341B:CC, M341C:CC

TNC Ecoregions: 6:P, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Daubenmire 1952, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1992, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett et al. 1989, Szaro 1989, Tuhy et al. 2002, Walford 1996, Walford et al. 1997, Walford et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722852#references

Description Author: M.S. Reid

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West
ClassifResp: West

ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN SHRUBLAND (CES306.832)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Woodland; Short (50-100 yrs) Persistence; Montane [Upper Montane]; Montane [Montane]; Shrubland (Shrub-dominated); Riverine / Alluvial; Broad-Leaved Deciduous Shrub

Non-Diagnostic Classifiers: Circumneutral Water; Erosional stream terrace; Floodplain; Montane [Lower Montane]; Stream terrace (undifferentiated); Valley bottom; Alluvial terrace; Temperate [Temperate Continental]; Mineral: W/ A-Horizon <10 cm; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9187

CONCEPT

Summary: This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally it is found at higher elevations, but can be found anywhere from 1700-3475 m. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this system are associated with beaver activity. This system often occurs as a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The dominant shrubs reflect the large elevational gradient and include *Alnus incana*, *Betula nana*, *Betula occidentalis*, *Cornus sericea*, *Salix bebbiana*, *Salix boothii*, *Salix brachycarpa*, *Salix drummondiana*, *Salix eriocephala*, *Salix geyeriana*, *Salix monticola*, *Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems are of either conifer or aspen forests.

Related Concepts:

- Riparian (422) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Acer glabrum* Drainage Bottom Shrubland (CEGL001062, G4?)
- *Alnus incana* - *Betula occidentalis* Shrubland (CEGL001142, G2G3)
- *Alnus incana* - *Salix (monticola, lucida, ligulifolia)* Shrubland (CEGL002651, G3)
- *Alnus incana* - *Salix drummondiana* Shrubland (CEGL002652, G3)
- *Alnus incana* / *Athyrium filix-femina* Shrubland (CEGL002628, G3)
- *Alnus incana* / *Calamagrostis canadensis* Shrubland (CEGL001143, G3Q)
- *Alnus incana* / *Carex (aquatilis, deweyana, lenticularis, luzulina, pellita)* Shrubland (CEGL001144, G3)
- *Alnus incana* / *Carex scopulorum var. prionophylla* Shrubland (CEGL000122, G1)
- *Alnus incana* / *Cornus sericea* Shrubland (CEGL001145, G3G4)
- *Alnus incana* / *Equisetum arvense* Shrubland (CEGL001146, G3)
- *Alnus incana* / *Glyceria striata* Shrubland (CEGL000228, G3)
- *Alnus incana* / *Lysichiton americanus* Shrubland (CEGL002629, G3)
- *Alnus incana* / Mesic Forbs Shrubland (CEGL001147, G3)
- *Alnus incana* / Mesic Graminoids Shrubland (CEGL001148, G3)
- *Alnus incana* / *Ribes (inerme, hudsonianum, lacustre)* Shrubland (CEGL001151, G3)
- *Alnus incana* / *Scirpus microcarpus* Shrubland (CEGL000481, G2G3)
- *Alnus incana* / *Spiraea douglasii* Shrubland (CEGL001152, G3)
- *Alnus incana* / *Symphoricarpos albus* Shrubland (CEGL001153, G3G4)
- *Alnus incana* Shrubland (CEGL001141, GNRQ)
- *Alnus incana ssp. tenuifolia* - *Salix irrorata* Shrubland (CEGL002687, G3)
- *Alnus oblongifolia* / *Symphoricarpos oreophilus* Forest (CEGL001063, GU)
- *Alnus viridis ssp. sinuata* / *Athyrium filix-femina* - *Cinna latifolia* Shrubland (CEGL001156, G4)
- *Alnus viridis ssp. sinuata* Shrubland [Placeholder] (CEGL001154, GNRQ)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)
- *Betula occidentalis* - *Dasiphora fruticosa ssp. floribunda* Shrubland (CEGL001083, G2Q)
- *Betula occidentalis* / *Cornus sericea* Shrubland (CEGL001161, G3)
- *Betula occidentalis* / *Maianthemum stellatum* Shrubland (CEGL001162, G4?)
- *Betula occidentalis* / Mesic Graminoids Shrubland (CEGL002654, G3)
- *Betula occidentalis* Shrubland (CEGL001080, G3G4)

- *Cornus sericea* / *Galium triflorum* Shrubland (CEGL001166, G3?)
- *Cornus sericea* / *Heracleum maximum* Shrubland (CEGL001167, G3)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Corylus cornuta* Shrubland [Provisional] (CEGL002903, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Elymus repens* Semi-natural Herbaceous Vegetation (CEGL005868, GNA)
- *Fraxinus anomala* Woodland (CEGL002752, GUQ)
- *Ribes lacustre* - *Ribes hudsonianum* / *Cinna latifolia* Shrubland (CEGL003445, G2)
- *Ribes lacustre* - *Ribes hudsonianum* / *Glyceria striata* Shrubland (CEGL003446, G2G3)
- *Ribes lacustre* / *Mertensia ciliata* Shrubland (CEGL001172, G1G2Q)
- *Salix* (*boothii*, *geyeriana*) / *Carex aquatilis* Shrubland (CEGL001176, G3)
- *Salix bebbiana* / Mesic Graminoids Shrubland (CEGL001174, G3)
- *Salix bebbiana* Shrubland (CEGL001173, G3?)
- *Salix boothii* - *Salix eastwoodiae* / *Carex nigricans* Shrubland (CEGL002607, G3)
- *Salix boothii* - *Salix geeyeriana* / *Carex angustata* Shrubland (CEGL001185, G2)
- *Salix boothii* - *Salix geeyeriana* Shrubland (CEGL001184, GU)
- *Salix boothii* - *Salix lemmonii* Shrubland (CEGL001186, G3)
- *Salix boothii* / *Calamagrostis canadensis* Shrubland (CEGL001175, G3G4Q)
- *Salix boothii* / *Carex nebrascensis* Shrubland (CEGL001177, G4G5)
- *Salix boothii* / *Carex utriculata* Shrubland (CEGL001178, G4)
- *Salix boothii* / *Deschampsia caespitosa* - *Geum rossii* Shrubland (CEGL002904, G4)
- *Salix boothii* / *Equisetum arvense* Shrubland (CEGL002671, G3)
- *Salix boothii* / *Maianthemum stellatum* Shrubland (CEGL001187, G3Q)
- *Salix boothii* / Mesic Forbs Shrubland (CEGL001180, G3)
- *Salix boothii* / Mesic Graminoids Shrubland (CEGL001181, G3?)
- *Salix boothii* / *Poa palustris* Shrubland (CEGL001183, GNA)
- *Salix brachycarpa* / *Carex aquatilis* Shrubland (CEGL001244, G2G3)
- *Salix brachycarpa* / Mesic Forbs Shrubland (CEGL001135, G4)
- *Salix candida* / *Carex utriculata* Shrubland (CEGL001188, G2)
- *Salix commutata* / *Carex scopulorum* Shrubland (CEGL001189, G3)
- *Salix commutata* / Mesic Graminoid Shrubland (CEGL003497, GNR)
- *Salix drummondiana* / *Calamagrostis canadensis* Shrubland (CEGL002667, G3)
- *Salix drummondiana* / *Carex scopulorum* var. *prionophylla* Shrubland (CEGL001584, G2G3)
- *Salix drummondiana* / *Carex utriculata* Shrubland (CEGL002631, G4)
- *Salix drummondiana* / Mesic Forbs Shrubland (CEGL001192, G4)
- *Salix drummondiana* Shrubland [Placeholder] (CEGL001190, G3Q)
- *Salix eriocephala* / *Ribes aureum* - *Rosa woodsii* Shrubland (CEGL001233, G3)
- *Salix geeyeriana* - *Salix eriocephala* Shrubland (CEGL001213, GU)
- *Salix geeyeriana* - *Salix lemmonii* / *Carex aquatilis* var. *dives* Shrubland (CEGL001212, G3)
- *Salix geeyeriana* - *Salix monticola* / *Calamagrostis canadensis* Shrubland (CEGL001247, G3)
- *Salix geeyeriana* - *Salix monticola* / Mesic Forbs Shrubland (CEGL001223, G3)
- *Salix geeyeriana* / *Calamagrostis canadensis* Shrubland (CEGL001205, G5)
- *Salix geeyeriana* / *Carex aquatilis* Shrubland (CEGL001206, G3)
- *Salix geeyeriana* / *Carex utriculata* Shrubland (CEGL001207, G5)
- *Salix geeyeriana* / *Deschampsia caespitosa* Shrubland (CEGL001208, G4)
- *Salix geeyeriana* / Mesic Forbs Shrubland (CEGL002666, G3)
- *Salix geeyeriana* / Mesic Graminoids Shrubland (CEGL001210, G3?)
- *Salix geeyeriana* / *Poa palustris* Shrubland (CEGL001211, GNA)
- *Salix glauca* / *Deschampsia caespitosa* Shrubland (CEGL001137, G4)
- *Salix lemmonii* / Mesic-Tall Forbs Shrubland (CEGL002771, G3?)
- *Salix lemmonii* / *Rosa woodsii* Shrubland (CEGL002772, G3)
- *Salix ligulifolia* / *Carex utriculata* Shrubland [Provisional] (CEGL002975, GNR)
- *Salix ligulifolia* Shrubland (CEGL001218, G2G3)
- *Salix lucida* ssp. *caudata* / *Rosa woodsii* Shrubland (CEGL002621, G3)
- *Salix lucida* ssp. *caudata* Shrubland [Provisional] (CEGL001215, G3Q)
- *Salix lutea* / *Calamagrostis canadensis* Shrubland (CEGL001219, G3?)
- *Salix lutea* / *Carex utriculata* Shrubland (CEGL001220, G4)
- *Salix lutea* / Mesic Forbs Shrubland (CEGL002774, G3?)
- *Salix lutea* / *Rosa woodsii* Shrubland (CEGL002624, G3)
- *Salix monticola* / *Angelica ampla* Shrubland (CEGL001221, GNR)
- *Salix monticola* / *Calamagrostis canadensis* Shrubland (CEGL001222, G3)
- *Salix monticola* / *Carex aquatilis* Shrubland (CEGL002656, G3)

- *Salix monticola* / *Carex utriculata* Shrubland (CEGL002657, G3)
- *Salix monticola* / Mesic Forbs Shrubland (CEGL002658, G4)
- *Salix monticola* / Mesic Graminoids Shrubland (CEGL002659, G3)
- *Salix monticola* Thicket Shrubland (CEGL001139, G2Q)
- *Salix planifolia* / *Calamagrostis canadensis* Shrubland (CEGL001225, G4)
- *Salix planifolia* / *Caltha leptosepala* Shrubland (CEGL002665, G4)
- *Salix planifolia* / *Carex aquatilis* Shrubland (CEGL001227, G5)
- *Salix planifolia* / *Carex scopulorum* Shrubland (CEGL001229, G4)
- *Salix planifolia* / *Deschampsia caespitosa* Shrubland (CEGL001230, G2G3)
- *Salix planifolia* / Mesic Forbs Shrubland (CEGL002893, G4)
- *Salix planifolia* Shrubland (CEGL001224, G4)
- *Salix wolfii* / *Carex aquatilis* Shrubland (CEGL001234, G4)
- *Salix wolfii* / *Carex microptera* Shrubland (CEGL001235, G3Q)
- *Salix wolfii* / *Carex nebrascensis* Shrubland (CEGL001236, G3Q)
- *Salix wolfii* / *Carex utriculata* Shrubland (CEGL001237, G4)
- *Salix wolfii* / *Deschampsia caespitosa* Shrubland (CEGL001238, G3)
- *Salix wolfii* / *Fragaria virginiana* Shrubland (CEGL001239, G4?)
- *Salix wolfii* / Mesic Forbs Shrubland (CEGL001240, G3)
- *Salix wolfii* / *Poa palustris* Shrubland (CEGL001241, GNA)
- *Salix wolfii* / *Swertia perennis* - *Pedicularis groenlandica* Shrubland (CEGL001242, G2)

Alliances:

- *Acer glabrum* Temporarily Flooded Shrubland Alliance (A.952)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Alnus oblongifolia* Temporarily Flooded Forest Alliance (A.953)
- *Alnus viridis* ssp. *sinuata* Temporarily Flooded Shrubland Alliance (A.966)
- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Betula occidentalis* Temporarily Flooded Shrubland Alliance (A.967)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Corylus cornuta* Temporarily Flooded Shrubland Alliance (A.2596)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Elymus repens* Herbaceous Alliance (A.2658)
- *Fraxinus anomala* Temporarily Flooded Woodland Alliance (A.2511)
- *Ribes lacustre* Temporarily Flooded Shrubland Alliance (A.970)
- *Salix bebbiana* Temporarily Flooded Shrubland Alliance (A.971)
- *Salix boothii* Seasonally Flooded Shrubland Alliance (A.1001)
- *Salix boothii* Temporarily Flooded Shrubland Alliance (A.972)
- *Salix brachycarpa* Seasonally Flooded Shrubland Alliance (A.998)
- *Salix candida* Seasonally Flooded Shrubland Alliance (A.1002)
- *Salix commutata* Seasonally Flooded Shrubland Alliance (A.1003)
- *Salix drummondiana* Seasonally Flooded Shrubland Alliance (A.1004)
- *Salix drummondiana* Temporarily Flooded Shrubland Alliance (A.973)
- *Salix eriocephala* Temporarily Flooded Shrubland Alliance (A.974)
- *Salix geyeriana* Seasonally Flooded Shrubland Alliance (A.1006)
- *Salix geyeriana* Temporarily Flooded Shrubland Alliance (A.975)
- *Salix glauca* Temporarily Flooded Shrubland Alliance (A.963)
- *Salix lemmonii* Seasonally Flooded Shrubland Alliance (A.2523)
- *Salix ligulifolia* Temporarily Flooded Shrubland Alliance (A.978)
- *Salix lucida* Temporarily Flooded Shrubland Alliance (A.979)
- *Salix lutea* Seasonally Flooded Shrubland Alliance (A.1007)
- *Salix lutea* Temporarily Flooded Shrubland Alliance (A.980)
- *Salix monticola* Temporarily Flooded Shrubland Alliance (A.981)
- *Salix planifolia* Seasonally Flooded Shrubland Alliance (A.1008)
- *Salix planifolia* Temporarily Flooded Shrubland Alliance (A.982)
- *Salix wolfii* Seasonally Flooded Shrubland Alliance (A.1009)
- *Salix wolfii* Temporarily Flooded Shrubland Alliance (A.983)

DISTRIBUTION

Range: This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana (including the isolated island mountain ranges of central and eastern Montana), and also occurs in mountainous areas of the Intermountain West and Colorado Plateau.

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Map Zones: 1:C, 6:?, 7:?, 8:?, 9:C, 10:C, 12:C, 15:?, 16:C, 17:P, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:P, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313A:CC, 313B:CC, 313D:CC, 315A:P?, 315H:PP, 321A:PP, 331A:C?, 331B:C?, 331J:CC, 341A:CP, 341B:CP, 341C:CP, 341D:CP, 341F:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CC, 342F:CC, 342G:CC, 342H:CC, 342J:CC, M242C:CP, M242D:CC, M261E:CC, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341B:CC, M341C:CC

TNC Ecoregions: 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 68:C

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Kittel 1993, Kittel 1994, Kittel et al. 1996, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al. 2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Rondeau 2001, Szaro 1989, Tuhy et al. 2002, Walford 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722841#references

Description Author: NatureServe Western Ecology Team

Version: 20 Feb 2003

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

ROCKY MOUNTAIN SUBALPINE-MONTANE RIPARIAN WOODLAND (CES306.833)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; RM Subalpine/Montane Riparian Shrubland; Montane [Upper Montane]; Montane [Montane]; Forest and Woodland (Treed); Riverine / Alluvial

Non-Diagnostic Classifiers: Circumneutral Water; Floodplain; Montane [Lower Montane]; Stream terrace (undifferentiated); Valley bottom; Temperate [Temperate Continental]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; Drainage bottom (undifferentiated)

National Mapping Codes: ESLF 9171

CONCEPT

Summary: This riparian woodland system is comprised of seasonally flooded forests and woodlands found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, and west into the Intermountain region and the Colorado Plateau. It occurs throughout the interior of British Columbia and the eastern slopes of the Cascade Mountains. This system contains the conifer and aspen woodlands that line montane streams. These are communities tolerant of periodic flooding and high water tables. Snowmelt moisture in this system may create shallow water tables or seeps for a portion of the growing season. Stands typically occur at elevations between 1500 and 3300 m (4920-10,830 feet), farther north elevation ranges between 900 and 2000 m. This is confined to specific riparian environments occurring on floodplains or terraces of rivers and streams, in V-shaped, narrow valleys and canyons (where there is cold-air drainage). Less frequently, occurrences are found in moderate-wide valley bottoms on large floodplains along broad, meandering rivers, and on pond or lake margins. Dominant tree species vary across the latitudinal range, although it usually includes *Abies lasiocarpa* and/or *Picea engelmannii*; other important species include *Pseudotsuga menziesii*, *Picea pungens*, *Picea engelmannii* X *glauca*, *Populus tremuloides*, and *Juniperus scopulorum*. Other trees possibly present but not usually dominant include *Alnus incana*, *Abies concolor*, *Abies grandis*, *Pinus contorta*, *Populus angustifolia*, *Populus balsamifera* ssp. *trichocarpa*, and *Juniperus osteosperma*.

Similar Ecological Systems:

- Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804)

Related Concepts:

- Blue Spruce: 216 (Eyre 1980) Intersecting. Blue spruce commonly occurs in riparian zones
- Engelmann Spruce - Subalpine Fir: 206 (Eyre 1980) Intersecting. Engelmann spruce occurs as a dominant in riparian zones.
- ER Engelmann Spruce Riparian (Ecosystems Working Group 1998) Broader
- Riparian (422) (Shiflet 1994) Broader

MEMBERSHIP

Associations:

- *Abies concolor* - *Picea pungens* - *Populus angustifolia* / *Acer glabrum* Forest (CEGL000255, G2)
- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus incana* Forest (CEGL000296, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Alnus viridis* ssp. *sinuata* Forest (CEGL000297, G4)
- *Abies lasiocarpa* - *Picea engelmannii* / *Mertensia ciliata* Forest (CEGL002663, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Oplomanax horridus* Forest (CEGL000322, G3)
- *Abies lasiocarpa* - *Picea engelmannii* / *Salix drummondiana* Forest (CEGL000327, G5)
- *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL000336, G4)
- *Abies lasiocarpa* / *Carex aquatilis* Forest (CEGL002636, G4)
- *Abies lasiocarpa* / *Trautvetteria caroliniensis* Forest (CEGL000339, G3)
- *Picea engelmannii* - *Populus angustifolia* / *Heracleum maximum* Forest (CEGL000367, G3G4)
- *Picea engelmannii* / *Caltha leptosepala* Forest (CEGL000357, G3?)
- *Picea engelmannii* / *Carex angustata* Forest (CEGL000359, G3)
- *Picea engelmannii* / *Carex scopulorum* var. *prionophylla* Woodland (CEGL002630, G3)
- *Picea engelmannii* / *Cornus sericea* Woodland (CEGL002677, G3)
- *Picea engelmannii* / *Eleocharis quinqueflora* Woodland (CEGL000361, G3)
- *Picea engelmannii* / *Salix drummondiana* Woodland (CEGL005843, G2G3)
- *Picea engelmannii* / *Senecio triangularis* Forest (CEGL000376, G3Q)
- *Picea glauca* Alluvial Black Hills Forest (CEGL002057, G2G3)
- *Picea pungens* / *Alnus incana* Woodland (CEGL000894, G3)
- *Picea pungens* / *Betula occidentalis* Woodland (CEGL002637, G2)
- *Picea pungens* / *Cornus sericea* Woodland (CEGL000388, G4)
- *Picea pungens* / *Dasiphora fruticosa* ssp. *floribunda* Woodland (CEGL000396, G2G3)
- *Picea pungens* / *Equisetum arvense* Woodland (CEGL000389, G3?)

- *Pinus contorta* / *Calamagrostis canadensis* Forest (CEGL000138, G5)
- *Pinus contorta* / *Carex (aquatilis, angustata)* Woodland (CEGL000140, G4Q)
- *Pinus contorta* / *Cornus sericea* Woodland (CEGL005929, G2G3)
- *Pinus contorta* / *Deschampsia caespitosa* Forest (CEGL000147, G3)
- *Populus balsamifera ssp. trichocarpa* - *Picea engelmannii* / *Equisetum arvense* Forest (CEGL005907, G2?)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Calamagrostis canadensis* Forest (CEGL005909, G2?)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Cornus sericea* Forest (CEGL005905, G2G3)
- *Populus balsamifera ssp. trichocarpa* - *Populus tremuloides* - Conifer / *Heracleum maximum* Forest (CEGL005910, G2?)
- *Populus tremuloides* - *Abies lasiocarpa* - *Picea engelmannii* / *Streptopus amplexifolius* Forest (CEGL005908, G2G3)
- *Populus tremuloides* / *Alnus incana* - *Salix* spp. Forest (CEGL001082, G4)
- *Populus tremuloides* / *Alnus incana* / *Betula nana* - *Ribes* spp. Forest (CEGL001149, G1)
- *Populus tremuloides* / *Alnus incana* Forest (CEGL001150, G3)
- *Populus tremuloides* / *Betula occidentalis* Forest (CEGL002650, G3)
- *Populus tremuloides* / *Calamagrostis canadensis* Forest (CEGL000574, G3)
- *Populus tremuloides* / *Carex aquatilis* var. *aquatilis* Forest (CEGL003442, G1?)
- *Populus tremuloides* / *Carex obnupta* Forest (CEGL003371, G2)
- *Populus tremuloides* / *Carex pellita* Forest (CEGL000577, G2)
- *Populus tremuloides* / *Cornus sericea* Forest (CEGL000582, G4)
- *Populus tremuloides* / *Corylus cornuta* Forest (CEGL000583, G3)
- *Populus tremuloides* / *Equisetum arvense* Forest (CEGL000584, G4)
- *Populus tremuloides* / *Quercus gambelii* / *Symphoricarpos oreophilus* Forest (CEGL000598, GNR)
- *Populus tremuloides* / *Ranunculus alismifolius* Forest (CEGL000599, G2?)
- *Populus tremuloides* / *Ribes montigenum* Forest (CEGL000600, G2)
- *Populus tremuloides* / *Salix drummondiana* Forest (CEGL002902, G3G4)
- *Populus tremuloides* / *Senecio bigelovii* var. *bigelovii* Forest (CEGL000590, G1?)
- *Populus tremuloides* / *Veratrum californicum* Forest (CEGL000621, G3?)
- *Populus tremuloides* Canyon Formation Forest (CEGL000576, GUQ)

Alliances:

- *Abies concolor* Forest Alliance (A.152)
- *Abies lasiocarpa* - *Populus tremuloides* Forest Alliance (A.422)
- *Abies lasiocarpa* Seasonally Flooded Forest Alliance (A.190)
- *Abies lasiocarpa* Temporarily Flooded Forest Alliance (A.177)
- *Picea engelmannii* Seasonally Flooded Forest Alliance (A.191)
- *Picea engelmannii* Seasonally Flooded Woodland Alliance (A.572)
- *Picea engelmannii* Temporarily Flooded Forest Alliance (A.179)
- *Picea engelmannii* Temporarily Flooded Woodland Alliance (A.566)
- *Picea glauca* Temporarily Flooded Forest Alliance (A.172)
- *Picea pungens* Temporarily Flooded Woodland Alliance (A.567)
- *Pinus contorta* Seasonally Flooded Forest Alliance (A.188)
- *Pinus contorta* Temporarily Flooded Forest Alliance (A.175)
- *Pinus contorta* Temporarily Flooded Woodland Alliance (A.562)
- *Populus balsamifera ssp. trichocarpa* Temporarily Flooded Forest Alliance (A.311)
- *Populus tremuloides* Forest Alliance (A.274)
- *Populus tremuloides* Seasonally Flooded Forest Alliance (A.340)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)

DISTRIBUTION

Range: This system is found at montane to subalpine elevations of the Rocky Mountain cordillera, from southern New Mexico north into Montana, Alberta and British Columbia, and west into the Intermountain region and the Colorado Plateau.

Divisions: 204:P; 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Map Zones: 1:C, 6:P, 7:?, 9:C, 10:C, 12:C, 16:P, 17:P, 18:P, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:P, 27:C, 28:C, 29:C

USFS Ecomap Regions: 313B:CC, 331A:C?, 331J:CC, 341A:CP, 341D:CP, 341F:CP, 341G:CC, 342A:CC, 342B:CP, 342C:CC, 342D:CC, 342E:CP, 342F:CC, 342G:CC, 342H:CC, 342I:CC, 342J:CC, M242C:CC, M242D:CC, M261E:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M341A:CC, M341D:CC

TNC Ecoregions: 4:P, 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 68:C

SOURCES

References: Baker 1988, Baker 1989a, Baker 1989b, Baker 1990, Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Crowe and Clausnitzer 1997, Ecosystems Working Group 1998, Kittel 1993, Kittel et al. 1994, Kittel et al. 1995, Kittel et al. 1999a, Kittel et al. 1999b, Kovalchik 1987, Kovalchik 1993, Kovalchik 2001, Manning and Padgett 1995, Muldavin et al.

2000a, Nachlinger et al. 2001, Neely et al. 2001, Padgett 1982, Padgett et al. 1988a, Padgett et al. 1988b, Rondeau 2001, Tuhy et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722840#references

Description Author: NatureServe Western Ecology Team, mod. R. Crawford

Version: 09 Feb 2005

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

WESTERN GREAT PLAINS FLOODPLAIN (CES303.678)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Deep (>15 cm) Water; Long (>25 yrs) Flooding Interval; Floodplain; Forest and Woodland (Treed); Herbaceous; Riverine / Alluvial

National Mapping Codes: ESLF 9153

CONCEPT

Summary: This ecological system is found in the floodplains of medium and large rivers of the western Great Plains. It occurs on the lower reaches of the North and South Platte, Platte, Arkansas, and Canadian rivers. Alluvial soils and periodic, intermediate flooding (every 5-25 years) typify this system. These are the perennial big rivers of the region with hydrologic dynamics largely driven by snowmelt in the mountains, instead of local precipitation events. Dominant communities within this system range from floodplain forests to wet meadows to gravel/sand flats; however, they are linked by underlying soils and the flooding regime. Dominant species include *Populus deltoides* and *Salix* spp. Grass cover underneath the trees is an important part of this system and is a mix of tallgrass species, including *Panicum virgatum* and *Andropogon gerardii*. *Tamarix* spp. and less desirable grasses and forbs can invade degraded areas within the floodplains, especially in the western portion of the province. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Another factor is that groundwater depletion and lack of fire have created additional species changes. In most cases, the majority of the wet meadow and prairie communities may be extremely degraded or extirpated from the system.

Classification Comments: All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956). Need to review if there needs to be another split of this system into a Central Great Plains floodplain system and a Southern Great Plains floodplain system. Will need to review in conjunction with Northwestern Great Plains Floodplain (CES303.676).

Similar Ecological Systems:

- Northwestern Great Plains Floodplain (CES303.676)
- South-Central Interior Large Floodplain (CES202.705)

Related Concepts:

- Bluestem Prairie (601) (Shiflet 1994) Intersecting
- Bur Oak: 236 (Eyre 1980) Intersecting
- Cottonwood - Willow: 235 (Eyre 1980) Broader

DESCRIPTION

Environment: This system is found primarily along floodplains of medium and large rivers. Soils are primarily alluvial and range from sandy to dense clays.

Vegetation: Dominant woody species occurring within this system include *Populus deltoides* and *Salix* spp. Understory species constitute an important component of this system and include a mixture of tallgrass prairie species, including *Panicum virgatum* and *Andropogon gerardii*. Sparsely vegetated areas, such as gravel and sand flats, are also included within this system.

Dynamics: Periodic and intermediate flooding (i.e., every 5-25 years) constitutes the major process influencing this system. Grazing and conversion to agriculture can significantly impact this system and can lead to the degradation or extirpation of the majority of prairie and wet meadow communities from this system.

MEMBERSHIP

Associations:

- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Elaeagnus angustifolia* Semi-natural Woodland (CEGL005269, GNA)
- *Ericameria nauseosa* / *Pseudoroegneria spicata* Shrubland (CEGL001330, G3Q)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix (exigua, interior)* Woodland (CEGL000659, G3G4)
- *Populus deltoides* - *Salix nigra* Woodland (CEGL004919, G3G4Q)
- *Populus deltoides* - *Ulmus americana* - *Celtis laevigata* Forest (CEGL002096, G3)
- *Populus deltoides* / *Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides* / *Muhlenbergia asperifolia* Forest (CEGL000678, G3)
- *Populus deltoides* / *Panicum virgatum* - *Schizachyrium scoparium* Woodland (CEGL001454, G2)

- Riverine Gravel Flats Great Plains Sparse Vegetation (CEGL005223, GNR)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)
- *Salix nigra* Forest (CEGL002103, G4)
- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus pungens* - *Suaeda calceoliformis* Alkaline Herbaceous Vegetation (CEGL002040, G3G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Typha* (*angustifolia*, *domingensis*, *latifolia*) - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha* (*latifolia*, *angustifolia*) Western Herbaceous Vegetation (CEGL002010, G5)
- *Ulmus* (*americana*, *rubra*) - *Quercus muehlenbergii* Forest (CEGL002091, GNR)
- *Ulmus americana* - *Celtis* (*laevigata*, *occidentalis*) - *Fraxinus pennsylvanica* Forest (CEGL002090, G3?)

Alliances:

- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Elaeagnus angustifolia* Semi-natural Woodland Alliance (A.3566)
- *Ericameria nauseosa* Shrubland Alliance (A.835)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis* (*occidentalis*, *laevigata*) Temporarily Flooded Forest Alliance (A.286)
- *Populus deltoides* ssp. *wislizeni* Temporarily Flooded Forest Alliance (A.312)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Salix* (*exigua*, *interior*) Temporarily Flooded Shrubland Alliance (A.947)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found along major river floodplains in the southern and central portions of the Western Great Plains Division. This system occurs on the middle to lower reaches of the North and South Platte, Platte, Arkansas, and Canadian rivers. Major river floodplains of eastern Wyoming and Montana are included in Northwestern Great Plains Floodplain (CES303.676) and not this system.

Divisions: 205:C; 303:C

Nations: US

Subnations: CO, KS, NE, OK, SD, TX

Map Zones: 22:C, 25:?, 26:C, 27:C, 28:P, 31:C, 32:C, 33:C, 34:C, 35:C, 36:C, 38:C, 43:C

USFS Ecomap Regions: 251B:CC, 251F:CP, 251H:CC, 315A:CC, 315B:CC, 315F:CC, 331B:CC, 331C:CC, 331H:CC, 331I:CC, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC, M331F:C?, M331I:C?

TNC Ecoregions: 27:C, 28:C, 32:C, 33:C, 37:C

SOURCES

References: Comer et al. 2003, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722980#references

Description Author: S. Menard and K. Kindscher, mod. K.A. Schulz

Version: 23 Jan 2008

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

HERBACEOUS WETLAND

1488 EASTERN GREAT PLAINS WET MEADOW, PRAIRIE, AND MARSH (CES205.687)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Eastern Great Plains (205)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Shoreline; Herbaceous; Depressional; Isolated Wetland [Partially Isolated]; Depression

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2488; ESLF 9213; ESP 1488

CONCEPT

Summary: This system is found along creeks and streams from Nebraska and Iowa to Illinois, and from Minnesota to Texas. It is also found in depressions and along lake borders, especially in the northern extension of its range into Minnesota. It is often adjacent to a floodplain system but is devoid of trees and riparian vegetation. It is also distinguished from upland prairie systems by having more hydrology, especially associated with silty, dense clay soils that are often hydric, classified as Vertic Haplaquolls. The landform is usually floodplain or poorly drained, relatively level land. The vegetation is dominated by *Spartina pectinata*, *Tripsacum dactyloides*, numerous large sedges, such as *Carex frankii* and *Carex hyalinolepis*, and in wetter areas, *Eleocharis* spp. Other emergent marsh species such as *Typha* spp. can be associated with this system. Forbs can include *Helianthus grosseserratus*, *Vernonia fasciculata*, and *Physostegia virginiana*. Some parts of this system may be saline and have species such as *Distichlis spicata* and *Schoenoplectus maritimus*. Fire has been the primary influence in keeping these wet areas free of trees. Other dynamic processes include grazing and flooding (often in late spring). Many areas have been converted to agricultural, but this usually requires some sort of drainage.

DESCRIPTION

Environment: This system is found primarily on silty and/or dense clay, hydric soils, usually classified as Vertic Haplaquolls. It is often found within poorly drained, relatively level areas.

Vegetation: *Spartina pectinata*, *Tripsacum dactyloides*, and numerous large sedges, such as *Carex frankii* and *Carex hyalinolepis*, dominate this system. In wetter areas, *Eleocharis* spp. and *Typha* spp. may be significant. Forbs such as *Helianthus grosseserratus*, *Vernonia fasciculata*, and *Physostegia virginiana* also may be common. Shrub species can be present, especially in the northern range of this system; however, they are usually insignificant compared to the prairie and meadow species.

Dynamics: Fire is the major dynamic process that helps maintain the herbaceous nature of this system and prevents trees from establishing. Grazing and periodic flooding can also influence this system.

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex aquatilis* - *Carex* spp. Herbaceous Vegetation (CEGL002262, G4?)
- *Carex atherodes* Herbaceous Vegetation (CEGL002220, G3G5)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex pellita* - *Calamagrostis stricta* Herbaceous Vegetation (CEGL002254, G3G5)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Ceratophyllum demersum* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL004528, G4G5)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Distichlis spicata* - *Schoenoplectus maritimus* - *Salicornia rubra* Herbaceous Vegetation (CEGL002043, G1G2)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* - (*Chrysosplenium iowense*, *Aconitum noveboracense*) Herbaceous Vegetation (CEGL002387, G2)
- *Nuphar lutea ssp. advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Polygonum amphibium* - (*Polygonum hydropiperoides*) Seasonally Flooded Herbaceous Vegetation (CEGL004699, G4G5)
- *Polygonum* spp. - Mixed Forbs Herbaceous Vegetation (CEGL002430, G4G5)
- *Potamogeton nodosus* Herbaceous Vegetation (CEGL004529, GNR)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Sagittaria cuneata* - *Sagittaria longiloba* Herbaceous Vegetation (CEGL004525, GNR)
- *Sagittaria latifolia* - *Leersia oryzoides* Herbaceous Vegetation (CEGL005240, GNR)

- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Schoenoplectus maritimus* - *Atriplex patula* - *Eleocharis parvula* Herbaceous Vegetation (CEGL005111, G1)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002027, G3?)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* - *Lythrum alatum* - (*Oxypolis rigidior*) Herbaceous Vegetation (CEGL002224, G3?)
- *Spartina pectinata* - *Carex* spp. - *Calamagrostis canadensis* Sand Herbaceous Vegetation (CEGL005178, G3?)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Spiraea tomentosa* - *Salix humilis* / *Andropogon gerardii* - *Panicum virgatum* Shrubland (CEGL005069, G1Q)
- *Typha* (*angustifolia*, *domingensis*, *latifolia*) - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha latifolia* - *Thalia dealbata* Herbaceous Vegetation (CEGL004526, GNR)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229, G4?)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)

Alliances:

- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex* (*rostrata*, *utriculata*) Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex atherodes* Seasonally Flooded Herbaceous Alliance (A.1396)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Corylus americana* - (*Spiraea tomentosa*, *Malus ioensis*) Shrubland Alliance (A.897)
- *Distichlis spicata* - (*Hordeum jubatum*) Temporarily Flooded Herbaceous Alliance (A.1341)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* Herbaceous Alliance (A.1598)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Sagittaria latifolia* Semipermanently Flooded Herbaceous Alliance (A.1675)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found throughout the northeastern Great Plains ranging from eastern Kansas to western Illinois and north into Minnesota.

Divisions: 205:C

Nations: US

Subnations: IA, IL, KS, MN, MO, ND, NE, OK, SD, TX?

Map Zones: 31:P, 38:C, 39:C, 40:C, 41:P, 42:C, 43:C, 49:C, 50:C, 51:P, 52:P

USFS Ecomap Regions: 251A:CC, 251B:CC, 251E:CC, 251F:CC, 251G:CC, 251H:CC, 255A:PP, 332B:CP, 332C:CC, 332D:CC, 332E:CC, 332F:C?

TNC Ecoregions: 35:C, 36:C, 45:P, 46:P

SOURCES

References: Comer et al. 2003, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722972#references

Description Author: S. Menard and K. Kindscher

Version: 18 Jul 2006

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, Southeast

ClassifResp: Midwest

NORTH-CENTRAL INTERIOR FRESHWATER MARSH (CES202.899)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; >180-day hydroperiod; Depressional [Lakeshore]; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Moderate (100-500 yrs) Persistence; Herbaceous; Depressional [Pond]; Isolated Wetland [Partially Isolated]; Muck; Aquatic Herb

National Mapping Codes: ESLF 9294

CONCEPT

Summary: This system is found throughout the northern Midwest ranging into southern Canada. It is typically found on glacial potholes, along small streams, ponds, channels in glacial outwash and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent and submergent species. Stands may be open ponds with floating or rooted aquatics, or deep marsh with bulrush or cattails, and range from fairly small to several acres. It contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate this system with an occasional scattering of tall *Carex* spp. and forbs that can vary from dense to open cover. Trees are generally absent and, if present, are scattered. Submergent wetlands include a variety of macrophytes.

Classification Comments: Some of the specific communities will also be found in the floodplain system and should not be considered a separate system in that case [see North-Central Interior Floodplain (CES202.694)]. Many of these marshes also may have a border of shrubby wet-meadow species similar to North-Central Interior Wet Meadow-Shrub Swamp (CES202.701), but only those areas with a relatively narrow border (<5-10 m) should included with this system.

Similar Ecological Systems:

- Laurentian-Acadian Freshwater Marsh (CES201.594)
- Laurentian-Acadian Shrub-Herbaceous Wetland Systems (CES201.642)

DESCRIPTION

Environment: This system is typically found on glacial potholes, along small streams, ponds, channels in glacial outwash, and on lakeplains. This system contains a deep to shallow area of freshwater marsh dominated by emergent and submergent species. It contains hydric soils flooded by water ranging from several centimeters to over 1 meter for most of the growing season.

Vegetation: This system contains a deep to shallow area of freshwater marsh dominated by emergent and submergent species. Stands may be open ponds with floating or rooted aquatics, or deep marsh with bulrush or cattails, and range from fairly small to several acres. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate this system with an occasional scattering of tall *Carex* spp. and forbs that can vary from dense to open cover. Trees are generally absent and, if present, are scattered. Submergent wetlands include a variety of macrophytes.

MEMBERSHIP

Associations:

- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation (CEGL004141, GNA)
- *Polygonum* spp. - Mixed Forbs Herbaceous Vegetation (CEGL002430, G4G5)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229, G4?)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)
- *Zizania (aquatica, palustris)* Herbaceous Vegetation (CEGL002382, G3G4)

Alliances:

- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441)

DISTRIBUTION

Range: This system is found in the northern Midwest and southern Canada.

Divisions: 201:C; 202:C

Nations: CA?, US

Subnations: IA, IL, IN, MI, MN, MO, ND, OH, ON?, SD, WI

Map Zones: 39:C, 40:C, 41:P, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:?

SOURCES

References: Comer and Albert 1997, Midwestern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.732597#references

Description Author: Midwest Ecology Group

Version: 18 Jul 2006

Concept Author: S. Menard

Stakeholders: Canada, Midwest, Southeast

ClassifResp: Midwest

ROCKY MOUNTAIN ALPINE-MONTANE WET MEADOW (CES306.812)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Rocky Mountain (306)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Alpine/AltiAndino [Alpine/AltiAndino]; Montane [Upper Montane]; Herbaceous; Seepage-Fed Sloping [Mineral]; Depressional [Lakeshore]; Depressional [Pond]; Graminoid

Non-Diagnostic Classifiers: Mesotrophic Water; Saturated Soil; Montane [Montane]; Temperate [Temperate Continental]; Mineral: W/ A-Horizon >10 cm; Mineral: W/ A-Horizon <10 cm; Forb

National Mapping Codes: ESLF 9217

CONCEPT

Summary: These are high-elevation communities found throughout the Rocky Mountains and Intermountain regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (1000-3600 m). These types occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10%. In alpine regions, sites typically are small depressions located below late-melting snow patches or on snowbeds. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Calamagrostis stricta*, *Caltha leptosepala*, *Cardamine cordifolia*, *Carex illota*, *Carex microptera*, *Carex nigricans*, *Carex scopulorum*, *Carex utriculata*, *Carex vernacula*, *Deschampsia caespitosa*, *Eleocharis quinqueflora*, *Juncus drummondii*, *Phippsia algida*, *Rorippa alpina*, *Senecio triangularis*, *Trifolium parryi*, and *Trollius laxus*. Often alpine dwarf-shrublands, especially those dominated by *Salix*, are immediately adjacent to the wet meadows. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

Classification Comments: Similar systems to this one include Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998) and Boreal Wet Meadow (CES103.873). Rocky Mountain Alpine-Montane Wet Meadow (CES306.812) occurs to the east of the coastal and Sierran mountains, in the semi-arid interior regions of western North America. Boreal wet meadow systems occur farther north and east in boreal regions where the climatic regime is generally colder than that of the Rockies or Pacific Northwest regions. Floristics of these three systems are somewhat similar, but there are differences related to biogeographic affinities of the species composing the vegetation.

Similar Ecological Systems:

- Rocky Mountain Subalpine-Montane Mesic Meadow (CES306.829)

Related Concepts:

- Alpine Rangeland (410) (Shiflet 1994) Intersecting. Alpine wet meadows are included in this SRM type.
- Tall Forb (409) (Shiflet 1994) Intersecting. Forb-dominated wet meadows are included in this ecological system.
- Tufted Hairgrass - Sedge (313) (Shiflet 1994) Intersecting. Wetter portions of this SRM type overlap with this system.

DESCRIPTION

Environment: Moisture for these wet meadow community types is acquired from groundwater, stream discharge, overland flow, overbank flow, and on-site precipitation. Salinity and alkalinity are generally low due to the frequent flushing of moisture through the meadow. Depending on the slope, topography, hydrology, soils and substrate, intermittent, ephemeral, or permanent pools may be present. These areas may support species more representative of purely aquatic environments. Standing water may be present during some or all of the growing season, with water tables typically remaining at or near the soil surface. Fluctuations of the water table throughout the growing season are not uncommon, however. On drier sites supporting the less mesic types, the late-season water table may be one meter or more below the surface.

Soils typically possess a high proportion of organic matter, but this may vary considerably depending on the frequency and magnitude of alluvial deposition (Kittel et. al. 1998). Organic composition of the soil may include a thin layer near the soil surface or accumulations of highly sapric material of up to 120 cm thick. Soils may exhibit gleying and/or mottling throughout the profile. Wet meadow ecological systems provide important water filtration, flow attenuation, and wildlife habitat functions.

Dynamics: Associations in this ecological system are adapted to soils that may be flooded or saturated throughout the growing season. They may also occur on areas with soils that are only saturated early in the growing season, or intermittently. Typically these associations are tolerant of moderate-intensity ground fires and late-season livestock grazing (Kovalchik 1987). Most appear to be relatively stable types, although in some areas these may be impacted by intensive livestock grazing.

MEMBERSHIP

Associations:

- *Betula nana* / *Carex* spp. Shrubland (CEGL005887, GNR)
- *Betula nana* / *Carex utriculata* Shrubland (CEGL001079, G4?)
- *Betula nana* / Mesic Forbs - Mesic Graminoids Shrubland (CEGL002653, G3G4)

- *Calamagrostis canadensis* - *Carex scopulorum* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001560, GUQ)
- *Calamagrostis canadensis* - *Senecio triangularis* Herbaceous Vegetation (CEGL001561, G2Q)
- *Calamagrostis canadensis* Western Herbaceous Vegetation (CEGL001559, G4)
- *Calamagrostis stricta* Herbaceous Vegetation [Provisional] (CEGL002891, GU)
- *Caltha leptosepala* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001956, G2Q)
- *Caltha leptosepala* - *Rhodiola rhodantha* Herbaceous Vegetation (CEGL001957, GNRQ)
- *Caltha leptosepala* Herbaceous Vegetation (CEGL001954, G4)
- *Camassia cusickii* Herbaceous Vegetation (CEGL003440, G2)
- *Cardamine cordifolia* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001958, GU)
- *Cardamine cordifolia* - *Mertensia ciliata* - *Senecio triangularis* Herbaceous Vegetation (CEGL002662, G4)
- *Carex amplifolia* Herbaceous Vegetation (CEGL003427, G3)
- *Carex aperta* Herbaceous Vegetation (CEGL001801, G1?)
- *Carex aquatilis* - *Carex utriculata* Herbaceous Vegetation (CEGL001803, G4)
- *Carex aquatilis* - *Pedicularis groenlandica* Herbaceous Vegetation (CEGL001804, GU)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex aquatilis* var. *dives* Herbaceous Vegetation (CEGL001826, G4)
- *Carex capillaris* - *Polygonum viviparum* Herbaceous Vegetation (CEGL001872, GU)
- *Carex duriuscula* Herbaceous Vegetation (CEGL001874, GUQ)
- *Carex illota* Herbaceous Vegetation (CEGL001876, GUQ)
- *Carex lachenalii* Herbaceous Vegetation (CEGL001871, GU)
- *Carex microglochis* Herbaceous Vegetation (CEGL001877, GU)
- *Carex microptera* Herbaceous Vegetation (CEGL001792, G4)
- *Carex nebrascensis* - *Carex microptera* Herbaceous Vegetation (CEGL001815, G3G4)
- *Carex nebrascensis* - *Catabrosa aquatica* Herbaceous Vegetation (CEGL001814, G1?)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex nebrascensis* Slope Herbaceous Vegetation (CEGL002890, GU)
- *Carex nigricans* - *Juncus drummondii* Herbaceous Vegetation (CEGL001818, GU)
- *Carex nigricans* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL005824, G4G5)
- *Carex nigricans* Herbaceous Vegetation (CEGL001816, G4)
- *Carex pellita* Herbaceous Vegetation (CEGL001809, G3)
- *Carex praegracilis* - *Carex aquatilis* Herbaceous Vegetation (CEGL001821, G3)
- *Carex praegracilis* Herbaceous Vegetation (CEGL002660, G3G4)
- *Carex pyrenaica* Herbaceous Vegetation (CEGL001860, GU)
- *Carex saxatilis* Herbaceous Vegetation (CEGL001769, G3)
- *Carex scirpoidea* ssp. *pseudoscirpoidea* Herbaceous Vegetation (CEGL001865, G3?)
- *Carex scopulorum* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001823, G4)
- *Carex scopulorum* - *Elymus trachycaulus* Herbaceous Vegetation (CEGL001824, GU)
- *Carex scopulorum* Herbaceous Vegetation (CEGL001822, G5)
- *Carex simulata* Herbaceous Vegetation (CEGL001825, G4)
- *Carex spectabilis* - *Arnica X diversifolia* Herbaceous Vegetation (CEGL005867, G3G4)
- *Carex stramineiformis* Herbaceous Vegetation (CEGL001793, G3?)
- *Carex utriculata* Herbaceous Vegetation (CEGL001562, G5)
- *Carex vernacula* - *Poa fendleriana* Herbaceous Vegetation (CEGL001869, G2G3)
- *Carex vesicaria* Herbaceous Vegetation (CEGL002661, G4Q)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex* spp. Shrubland (CEGL001106, G3?)
- *Dasiphora fruticosa* ssp. *floribunda* / *Deschampsia caespitosa* Shrubland (CEGL001107, G4)
- *Dasiphora fruticosa* ssp. *floribunda* Shrubland [Provisional] (CEGL001105, G5?)
- *Deschampsia caespitosa* - *Achillea millefolium* var. *occidentalis* Herbaceous Vegetation (CEGL001880, G5)
- *Deschampsia caespitosa* - *Caltha leptosepala* Herbaceous Vegetation (CEGL001882, G4)
- *Deschampsia caespitosa* - *Carex douglasii* Herbaceous Vegetation (CEGL001602, G2)
- *Deschampsia caespitosa* - *Carex microptera* Herbaceous Vegetation (CEGL001883, G2G3)
- *Deschampsia caespitosa* - *Carex nebrascensis* Herbaceous Vegetation (CEGL001601, G3?Q)
- *Deschampsia caespitosa* - *Carex* spp. Herbaceous Vegetation (CEGL001603, G4Q)
- *Deschampsia caespitosa* - *Geum rossii* Herbaceous Vegetation (CEGL001884, G5)
- *Deschampsia caespitosa* - *Ligusticum tenuifolium* Herbaceous Vegetation (CEGL001885, GU)
- *Deschampsia caespitosa* - *Luzula multiflora* Herbaceous Vegetation (CEGL001886, G2Q)
- *Deschampsia caespitosa* - *Mertensia ciliata* Herbaceous Vegetation (CEGL001887, GU)
- *Deschampsia caespitosa* - *Phleum alpinum* Herbaceous Vegetation (CEGL001888, G3Q)
- *Deschampsia caespitosa* - *Potentilla diversifolia* Herbaceous Vegetation (CEGL001889, G5)
- *Deschampsia caespitosa* - *Symphyotrichum foliaceum* Herbaceous Vegetation (CEGL001881, G2Q)
- *Deschampsia caespitosa* Herbaceous Vegetation (CEGL001599, G4)
- *Eleocharis acicularis* Herbaceous Vegetation (CEGL001832, G4?)

- *Eleocharis palustris* - *Distichlis spicata* Herbaceous Vegetation (CEGL001834, G2G4)
- *Eleocharis palustris* - *Juncus balticus* Herbaceous Vegetation (CEGL001835, G2G4)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Eleocharis quinqueflora* - *Carex scopulorum* Herbaceous Vegetation (CEGL001837, G3G4)
- *Eleocharis quinqueflora* Herbaceous Vegetation (CEGL001836, G4)
- *Eleocharis rostellata* Herbaceous Vegetation (CEGL003428, G3)
- *Equisetum arvense* Herbaceous Vegetation (CEGL003314, G5)
- *Equisetum fluviatile* Herbaceous Vegetation (CEGL002746, G4)
- *Equisetum laevigatum* Herbaceous Vegetation (CEGL002241, GNR)
- *Geum rossii* - *Polygonum bistortoides* Herbaceous Vegetation (CEGL001967, G4G5)
- *Geum rossii* - *Sibbaldia procumbens* Herbaceous Vegetation (CEGL001969, GU)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Glyceria grandis* Herbaceous Vegetation (CEGL003429, G2?)
- *Glyceria striata* Herbaceous Vegetation (CEGL000219, G3)
- *Heracleum maximum* - *Rudbeckia occidentalis* Herbaceous Vegetation (CEGL001940, G4)
- *Heracleum maximum* Herbaceous Vegetation (CEGL005857, G3G4)
- *Juncus balticus* - *Carex rossii* Herbaceous Vegetation (CEGL001839, G2G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Juncus drummondii* - *Antennaria lanata* Herbaceous Vegetation (CEGL001904, G3?)
- *Juncus drummondii* - *Carex* spp. Herbaceous Vegetation (CEGL001905, G4)
- *Juncus parryi* - *Erigeron ursinus* Herbaceous Vegetation (CEGL001906, G2?)
- *Juncus parryi* / *Sibbaldia procumbens* Herbaceous Vegetation (CEGL005871, G3G4)
- *Phippsia algida* Herbaceous Vegetation (CEGL002892, GU)
- *Phleum alpinum* - *Carex aquatilis* Herbaceous Vegetation (CEGL001921, G2Q)
- *Phleum alpinum* - *Carex microptera* Herbaceous Vegetation (CEGL001922, G2Q)
- *Poa glauca* Herbaceous Vegetation (CEGL001926, GU)
- *Poa palustris* Herbaceous Vegetation (CEGL001659, GNA)
- *Primula parryi* Herbaceous Vegetation (CEGL001983, GNR)
- *Rhodiola rhodantha* Herbaceous Vegetation (CEGL001931, GU)
- *Rorippa alpina* Herbaceous Vegetation (CEGL002009, GU)
- *Saxifraga odontoloma* Herbaceous Vegetation (CEGL001985, GU)
- *Senecio triangularis* - *Mimulus guttatus* Herbaceous Vegetation (CEGL001988, G3?)
- *Senecio triangularis* - *Veratrum californicum* Herbaceous Vegetation (CEGL001989, G4)
- *Senecio triangularis* Herbaceous Vegetation (CEGL001987, G5?)
- *Trichophorum caespitosum* - *Carex livida* Herbaceous Vegetation (CEGL001842, G1)
- *Trollius laxus* - *Parnassia fimbriata* Herbaceous Vegetation (CEGL005858, G3?)
- *Valeriana sitchensis* - *Veratrum viride* Herbaceous Vegetation (CEGL001998, G4)

Alliances:

- *Betula nana* Seasonally Flooded Shrubland Alliance (A.995)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Calamagrostis stricta* Temporarily Flooded Herbaceous Alliance (A.2594)
- *Caltha leptosepala* Saturated Herbaceous Alliance (A.1698)
- *Camassia (cusickii, quamash)* Seasonally Flooded Herbaceous Alliance (A.2587)
- *Cardamine cordifolia* Saturated Herbaceous Alliance (A.1699)
- *Carex (lachenalii, capillaris, illota)* Seasonally Flooded Herbaceous Alliance (A.1424)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex amplifolia* Saturated Herbaceous Alliance (A.2584)
- *Carex aperta* Saturated Herbaceous Alliance (A.1468)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex aquatilis var. dives* Seasonally Flooded Herbaceous Alliance (A.1412)
- *Carex duriuscula* Herbaceous Alliance (A.1283)
- *Carex microglochis* Saturated Herbaceous Alliance (A.1470)
- *Carex microptera* Seasonally Flooded Herbaceous Alliance (A.1411)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex nigricans* Seasonally Flooded Herbaceous Alliance (A.1418)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex praegracilis* Seasonally Flooded Herbaceous Alliance (A.1419)
- *Carex pyrenaica* Herbaceous Alliance (A.1320)
- *Carex saxatilis* Temporarily Flooded Herbaceous Alliance (A.1357)
- *Carex scirpoidea ssp. pseudoscirpoidea* Herbaceous Alliance (A.1306)
- *Carex scopulorum* Seasonally Flooded Herbaceous Alliance (A.1420)
- *Carex simulata* Saturated Herbaceous Alliance (A.1469)

- *Carex spectabilis* Herbaceous Alliance (A.1300)
- *Carex stramineiformis* Herbaceous Alliance (A.1314)
- *Carex vernacula* Herbaceous Alliance (A.1309)
- *Carex vesicaria* Seasonally Flooded Herbaceous Alliance (A.2501)
- *Dasiphora fruticosa* Temporarily Flooded Shrubland Alliance (A.958)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Deschampsia caespitosa* Temporarily Flooded Herbaceous Alliance (A.1355)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis (quinqueflora, rostellata)* Saturated Herbaceous Alliance (A.1423)
- *Eleocharis acicularis* Seasonally Flooded Herbaceous Alliance (A.1421)
- *Equisetum (arvense, variegatum, hyemale)* Semipermanently Flooded Herbaceous Alliance (A.3539)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Equisetum laevigatum* Semipermanently Flooded Herbaceous Alliance (A.2648)
- *Geum rossii* Herbaceous Alliance (A.1645)
- *Glyceria (grandis, striata)* Seasonally Flooded Herbaceous Alliance (A.2578)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Heracleum maximum* Temporarily Flooded Herbaceous Alliance (A.1661)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Juncus drummondii* Herbaceous Alliance (A.1324)
- *Juncus parryi* Herbaceous Alliance (A.1325)
- *Phippisia algida* Saturated Herbaceous Alliance (A.2595)
- *Pheum alpinum* Temporarily Flooded Herbaceous Alliance (A.1360)
- *Poa glauca* Temporarily Flooded Herbaceous Alliance (A.1361)
- *Poa palustris* Semi-natural Seasonally Flooded Herbaceous Alliance (A.1409)
- *Primula parryi* Temporarily Flooded Herbaceous Alliance (A.1665)
- *Rhodiola rhodantha* Temporarily Flooded Herbaceous Alliance (A.1659)
- *Rorippa alpina* Saturated Herbaceous Alliance (A.1700)
- *Saxifraga odontoloma* Temporarily Flooded Herbaceous Alliance (A.1666)
- *Senecio triangularis* Semipermanently Flooded Herbaceous Alliance (A.1680)
- *Senecio triangularis* Temporarily Flooded Herbaceous Alliance (A.1667)
- *Trichophorum caespitosum* Semipermanently Flooded Herbaceous Alliance (A.1446)
- *Trollius laxus* Saturated Herbaceous Alliance (A.2631)
- *Valeriana sitchensis* Herbaceous Alliance (A.1611)

DISTRIBUTION

Range: This system is found throughout the Rocky Mountains and Intermountain West regions, ranging in elevation from montane to alpine (1000-3600 m).

Divisions: 304:C; 306:C

Nations: CA, US

Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Map Zones: 9:C, 10:C, 12:P, 13:C, 15:?, 16:C, 17:P, 18:P, 19:C, 21:C, 22:P, 23:C, 24:P, 25:C, 27:C, 28:C, 29:P

USFS Ecomap Regions: 313A:CP, 313B:CC, 313D:C?, 315A:C?, 315B:C?, 315H:CC, 321A:??, 322A:CC, 331H:CP, 331I:CP, 331J:CC, 341A:CC, 341B:CC, 341C:CC, 341F:CP, 341G:CP, 342B:CC, 342C:CC, 342D:C?, 342E:CC, 342F:CP, 342G:CC, 342H:CC, 342J:CP, M242D:PP, M313A:CC, M313B:CC, M331A:CC, M331B:CC, M331D:CC, M331E:CC, M331F:CC, M331G:CC, M331H:CC, M331I:CC, M331J:CC, M332A:CC, M332B:CC, M332D:CC, M332E:CC, M332F:CC, M332G:CC, M333A:CC, M333B:CC, M333C:CC, M333D:CC, M334A:PP, M341A:CP, M341B:CC, M341C:CC, M341D:CC

TNC Ecoregions: 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 22:P, 25:C, 68:C

SOURCES

References: Canadian Rockies Ecoregional Plan 2002, Comer et al. 2002, Comer et al. 2003, Cooper 1986b, Crowe and Clausnitzer 1997, Kittel et al. 1999b, Komarkova 1976, Komarkova 1986, Kovalchik 1987, Kovalchik 1993, Manning and Padgett 1995, Meidinger and Pojar 1991, Nachlinger 1985, Nachlinger et al. 2001, Neely et al. 2001, Padgett et al. 1988a, Reed 1988, Sanderson and Kettler 1996, Tuhy et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722861#references

Description Author: NatureServe Western Ecology Team

Version: 14 Dec 2004

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West
ClassifResp: West

WESTERN GREAT PLAINS CLOSED DEPRESSION WETLAND (CES303.666)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Clay Subsoil Texture; Impermeable Layer; Saturated Soil; Lowland [Lowland]; Playa; Herbaceous; Depressional; Isolated Wetland [Strictly Isolated]; Depression

National Mapping Codes: ESLF 9252

CONCEPT

Summary: Communities associated with the playa lakes in the southern areas of this province and the rainwater basins in Nebraska characterize this system. They are primarily upland depressional basins. This hydric system is typified by the presence of an impermeable layer such as a dense clay, hydric soil and is usually recharged by rainwater and nearby runoff. They are rarely linked to outside groundwater sources and do not have an extensive watershed. Ponds and lakes associated with this system can experience periodic drawdowns during drier seasons and years, and are often replenished by spring rains. *Eleocharis* spp., *Hordeum jubatum*, along with common forbs such as *Coreopsis tinctoria*, *Symphytotrichum subulatum* (= *Aster subulatus*), and *Polygonum pensylvanicum* (= *Polygonum bicornne*) are common vegetation in the wetter and deeper depression, while *Pascopyrum smithii* and *Buchloe dactyloides* are more common in shallow depressions in rangeland. Species richness can vary considerably among individual examples of this system and is especially influenced by adjacent land use, which is often agriculture, and may provide nutrient and herbicide runoff. Dynamic processes that affect these depressions are hydrological changes, grazing, and conversion to agricultural use.

Classification Comments: Open and emergent marshes may be a separate system from wet meadows and wet prairies. This system needs to be more clearly distinguished from the similar open depressional wetlands of the western Great Plains, as well as from Great Plains Prairie Pothole (CES303.661).

Similar Ecological Systems:

- Inter-Mountain Basins Alkaline Closed Depression (CES304.998)
- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)
- Western Great Plains Saline Depression Wetland (CES303.669)

Related Concepts:

- Bluestem Prairie (601) (Shiflet 1994) Intersecting. *Spartina pectinata* wet swales occur as inclusions in this SRM type, but are classed into a wetland ecological system.

DESCRIPTION

Environment: This system is typified by upland depressional basins with an impermeable layer such as dense clay, hydric soils. Rainwater and runoff primarily recharge this system and it is rarely linked to outside groundwater sources.

Vegetation: Species richness varies considerably among individual examples of this system. Commonly, *Eleocharis* spp., *Hordeum jubatum*, along with *Coreopsis tinctoria*, *Symphytotrichum subulatum* (= *Aster subulatus*), and *Polygonum pensylvanicum* (= *Polygonum bicornne*) are found in the wetter and deeper depression. Shallower depressions in rangelands commonly contain *Pascopyrum smithii* and *Buchloe dactyloides*.

Dynamics: Hydrological changes, grazing and conversion to agriculture are the primary processes influencing this system.

MEMBERSHIP

Associations:

- *Argentina anserina* Herbaceous Vegetation [Provisional] (CEGL005825, GNA)
- *Eleocharis palustris* - (*Eleocharis compressa*) - *Leptochloa fusca* ssp. *fascicularis* Herbaceous Vegetation (CEGL002259, GNR)
- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Heteranthera limosa* - *Bacopa rotundifolia* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL002279, GNR)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Panicum obtusum* - *Buchloe dactyloides* Herbaceous Vegetation (CEGL001573, GNRQ)
- *Panicum obtusum* - *Panicum hallii* Herbaceous Vegetation (CEGL001575, GNR)
- *Pascopyrum smithii* - (*Elymus trachycaulus*) Clay Pan Herbaceous Vegetation (CEGL002239, GNR)
- *Pascopyrum smithii* - *Buchloe dactyloides* - (*Phyla cuneifolia*, *Oenothera canescens*) Herbaceous Vegetation (CEGL002038, G2G3)
- *Pascopyrum smithii* - *Distichlis spicata* Herbaceous Vegetation (CEGL001580, G4)
- *Pascopyrum smithii* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001581, G1)
- *Pascopyrum smithii* - *Hordeum jubatum* Herbaceous Vegetation (CEGL001582, G4)
- *Pleuraphis mutica* - *Panicum obtusum* Herbaceous Vegetation (CEGL001639, G3)
- *Polygonum* spp. - *Echinochloa* spp. - *Distichlis spicata* Playa Lake Herbaceous Vegetation (CEGL002039, G2G4)

- *Sarcobatus vermiculatus* / *Leymus cinereus* Shrubland (CEGL001366, G3)
- *Schoenoplectus americanus* - *Eleocharis* spp. Herbaceous Vegetation (CEGL001586, GNR)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)

Alliances:

- *Argentina anserina* Herbaceous Alliance [Provisional] (A.2642)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis palustris* Temporarily Flooded Herbaceous Alliance (A.1342)
- *Heteranthera limosa* Permanently Flooded Herbaceous Alliance (A.1744)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Panicum obtusum* Herbaceous Alliance (A.1238)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Pascopyrum smithii* Intermittently Flooded Herbaceous Alliance (A.1328)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Pleuraphis mutica* Intermittently Flooded Herbaceous Alliance (A.1330)
- *Polygonum* spp. - *Echinochloa* spp. Temporarily Flooded Herbaceous Alliance (A.1348)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

DISTRIBUTION

Range: This system can be found throughout the eastern portion of the Western Great Plains Division, however, it is most prevalent in the central states of Nebraska, Kansas and Oklahoma. In addition, it does occur farther to the west, in central and eastern Montana and eastern Wyoming.

Divisions: 205:P; 303:C

Nations: US

Subnations: CO, KS, MT, NE, NM, OK, SD, TX, WY

Map Zones: 20:?, 22:C, 25:?, 26:P, 29:P, 30:P, 31:P, 32:P, 33:C, 34:C, 35:?, 36:P, 38:C

USFS Ecomap Regions: 251F:CC, 251G:CC, 251H:CC, 315F:PP, 331B:CP, 331C:CC, 331D:C?, 331E:CC, 331F:CC, 331G:CP, 331H:CC, 331K:CP, 331L:CP, 331M:CP, 332B:CC, 332C:CC, 332D:CC, 332E:CC, 332F:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 32:P, 33:C

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722992#references

Description Author: S. Menard and K. Kindscher

Version: 14 Dec 2004

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

WESTERN GREAT PLAINS OPEN FRESHWATER DEPRESSION WETLAND (CES303.675)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saturated Soil; Herbaceous; Depressional; Isolated Wetland [Partially Isolated]; Depression

National Mapping Codes: ESLF 9218

CONCEPT

Summary: This Great Plains emergent marsh ecological system is composed of lowland depressions; it also occurs along lake borders that have more open basins and a permanent water source through most of the year, except during exceptional drought years. These areas are distinct from Western Great Plains Closed Depression Wetland (CES303.666) by having a large watershed and/or significant connection to the groundwater table. A variety of species are part of this system, including emergent species of *Typha*, *Carex*, *Eleocharis*, *Juncus*, *Spartina*, and *Schoenoplectus*, as well as floating genera such as *Potamogeton*, *Sagittaria*, *Stuckenia*, or *Ceratophyllum*. The system includes submergent and emergent marshes and associated wet meadows and wet prairies. These types can also drift into stream margins that are more permanently wet and linked directly to the basin via groundwater flow from/into the pond or lake. Some of the specific communities will also be found in the floodplain system and should not be considered a separate system in that case. These types should also not be considered a separate system if they are occurring in lowland areas of the prairie matrix only because of an exceptional wet year.

Classification Comments: This system occurs widely throughout the western Great Plains, but in the arid shortgrass region, it is replaced by North American Arid West Emergent Marsh (CES300.729). Open and emergent marshes may be a separate system from wet meadows and wet prairies. More clarification needs to be made between this system and other depressional wetlands occurring in Wyoming and Montana, such as the Inter-Mountain Basins Alkaline Closed Depression (CES304.998), Great Plains Prairie Pothole (CES303.661), and the other western Great Plains depressional wetland systems.

Similar Ecological Systems:

- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Closed Depression Wetland (CES303.666)
- Western Great Plains Saline Depression Wetland (CES303.669)

DESCRIPTION

Environment: This system is found within lowland depressions and along lakes that have more permanent water sources throughout the year. These areas typically have a large watershed and are connected to the groundwater sources. Examples may also drift into stream margins that are more permanently wet and linked to a basin via groundwater flow from/into a pond or lake. Those areas that are found within larger prairie matrix that are only lowland or wet because of an exceptional wet year are not part of this system.

Vegetation: Many species can be associated with this system with *Typha* spp. and *Schoenoplectus* spp. being common.

Dynamics: Hydrology is the primary process influencing this system. Grazing and conversion to agriculture can significantly impact the hydrology and species composition of this system.

MEMBERSHIP

Associations:

- *Alnus incana* Swamp Shrubland (CEGL002381, G5)
- *Betula occidentalis* - *Dasiphora fruticosa* ssp. *floribunda* Shrubland (CEGL001083, G2Q)
- *Calamagrostis canadensis* - *Juncus* spp. - *Carex* spp. Sandhills Herbaceous Vegetation (CEGL002028, G3G4)
- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex aquatilis* - *Carex* spp. Herbaceous Vegetation (CEGL002262, G4?)
- *Carex aquatilis* Herbaceous Vegetation (CEGL001802, G5)
- *Carex atherodes* Herbaceous Vegetation (CEGL002220, G3G5)
- *Carex interior* - *Eleocharis elliptica* - *Thelypteris palustris* Herbaceous Vegetation (CEGL002390, G1G2)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Carex pellita* - *Calamagrostis stricta* Herbaceous Vegetation (CEGL002254, G3G5)
- *Carex prairea* - *Schoenoplectus pungens* - *Rhynchospora capillacea* Herbaceous Vegetation (CEGL002267, G2)
- *Carex* spp. - *Triglochin maritima* - *Eleocharis quinqueflora* Marl Fen Herbaceous Vegetation (CEGL002268, G1?)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Cephalanthus occidentalis* / *Ampelopsis arborea* Shrubland (CEGL004182, GNA)
- *Ceratophyllum demersum* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL004528, G4G5)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Eleocharis palustris* - (*Eleocharis compressa*) - *Leptochloa fusca* ssp. *fascicularis* Herbaceous Vegetation (CEGL002259, GNR)

- *Eleocharis palustris* Herbaceous Vegetation (CEGL001833, G5)
- *Glyceria borealis* Herbaceous Vegetation (CEGL001569, G4)
- *Juncus balticus* Herbaceous Vegetation (CEGL001838, G5)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Panicum virgatum* - (*Pascopyrum smithii*) Herbaceous Vegetation (CEGL001484, G2Q)
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474, G5)
- *Polygonum amphibium* Permanently Flooded Herbaceous Vegetation [Placeholder] (CEGL002002, G5)
- *Polygonum pennsylvanicum* - *Polygonum lapathifolium* Herbaceous Vegetation (CEGL002277, G4?)
- *Polygonum* spp. - *Echinochloa* spp. - *Distichlis spicata* Playa Lake Herbaceous Vegetation (CEGL002039, G2G4)
- *Potamogeton nodosus* Herbaceous Vegetation (CEGL004529, GNR)
- *Potamogeton richardsonii* - *Myriophyllum spicatum* Herbaceous Vegetation (CEGL002006, G2Q)
- *Potamogeton* spp. - *Ceratophyllum demersum* Great Plains Herbaceous Vegetation (CEGL002044, G4G5)
- *Sagittaria cuneata* - *Sagittaria longiloba* Herbaceous Vegetation (CEGL004525, GNR)
- *Sagittaria latifolia* - *Leersia oryzoides* Herbaceous Vegetation (CEGL005240, GNR)
- *Salix nigra* / (*Cephalanthus occidentalis*) Forest (CEGL004773, G4G5)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus acutus* - *Typha latifolia* - (*Schoenoplectus tabernaemontani*) Sandhills Herbaceous Vegetation (CEGL002030, G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Schoenoplectus tabernaemontani* Temperate Herbaceous Vegetation (CEGL002623, G5)
- *Scolochloa festucacea* Herbaceous Vegetation (CEGL002260, G4G5)
- *Spartina pectinata* - *Calamagrostis stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002027, G3?)
- *Spartina pectinata* - *Carex* spp. Herbaceous Vegetation (CEGL001477, G3?)
- *Spartina pectinata* - *Eleocharis* spp. - *Carex* spp. Herbaceous Vegetation (CEGL002223, G2G4)
- *Spartina pectinata* - *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001478, G3?)
- *Stuckenia pectinata* - *Myriophyllum (sibiricum, spicatum)* Herbaceous Vegetation (CEGL002003, G3G4)
- *Stuckenia pectinata* - *Zannichellia palustris* Herbaceous Vegetation (CEGL002005, G3G4)
- *Typha (angustifolia, domingensis, latifolia)* - *Schoenoplectus americanus* Herbaceous Vegetation (CEGL002032, G3G4)
- *Typha (latifolia, angustifolia)* Western Herbaceous Vegetation (CEGL002010, G5)
- *Typha latifolia* - *Equisetum hyemale* - *Carex (hystericina, pellita)* Seep Herbaceous Vegetation (CEGL002033, G3)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389, G4G5)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Betula occidentalis* Seasonally Flooded Shrubland Alliance (A.996)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex aquatilis* Seasonally Flooded Herbaceous Alliance (A.1404)
- *Carex atherodes* Seasonally Flooded Herbaceous Alliance (A.1396)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Carex* spp. - *Typha* spp. Saturated Herbaceous Alliance (A.1465)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422)
- *Eleocharis palustris* Temporarily Flooded Herbaceous Alliance (A.1342)
- *Glyceria borealis* Semipermanently Flooded Herbaceous Alliance (A.1445)
- *Juncus balticus* Seasonally Flooded Herbaceous Alliance (A.1374)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Polygonum* spp. - *Echinochloa* spp. Temporarily Flooded Herbaceous Alliance (A.1348)
- *Potamogeton richardsonii* Permanently Flooded Herbaceous Alliance (A.1765)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Sagittaria latifolia* Semipermanently Flooded Herbaceous Alliance (A.1675)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Scolochloa festucacea* Seasonally Flooded Herbaceous Alliance (A.1401)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

- *Stuckenia pectinata* Permanently Flooded Herbaceous Alliance (A.1764)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system can occur throughout the Northwestern Great Plains Division but not in the arid shortgrass region.

Divisions: 205:P; 303:C

Nations: US

Subnations: KS, MT, ND, NE, OK, SD, TX, WY

Map Zones: 25:P, 26:C, 27:C, 29:C, 30:C, 31:C, 33:C, 34:C, 38:C

USFS Ecomap Regions: 331F:??

TNC Ecoregions: 26:C, 28:C, 29:C, 33:C, 34:C, 37:?, 66:P, 67:P

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722983#references

Description Author: S. Menard and K. Kindscher

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

WESTERN GREAT PLAINS SALINE DEPRESSION WETLAND (CES303.669)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saline Water Chemistry; Herbaceous; Depressional; Isolated Wetland [Partially Isolated]; Depression

National Mapping Codes: ESLF 9256

CONCEPT

Summary: This ecological system is very similar to Western Great Plains Open Freshwater Depression Wetland (CES303.675) and Western Great Plains Closed Depression Wetland (CES303.666). However, strongly saline soils cause both the shallow lakes and depressions and the surrounding areas to be more brackish. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum*. Other commonly occurring taxa include *Puccinellia nuttalliana*, *Salicornia rubra*, *Schoenoplectus maritimus*, *Schoenoplectus americanus*, *Suaeda calceoliformis*, *Spartina* spp., *Triglochin maritima*, and shrubs such as *Sarcobatus vermiculatus* and *Krascheninnikovia lanata*. During exceptionally wet years, an increase in precipitation can dilute the salt concentration in the soils of some examples of this system which may allow for less salt-tolerant species to occur. Communities found within this system may also occur in floodplains (i.e., more open depressions) but probably should not be considered a separate system unless they transition to areas outside the immediate floodplain.

Classification Comments: Open and emergent saline marshes may be a separate system from saline wet meadows and prairies. This system is often intimately associated (in space) with greasewood flats, and there is some overlap in the associations between the two. This system tends to be more of an herbaceous wetlands, whereas Inter-Mountain Basins Greasewood Flat (CES304.780) is more strongly shrub-dominated with patches of herb-dominance.

Similar Ecological Systems:

- North American Arid West Emergent Marsh (CES300.729)
- Western Great Plains Closed Depression Wetland (CES303.666)
- Western Great Plains Open Freshwater Depression Wetland (CES303.675)

Related Concepts:

- Wheatgrass - Saltgrass - Grama (615) (Shiflet 1994) Intersecting

DESCRIPTION

Environment: This system is distinct from the freshwater depression systems by its brackish nature caused by strongly saline soils. Salt encrustations could occur near the surface in some examples of this system.

Vegetation: Salt-tolerant and halophytic species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum* typify the system.

Dynamics: Hydrology processes primarily drive this system. Increases in precipitation and/or runoff can dilute the salt concentration and allow for less salt-tolerant species to occur. Conversion to agriculture and pastureland can also impact this system, especially when it alters the hydrology of the system.

MEMBERSHIP

Associations:

- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Distichlis spicata* - (*Hordeum jubatum*, *Poa arida*, *Sporobolus airoides*) Herbaceous Vegetation (CEGL002042, G3)
- *Distichlis spicata* - *Hordeum jubatum* - (*Poa arida*, *Iva annua*) Herbaceous Vegetation (CEGL002031, G2G3)
- *Distichlis spicata* - *Hordeum jubatum* - *Puccinellia nuttalliana* - *Suaeda calceoliformis* Herbaceous Vegetation (CEGL002273, G2G3)
- *Distichlis spicata* - *Schoenoplectus maritimus* - *Salicornia rubra* Herbaceous Vegetation (CEGL002043, G1G2)
- *Distichlis spicata* - *Spartina* spp. Herbaceous Vegetation (CEGL002275, G4)
- *Distichlis spicata* Herbaceous Vegetation (CEGL001770, G5)
- *Hordeum jubatum* Herbaceous Vegetation (CEGL001798, G4)
- *Pascopyrum smithii* - *Distichlis spicata* Herbaceous Vegetation (CEGL001580, G4)
- *Pascopyrum smithii* - *Hordeum jubatum* Herbaceous Vegetation (CEGL001582, G4)
- *Puccinellia nuttalliana* Herbaceous Vegetation (CEGL001799, G3?)
- *Salicornia rubra* Herbaceous Vegetation (CEGL001999, G2G3)
- *Sarcobatus vermiculatus* / *Distichlis spicata* - (*Puccinellia nuttalliana*) Shrub Herbaceous Vegetation (CEGL002146, GNR)
- *Sarcobatus vermiculatus* / *Pascopyrum smithii* - (*Elymus lanceolatus*) Shrub Herbaceous Vegetation (CEGL001508, G4)
- *Schoenoplectus americanus* - *Carex* spp. Herbaceous Vegetation (CEGL004144, GNR)
- *Schoenoplectus americanus* Great Plains Herbaceous Vegetation (CEGL002226, GNR)

- *Schoenoplectus maritimus* - *Schoenoplectus acutus* - (*Triglochin maritima*) Herbaceous Vegetation (CEGL002227, G3G5)
- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)
- *Schoenoplectus pungens* - *Suaeda calceoliformis* Alkaline Herbaceous Vegetation (CEGL002040, G3G4)
- *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001587, G3G4)
- *Scolochloa festucacea* Herbaceous Vegetation (CEGL002260, G4G5)
- *Spartina pectinata* - *Schoenoplectus pungens* Herbaceous Vegetation (CEGL001478, G3?)
- *Sporobolus airoides* Monotype Herbaceous Vegetation (CEGL001688, GUQ)
- *Sporobolus airoides* Northern Plains Herbaceous Vegetation (CEGL002274, GNR)
- *Sporobolus airoides* Southern Plains Herbaceous Vegetation (CEGL001685, G3Q)
- *Stuckenia pectinata* - *Ruppia maritima* Herbaceous Vegetation (CEGL002004, G2?)
- *Stuckenia pectinata* - *Zannichellia palustris* Herbaceous Vegetation (CEGL002005, G3G4)
- *Typha* spp. - *Schoenoplectus* spp. - Mixed Herbs Great Plains Herbaceous Vegetation (CEGL002228, G4G5)
- *Typha* spp. Great Plains Herbaceous Vegetation (CEGL002389, G4G5)

Alliances:

- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Distichlis spicata* - (*Hordeum jubatum*) Temporarily Flooded Herbaceous Alliance (A.1341)
- *Distichlis spicata* Intermittently Flooded Herbaceous Alliance (A.1332)
- *Hordeum jubatum* Temporarily Flooded Herbaceous Alliance (A.1358)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Puccinellia nuttalliana* Intermittently Flooded Herbaceous Alliance (A.1335)
- *Salicornia rubra* Seasonally Flooded Herbaceous Alliance (A.1818)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrub Herbaceous Alliance (A.1554)
- *Sarcobatus vermiculatus* Shrub Herbaceous Alliance (A.1535)
- *Schoenoplectus americanus* Semipermanently Flooded Herbaceous Alliance (A.1432)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)
- *Schoenoplectus pungens* Semipermanently Flooded Herbaceous Alliance (A.1433)
- *Scolochloa festucacea* Seasonally Flooded Herbaceous Alliance (A.1401)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Sporobolus airoides* Herbaceous Alliance (A.1267)
- *Stuckenia pectinata* Permanently Flooded Herbaceous Alliance (A.1764)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

DISTRIBUTION

Range: This system can occur throughout the western Great Plains but is likely more prevalent in the south-central portions of the division. Its distribution extends as far west as central Montana and eastern Wyoming where it occurs in the matrix of Northwestern Great Plains Mixedgrass Prairie (CES303.674).

Divisions: 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, NM, OK, SD, TX, WY

Map Zones: 20:C, 25:?, 26:C, 27:C, 29:C, 30:C, 31:C, 33:C, 34:C, 35:?, 38:C, 39:?, 40:?

USFS Ecomap Regions: 315A:CC, 315B:CC, 315F:CC, 321A:CC, 331B:CC, 331C:CC, 331D:CP, 331E:CP, 331F:C?, 331G:CP, 331H:C?, 331I:CC, 331K:CC, 331L:CP, 331M:CP, 332E:CC, 332F:C?, M313B:CC

TNC Ecoregions: 26:C, 27:C, 28:C, 33:C, 34:?

SOURCES

References: Comer et al. 2003, Hoagland 2000, Lauver et al. 1999, Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722989#references

Description Author: S. Menard and K. Kindscher, mod. M.S. Reid

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

MIXED UPLAND AND WETLAND

1482 GREAT PLAINS PRAIRIE POTHOLE (CES303.661)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Lowland [Lowland]; Pothole; Herbaceous; Temperate [Temperate Continental]; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2482; ESLF 9203; ESP 1482

CONCEPT

Summary: The prairie pothole system is found primarily in the glaciated northern Great Plains of the United States and Canada, and is dominated by depressional wetlands formed by glaciers scraping the landscape during the Pleistocene era. This system is typified by several classes of wetlands distinguished by changes in topography, soils and hydrology. Many of the basins within this system are closed basins and receive irregular inputs of water from their surroundings (groundwater and precipitation), and export water as groundwater. Hydrology of the potholes is complex. Precipitation and runoff from snowmelt are often the principal water sources, with groundwater inflow secondary. Evapotranspiration is the major water loss, with seepage loss secondary. Most of the wetlands and lakes contain water that is alkaline (pH >7.4). The concentration of dissolved solids result in water that ranges from fresh to extremely saline. The flora and vegetation of this system are a function of the topography, water regime, and salinity. In addition, because of periodic droughts and wet periods, many wetlands within this system may undergo vegetation cycles. This system includes elements of emergent marshes and wet, sedge meadows that develop into a pattern of concentric rings. This system is responsible for a significant percentage of the annual production of many economically important waterfowl in North America and houses more than 50% of North American's migratory waterfowl, with several species reliant on this system for breeding and feeding. Much of the original extent of this system has been converted to agriculture, and only approximately 40-50% of the system remains undrained.

Classification Comments: More data from Canada is needed to really define this system completely.

DESCRIPTION

Environment: This system is dominated by closed basins, potholes, that receive irregular inputs of water from the surroundings and export water as groundwater. The climate for the range of this system is characterized by mid-continental temperature and precipitation extremes. Snowmelt in the spring typically fills many of the potholes in examples of this system. The region in the range of this system is distinguished by a thin mantle of glacial drift with overlying stratified sedimentary rocks of the Mesozoic and Cenozoic ages; these form a glacial landscape of end moraines, stagnation moraines, outwash plains and lakeplains. The glacial drift ranges 30 to 120 m thick and forms steep to slight local relief with fine-grained, silty to clayey soils. Limestone, sandstone, and shales predominant, and highly mineralized water can discharge from these rocks. The hydrology of this system is complex with salinity ranging from fresh to saline, and chemical characteristics varying seasonally and annually. Precipitation and snowmelt are the primary water sources with evapotranspiration being the source of major water loss.

Vegetation: The vegetation within this system is highly influenced by hydrology, salinity and dynamics. Potholes found within this system can vary in depth and duration, which will determine the local gradient of species. Likewise, plant species found within individual potholes of this system will be strongly influenced by periodic drought and wet periods. Deeper potholes with standing water throughout most of the year have a central zone of submersed aquatic vegetation. Potholes that dry during droughty times can have central zones dominated by either tall emergents or mid-height emergents depending on the depth of the marsh. Wet meadow species such as grasses, forbs and sedges can be found in potholes that are only flooded briefly in the spring. All of these types of potholes can be found within an example of this system. Grazing, draining, and mowing of this system can influence the distribution of these types of potholes and plant species within this system.

Dynamics: Flooding is the primary natural dynamic influencing this system. Snowmelt in the spring often floods this system and can cause the prominent potholes within the system to overflow. Greater than normal precipitation can flood out emergent vegetation and/or increase herbivory by animal species such as muskrats. This system can undergo periodic wet and droughty periods that can cause shifts in the vegetation. Vegetation zones are evident around the wet potholes throughout this system, and each zone responds to changing environmental conditions. Draining and conversion to agriculture can also significantly impact this system. Much of the original extent of this system has been converted to cropland, and many remaining examples are under pressure to be drained.

MEMBERSHIP

Associations:

- *Carex lasiocarpa* - *Carex oligosperma* / *Sphagnum* spp. Herbaceous Vegetation (CEGL002265, G3G4)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus maritimus* - *Schoenoplectus acutus* - (*Triglochin maritima*) Herbaceous Vegetation (CEGL002227, G3G5)

- *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL001843, G4)

Alliances:

- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus maritimus* Semipermanently Flooded Herbaceous Alliance (A.1444)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Mixedgrass Prairie (CES303.674)

DISTRIBUTION

Range: This system can be found throughout the northern Great Plains ranging from central Iowa northeast to southern Saskatchewan and Alberta, and extending west into north-central Montana. It encompasses approximately 870,000 square km with approximately 80% of its range in southern Canada. It is also prevalent in North Dakota, South Dakota, and northern Minnesota.

Divisions: 205:C; 303:C

Nations: CA, US

Subnations: AB, IA?, MB, MN, MT, ND, SD, SK

Map Zones: 20:C, 29:C, 38:?, 39:C, 40:C, 41:C, 42:P

USFS Ecomap Regions: 251A:CC, 251B:CC, 331D:CC, 331E:CC, 331K:CC, 331L:CC, 331M:CC

TNC Ecoregions: 26:C, 34:C, 35:C, 66:P, 67:P

SOURCES

References: Comer et al. 2003, Johnson et al. 1987, Kantrud et al. 1989, Lesica 1989, Stewart and Kantrud 1972

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722997#references

Description Author: S. Menard

Version: 05 Mar 2003

Concept Author: S. Menard

Stakeholders: Canada, Midwest, West

ClassifResp: Midwest

NORTH-CENTRAL INTERIOR FLOODPLAIN (CES202.694)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Floodplain; Forest and Woodland (Treed); Herbaceous; Glaciated; Clay Soil Texture; Sand Soil Texture; Udic

National Mapping Codes: ESLF 9338

CONCEPT

Summary: This system is found along rivers across the glaciated Midwest. It occurs from river's edge across the floodplain or to where it meets a wet meadow system. It can have a variety of soil types found within the floodplain from very well-drained sandy substrates to very dense clays. It is this variety of substrates and flooding that creates the mix of vegetation that includes *Acer saccharinum*, *Populus deltoides*, willows, especially *Salix nigra* in the wettest areas, and *Fraxinus pennsylvanica*, *Ulmus americana*, and *Quercus macrocarpa* in more well-drained areas. Within this system are oxbows that may support *Nelumbo lutea* and *Typha latifolia*. Understory species are mixed, but include shrubs, such as *Cornus drummondii* and *Asimina triloba* (in Kansas), sedges and grasses, which sometimes help form savanna vegetation. Flooding is the primary dynamic process, but drought, grazing, and fire have all had historical influence on this system. Federal reservoirs have had a serious and negative effect on this system, along with agriculture that has converted much of this system to drained agricultural land.

Classification Comments: The distribution limit northward is considered to be the Laurentian region boundary. This system is distinguished from floodplain systems northeastward, Laurentian-Acadian Floodplain Forest (CES201.587), and eastward, Central Appalachian River Floodplain (CES202.608). *Celtis* and *Populus deltoides* are absent (or essentially so) from the Laurentian-Acadian type.

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- Laurentian-Acadian Floodplain Forest (CES201.587)

DESCRIPTION

Environment: This ecological system occurs in floodplains of medium to large rivers. It primarily is found on alluvial soils ranging from sandy to very dense clays.

Vegetation: The variety of soil properties associated with this system can create a mixture of vegetation. *Acer saccharinum* occurs on the wetter soils of floodplains in the eastern portion of this system, with *Populus deltoides* and willows, especially *Salix nigra*, occurring more in the western range of this system. *Fraxinus pennsylvanica*, *Ulmus americana*, and *Quercus macrocarpa* occur in more well-drained areas. Understory species can vary across the range of this system but can include shrubs such as *Cornus drummondii* and *Asimina triloba*, and sedge and grass species. Oxbows within this system may have species such as *Nelumbo lutea* and *Typha latifolia*.

Dynamics: This system is primarily controlled by moderate to frequent flooding. Grazing can also impact this system and can lead to decreased cover of many graminoid species in some areas.

MEMBERSHIP

Associations:

- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharum* - *Carya cordiformis* / *Asimina triloba* Floodplain Forest (CEGL005035, G2)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Brasenia schreberi* Herbaceous Vegetation (CEGL004527, G4?)
- *Calamagrostis canadensis* - *Juncus* spp. - *Carex* spp. Sandhills Herbaceous Vegetation (CEGL002028, G3G4)
- *Calamagrostis stricta* - *Carex sartwellii* - *Carex praegracilis* - *Plantago eriopoda* Saline Herbaceous Vegetation (CEGL002255, G2G3)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex pellita* - *Carex* spp. - *Schoenoplectus tabernaemontani* Fen Herbaceous Vegetation (CEGL002041, G1)
- *Carex* spp. - (*Carex pellita*, *Carex vulpinoidea*) Herbaceous Vegetation (CEGL005272, GNR)
- *Carya illinoensis* - *Celtis laevigata* Forest (CEGL002087, G4?)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) / *Symphoricarpos occidentalis* Forest (CEGL002088, G4?)
- *Fraxinus pennsylvanica* - *Celtis occidentalis* - *Tilia americana* - (*Quercus macrocarpa*) Forest (CEGL002081, G4?)
- *Fraxinus pennsylvanica* - *Celtis* spp. - *Quercus* spp. - *Platanus occidentalis* Bottomland Forest (CEGL002410, G3G4)

- *Fraxinus pennsylvanica* - *Ulmus americana* - (*Acer negundo*, *Tilia americana*) Northern Forest (CEGL002089, G3G4)
- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014, G3G5)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044, GNA)
- *Pinus strobus* - (*Pinus resinosa*) - *Quercus rubra* Forest (CEGL002480, G4)
- *Populus deltoides* - (*Salix nigra*) / *Spartina pectinata* - *Carex* spp. Woodland (CEGL002017, G1)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* - *Platanus occidentalis* Forest (CEGL002095, G1G2)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068, G4?)
- *Quercus macrocarpa* - *Quercus bicolor* - (*Celtis occidentalis*) Woodland (CEGL002140, G1)
- *Quercus macrocarpa* - *Quercus bicolor* - *Carya laciniosa* / *Leersia* spp. - *Cinna* spp. Forest (CEGL002098, G2G3)
- *Quercus macrocarpa* - *Quercus shumardii* - *Carya cordiformis* / *Chasmanthium latifolium* Forest (CEGL004544, G3?)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Hesperostipa spartea* Woodland (CEGL002053, G2G3)
- River Mudflats Sparse Vegetation (CEGL002314, GNR)
- Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049, G4G5)
- *Sagittaria latifolia* - *Leersia oryzoides* Herbaceous Vegetation (CEGL005240, GNR)
- *Salix interior* Temporarily Flooded Shrubland (CEGL008562, G4G5)
- *Salix nigra* Forest (CEGL002103, G4)
- *Salix* spp. / *Andropogon gerardii* - *Sorghastrum nutans* Gravel Wash Herbaceous Vegetation (CEGL005175, G2G)
- *Sarcobatus vermiculatus* / *Distichlis spicata* - (*Puccinellia nuttalliana*) Shrub Herbaceous Vegetation (CEGL002146, GNR)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)
- *Typha latifolia* - *Equisetum hyemale* - *Carex (hystericina, pellita)* Seep Herbaceous Vegetation (CEGL002033, G3)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)

Alliances:

- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Brasenia schreberi* Permanently Flooded Herbaceous Alliance (A.1742)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Carex pellita* Seasonally Flooded Herbaceous Alliance (A.1414)
- *Carex* spp. - *Plantago eriopoda* Temporarily Flooded Herbaceous Alliance (A.1350)
- *Carex* spp. - *Typha* spp. Saturated Herbaceous Alliance (A.1465)
- *Carya illinoensis* - (*Celtis laevigata*) Temporarily Flooded Forest Alliance (A.282)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Temporarily Flooded Forest Alliance (A.308)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus macrocarpa* - *Quercus (alba, ellipsoidalis, velutina)* Woodland Alliance (A.619)
- *Quercus macrocarpa* - *Quercus bicolor* - (*Carya laciniosa*) Temporarily Flooded Forest Alliance (A.293)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Sagittaria latifolia* Semipermanently Flooded Herbaceous Alliance (A.1675)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- Sand Flats Temporarily Flooded Sparsely Vegetated Alliance (A.1864)

- *Sarcobatus vermiculatus* Shrub Herbaceous Alliance (A.1535)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)

DISTRIBUTION

Range: This system is found along medium and large river floodplains throughout the glaciated Midwest ranging from eastern Kansas and western Missouri to western Ohio and north along the Red River basin in Minnesota.

Divisions: 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI

Map Zones: 38:C, 39:C, 40:C, 42:C, 43:C, 44:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 222H:CC, 222I:CC, 222Ja:CCC, 222Jb:CCC, 222Jc:CCC, 222Je:CCC, 222Jg:CCC, 222Jh:CCC, 222Ji:CCC, 222K:CC, 222L:CC, 222M:CC, 222Ua:CCC, 222Ud:CCC, 222Ue:CCC, 223A:CC, 251B:CC, 251E:CC, 251F:CC, 251G:CC, 251H:CC, 255A:CC, 332B:CC, 332C:CC, 332D:CC, 332E:CC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:?, 48:?

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722965#references

Description Author: S. Menard and K. Kindscher

Version: 18 Jul 2006

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, Southeast

ClassifResp: Midwest

NORTHWESTERN GREAT PLAINS RIPARIAN (CES303.677)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9326

CONCEPT

Summary: This system is found in the riparian areas of medium and small rivers and streams throughout the northwestern Great Plains. It is likely most common in the Northern Great Plains Steppe. This system occurs in the Upper Missouri and tributaries starting at the Niobrara, White, Cheyenne, Belle Fourche, Moreau, Grand, Heart, Little Missouri, Yellowstone, Powder, Tongue, Bighorn, Wind, Milk, Musselshell, Marias, and Teton rivers; and in Canada, the Southern Saskatchewan, Red Deer and Old Man rivers to where they extend into Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) or Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (CES306.804). These are found on alluvial soils in highly variable landscape settings, from deep cut ravines to wide, braided streambeds. Hydrologically, these tend to be more flashy with less developed floodplain than on larger rivers, and typically dry down completely for some portion of the year. Dominant vegetation shares much with generally drier portions of larger floodplain systems downstream, but overall abundance of vegetation is generally lower. Communities within this system range from riparian forests and shrublands to gravel/sand flats. Dominant species include *Populus deltoides*, *Populus balsamifera ssp. trichocarpa*, *Salix spp.*, *Artemisia cana ssp. cana*, and *Pascopyrum smithii*. These areas are often subjected to heavy grazing and/or agriculture and can be heavily degraded. Another factor is that groundwater depletion and lack of fire have created additional species changes.

Classification Comments: This system needs to be more clearly delineated from Northwestern Great Plains Floodplain (CES303.676). The component plant association list is incomplete. All the riparian/floodplain/alluvial systems of the Great Plains region need to be revisited for naming conventions, along with better definitions of conceptual boundaries. There is much apparent overlap in their concepts and distribution, and the names add to the confusion. In particular, the difference between "riparian" and "floodplain" usage in the names needs revisiting and possible changing. These systems include Northwestern Great Plains Floodplain (CES303.676), Northwestern Great Plains Riparian (CES303.677), Western Great Plains Floodplain (CES303.678), and Western Great Plains Riparian (CES303.956).

Related Concepts:

- Sagebrush - Grass (612) (Shiflet 1994) Intersecting. Most *Artemisia cana ssp. cana* shrublands occur on stream terraces.

MEMBERSHIP

Associations:

- *Artemisia cana* / *Pascopyrum smithii* Shrubland (CEGL001072, G4)
- *Pascopyrum smithii* - (*Elymus trachycaulus*) Clay Pan Herbaceous Vegetation (CEGL002239, GNR)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Cornus sericea* Forest (CEGL000657, G2G3)
- *Populus deltoides* / *Symphoricarpos occidentalis* Woodland (CEGL000660, G2G3)

Alliances:

- *Artemisia cana* Temporarily Flooded Shrubland Alliance (A.843)
- *Pascopyrum smithii* Herbaceous Alliance (A.1232)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)

DISTRIBUTION

Range: This system occurs throughout the northwestern Great Plains, north of the North Platte River basin in eastern Wyoming. It is found in eastern Wyoming and eastern Montana along the upper Missouri, Yellowstone, Powder, Tongue, Bighorn, Wind, Milk, Musselshell, Marias, and Teton rivers; in northern Nebraska and the Dakotas on the Niobrara, upper Missouri, White, Cheyenne, Belle Fourche, Moreau, Grand, Heart, Little Missouri rivers; and in Canada the Southern Saskatchewan, Red Deer and Old Man rivers.

Divisions: 205:P; 303:C

Nations: CA, US

Subnations: AB, MB, MT, ND, NE, SD, SK, WY

Map Zones: 20:C, 22:P, 29:C, 30:C, 31:C, 39:C, 40:C

USFS Ecomap Regions: 331D:CC, 331F:CP, 331G:CC, 331K:CC, 331L:CC, 331M:C?, 331N:CC, 342A:CC, 342F:CC, M334A:CC

TNC Ecoregions: 10:C, 26:C, 34:C, 66:P, 67:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722981#references

Description Author: NatureServe Western Ecology Team

Version: 01 Oct 2007

Concept Author: NatureServe Western Ecology Team

Stakeholders: Canada, Midwest, West

ClassifResp: West

1385 WESTERN GREAT PLAINS WOODED DRAW AND RAVINE (CES303.680)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Ravine; G-Patch/Medium Intensity; Draw

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2385; ESLF 4328; ESP 1385

CONCEPT

Summary: This ecological system is typically found associated with permanent or ephemeral streams and may occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding, although soil moisture and topography allow greater than normal moisture conditions compared to the surrounding areas. Occurrences can be either tree-dominated or predominantly shrubland. *Fraxinus* spp. with *Ulmus rubra* or *Ulmus americana* typically dominate this system, although in some areas of the western Great Plains steppe province, *Juniperus scopulorum* can dominate the canopy. *Populus tremuloides*, *Betula papyrifera*, or *Acer negundo* are commonly present in portions of the northwestern Great Plains, for example in areas of central and eastern Montana. In south-central portions of the Great Plains, *Quercus macrocarpa* can also be present. Component shrubs can include *Cornus sericea*, *Crataegus douglasii*, *Crataegus chrysocarpa*, *Crataegus succulenta*, *Elaeagnus commutata*, *Prunus virginiana*, *Rhus* spp., *Rosa woodsii*, *Shepherdia argentea*, *Symphoricarpos occidentalis*, or *Viburnum lentago*. Common grasses can include *Calamagrostis stricta*, *Carex* spp., *Pascopyrum smithii*, *Piptatherum micranthum*, *Pseudoroegneria spicata*, or *Schizachyrium scoparium*. This system was often subjected to heavy grazing and trampling by both domestic animals and wildlife and can be heavily degraded in some areas. In addition, exotic species such as *Ulmus pumila* and *Elaeagnus angustifolia* can invade these systems.

Classification Comments: More information from the broader division and from the Rocky Mountain division will be needed to determine if those areas dominated by ash and elm should be separated from areas dominated by *Juniperus scopulorum*. Those areas dominated by *Juniperus* are typically found in the Badlands and the western portions of North Dakota and Nebraska, and should probably be described based on data from the Great Plains Steppe or Rocky Mountain division. However, *Juniperus* can occur in stands with elm and ash in Nebraska and North Dakota.

Related Concepts:

- Bur Oak: 236 (Eyre 1980) Intersecting
- Rocky Mountain Juniper: 220 (Eyre 1980) Intersecting

DESCRIPTION

Environment: This system is associated with permanent or ephemeral streams. It also can occur on steep northern slopes or within canyon bottoms that do not experience periodic flooding. Soils are primarily wet to mesic, and more dissected topography allows for greater than normal moisture conditions. This system is most often associated with smaller rivers and/or temporary streams.

Vegetation: Species composition can vary across the range of this system. *Fraxinus* spp. and *Ulmus* spp. typically dominate this system. In some western areas of the Great Plains Division, *Juniperus* spp. can dominate, and in the south-central portion of the division, *Quercus macrocarpa* can also be important. Exotic species, such as *Ulmus pumila* and *Elaeagnus angustifolia*, can be present in degraded examples of this system.

Dynamics: Fire can influence this system; however, grazing is the most prevalent dynamic process influencing this system. Overgrazing can heavily degrade this system and allow for the invasion of exotic species.

MEMBERSHIP

Associations:

- *Betula papyrifera* / *Corylus cornuta* Forest (CEGL002079, G2G3)
- *Carex nebrascensis* Herbaceous Vegetation (CEGL001813, G4)
- *Cornus drummondii* - (*Rhus glabra*, *Prunus* spp.) Shrubland (CEGL005219, GNA)
- *Cornus drummondii* - *Amorpha fruticosa* - *Cornus sericea* Shrubland (CEGL005220, G4?)
- *Cornus sericea* - *Salix (bebbiana, discolor, petiolaris)* / *Calamagrostis stricta* Shrubland (CEGL002187, G3G4)
- *Cornus sericea* Shrubland (CEGL001165, G4Q)
- *Crataegus douglasii* - (*Crataegus chrysocarpa*) Shrubland (CEGL001093, G2Q)
- *Crataegus succulenta* Shrubland [Provisional] (CEGL001097, G3G4Q)
- *Elaeagnus commutata* / *Pascopyrum smithii* Shrubland (CEGL001099, G3?)
- *Elaeagnus commutata* Shrubland (CEGL001098, G2Q)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) / *Symphoricarpos occidentalis* Forest (CEGL002088, G4?)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Prunus virginiana* Woodland (CEGL000643, G2G3)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Symphoricarpos occidentalis* Forest (CEGL002082, G3G5)
- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014, G3G5)
- *Fraxinus pennsylvanica* / *Prunus virginiana* Forest (CEGL000642, G3?)

- *Juniperus scopulorum* / *Cornus sericea* Woodland (CEGL000746, G4)
- *Juniperus scopulorum* / *Piptatherum micranthum* Woodland (CEGL000747, G3G4)
- *Juniperus scopulorum* / *Pseudoroegneria spicata* Woodland (CEGL000748, G4)
- *Juniperus scopulorum* / *Schizachyrium scoparium* Woodland (CEGL000750, G2)
- *Juniperus scopulorum* Woodland (CEGL003550, GNR)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Pascopyrum smithii* Woodland (CEGL002680, G3)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides* / *Juniperus scopulorum* Woodland (CEGL002152, G1G2)
- *Populus deltoides* / *Symphoricarpos occidentalis* Woodland (CEGL000660, G2G3)
- *Prunus virginiana* - (*Prunus americana*) Shrubland (CEGL001108, G4Q)
- *Quercus macrocarpa* / *Prunus virginiana* - *Symphoricarpos occidentalis* Woodland (CEGL002138, G3G4)
- *Rosa woodsii* Shrubland (CEGL001126, G5)
- *Shepherdia argentea* Shrubland (CEGL001128, G3G4)
- *Symphoricarpos occidentalis* Shrubland (CEGL001131, G4G5)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Carex nebrascensis* Seasonally Flooded Herbaceous Alliance (A.1417)
- *Cornus drummondii* Shrubland Alliance (A.3558)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Cornus sericea* Temporarily Flooded Shrubland Alliance (A.968)
- *Crataegus (douglasii, succulenta)* Temporarily Flooded Shrubland Alliance (A.954)
- *Elaeagnus commutata* Shrubland Alliance (A.918)
- *Elaeagnus commutata* Temporarily Flooded Shrubland Alliance (A.956)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Forest Alliance (A.259)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Temporarily Flooded Forest Alliance (A.308)
- *Fraxinus pennsylvanica* - (*Ulmus americana*) Woodland Alliance (A.629)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juniperus scopulorum* Temporarily Flooded Woodland Alliance (A.563)
- *Juniperus scopulorum* Woodland Alliance (A.506)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Prunus virginiana* Shrubland Alliance (A.919)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Rosa woodsii* Temporarily Flooded Shrubland Alliance (A.959)
- *Shepherdia argentea* Temporarily Flooded Shrubland Alliance (A.960)
- *Symphoricarpos occidentalis* Temporarily Flooded Shrubland Alliance (A.961)

DISTRIBUTION

Range: This system is found throughout more northern portions of the Western Great Plains Division. In Wyoming, it occurs in the northeastern foothills of the Bighorns and across far-northeastern Wyoming into the northern fringes of the Black Hills.

Divisions: 205:P; 303:C

Nations: US

Subnations: CO, KS, MT, ND, NE, OK, SD, TX, WY

Map Zones: 20:C, 27:P, 28:P, 29:C, 30:C, 31:C, 33:C, 34:C, 35:?, 38:C, 39:C, 40:C, 43:C

USFS Ecomap Regions: 331D:CP, 331E:CP, 331F:C?, 331G:CP, 331H:C?, 331K:CC, 331L:CC, 331M:CP, 331N:C?, M331B:??, M331I:??, M334A:PP

TNC Ecoregions: 26:C, 27:C, 28:P, 33:C, 34:C, 37:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722979#references

Description Author: S. Menard and K. Kindscher, mod. M.S. Reid

Version: 23 Jan 2008

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, Southeast, West

ClassifResp: Midwest

SPARSELY VEGETATED

1341 NORTHWESTERN GREAT PLAINS CANYON (CES303.658)

CLASSIFIERS

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Very Shallow Soil; Flood Scouring; Canyon

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2341; ESLF 4148; ESP 1341

CONCEPT

Summary: This system occurs primarily along springbranch and dry canyons. Soils can range from deep loams to alluvial to sandy. Limestone and sandstone rock outcrops and cliffs are common. This system often contains elements of other systems that form a complex, small-patch or linear mosaic. Ecological processes are related to canyon landforms and patchy vegetation. Examples of this system are found along the Niobrara and North Platte rivers in Nebraska. Areas along the tributaries of the White River and within the Black Hills region of South Dakota also may be considered part of this system. Vegetation varies locally depending on aspect, slope position and substrate and can range from riparian vegetation to xeric or mesic woodlands. Rock outcrops with sparse vegetation are also common. Dominant tree species include *Quercus macrocarpa*, *Populus deltoides*, *Fraxinus pennsylvanica*, *Ulmus rubra*, *Pinus ponderosa*, and *Juniperus scopulorum* and *Juniperus virginiana*; shrub species may be present as well. This system can grade into areas dominated by *Pinus ponderosa*. Other system elements contained in this system include Western Great Plains Cliff and Outcrop (CES303.665) on south aspects and rims; Western Great Plains Riparian (CES303.956) in drainages, and Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822) and Northwestern Great Plains Shrubland (CES303.662), but unique geology and dynamics bring these together to form this canyon system. Occasionally, fens may occur in canyon bottom seeps.

DESCRIPTION

Vegetation: Vegetation can vary locally with aspect, slope position and substrate. It can range from riparian to mesic to xeric woodlands. Several tree species, such as *Quercus macrocarpa*, *Populus deltoides*, *Betula papyrifera*, *Fraxinus pennsylvanica*, *Ulmus rubra*, and *Pinus ponderosa*, and shrub species, such as *Juniperus virginiana* and *Juniperus scopulorum*, can occur within this system. Cover of these species can range from less than 10% on rock outcrops to greater than 60%.

MEMBERSHIP

Associations:

- *Betula papyrifera* - (*Tilia americana*, *Quercus macrocarpa*) Canyon Forest (CEGL002013, G2?)
- *Carex pellita* - *Carex* spp. - *Schoenoplectus tabernaemontani* Fen Herbaceous Vegetation (CEGL002041, G1)
- *Cercocarpus montanus* / *Bouteloua curtipendula* Shrubland (CEGL001086, G5)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Distichlis spicata* Woodland (CEGL000939, G2)
- *Populus deltoides* (ssp. *wislizeni*, ssp. *monilifera*) / *Salix exigua* Woodland (CEGL002685, G3)
- *Populus deltoides* - (*Salix amygdaloides*) / *Salix (exigua, interior)* Woodland (CEGL000659, G3G4)
- *Populus deltoides* - *Fraxinus pennsylvanica* Forest (CEGL000658, G2G3)
- *Populus deltoides* / *Carex pellita* Woodland (CEGL002649, G2)
- *Populus deltoides* / *Panicum virgatum* - *Schizachyrium scoparium* Woodland (CEGL001454, G2)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Hesperostipa spartea* Woodland (CEGL002053, G2G3)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Panicum virgatum* Woodland (CEGL002052, G1G2)
- *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203, G5)

Alliances:

- *Betula papyrifera* Forest Alliance (A.267)
- *Carex pellita* - (*Carex nebrascensis*) - *Schoenoplectus* spp. Saturated Herbaceous Alliance (A.1466)
- *Cercocarpus montanus* Shrubland Alliance (A.896)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Populus deltoides* Temporarily Flooded Woodland Alliance (A.636)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Salix (exigua, interior)* Temporarily Flooded Shrubland Alliance (A.947)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northwestern Great Plains Shrubland (CES303.662)

- Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822)
- Western Great Plains Cliff and Outcrop (CES303.665)
- Western Great Plains Riparian (CES303.956)

Adjacent Ecological System Comments: Other system elements contained in this system include Western Great Plains Cliff and Outcrop (CES303.665) on south aspects and rims; Western Great Plains Riparian (CES303.956) in drainages, and Rocky Mountain Lower Montane-Foothill Shrubland (CES306.822) and Northwestern Great Plains Shrubland (CES303.662), but unique geology and dynamics bring these together to form this canyon system.

DISTRIBUTION

Range: This system occurs along springbranch and dry canyons along the Niobrara and North Platte rivers in Nebraska and likely ranges north along the tributaries of the White River and areas within the Black Hills region of South Dakota.

Divisions: 303:C

Nations: US

Subnations: NE, SD?, WY?

Map Zones: 22:?, 29:C, 30:?, 31:C, 33:?, 38:C, 39:?, 40:?

USFS Ecomap Regions: 331K:PP, 331L:PP, 331M:P?, M331I:PP

TNC Ecoregions: 26:C, 33:C, 35:P

SOURCES

References: Midwestern Ecology Working Group n.d., Steinauer and Rolfsmeier 2000

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.735388#references

Description Author: S. Menard

Version: 27 May 2004

Concept Author: S. Menard and K. Kindscher

Stakeholders: Midwest, West

ClassifResp: Midwest

WESTERN GREAT PLAINS BADLANDS (CES303.663)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Western Great Plains (303)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Badland; Badlands

Non-Diagnostic Classifiers: Temperate [Temperate Continental]; Ustic; Flood Scouring; W-Patch/High Intensity

National Mapping Codes: ESLF 3114

CONCEPT

Summary: This ecological system is found within the northern Great Plains region of the United States and Canada with some of the better known and extensive examples in North and South Dakota. In contrast to Western Great Plains Cliff and Outcrop (CES303.665), this system is typified by extremely dry and easily eroded, consolidated clay soils with bands of sandstone or isolated consolidates and little to no cover of vegetation (usually less than 10% but can be as high as 20%). Vegetated patches within the badlands system may have cover higher than 20%. In north-central Montana, badlands often are a mosaic of bare substrate with small patches of grasses and/or shrubs that may exceed 10% cover. In those areas with vegetation, species can include scattered individuals of many dryland shrubs or herbaceous taxa, including *Grindelia squarrosa*, *Gutierrezia sarothrae* (especially with overuse and grazing), *Sarcobatus vermiculatus*, *Atriplex gardneri*, *Artemisia pedatifida*, *Eriogonum* spp., *Muhlenbergia cuspidata*, *Pseudoroegneria spicata*, and *Arenaria hookeri*. Patches of *Artemisia* spp. can also occur. This system can occur where the land lies well above its local base level or below and is created by several factors, including elevation, rainfall, carving action of streams, and parent material.

Classification Comments: It has been proposed to change the name of this system to include "shale barrens." As with all predominantly "barren" systems, there will be patches of vegetated areas within the overall system. Small areas of "badlands" or "shale barrens" can also occur without major erosional processes actively taking place. An example location is Bitter Creek Area of Environmental Concern (BLM designation), which is much like a badland but not so eroded. The vegetation is sparse with *Juniperus horizontalis* and much bare ground; there is some grass cover as well. The driving process is erosion. Exactly where this transitions to Inter-Mountain Basins Shale Badland (CES304.789) in central Wyoming needs to be clarified.

Similar Ecological Systems:

- Western Great Plains Cliff and Outcrop (CES303.665)

DESCRIPTION

Environment: A combination of factors such as elevation, rainfall, carving action of streams and parent material can contribute to the development of this system. This system is primarily a type of mature dissection with finely textured drainage pattern and steep slopes. This system contains extremely dry and easily erodible, consolidated clayey soils with bands of sandstone or isolated consolidates. This system is found within an arid to semi-arid climate with infrequent, but torrential, rains that cause erosion.

Vegetation: Vegetation in this system is limited by climate and soils and often is less than 10% cover. Scattered individuals of *Grindelia squarrosa*, *Gutierrezia sarothrae*, or *Eriogonum* spp. and/or patches of *Artemisia* spp. may occur.

Dynamics: This system contains highly erodible soils that can be strongly influenced by infrequent, but often torrential, rains.

MEMBERSHIP

Associations:

- *Arenaria hookeri* Barrens Herbaceous Vegetation (CEGL001951, GU)
- *Artemisia longifolia* Badlands Sparse Vegetation (CEGL002195, GNR)
- *Artemisia pedatifida* - *Atriplex gardneri* Shrubland (CEGL001525, G3?)
- *Atriplex gardneri* - *Picrothamnus desertorum* Dwarf-shrubland (CEGL001439, G2G3)
- *Atriplex gardneri* / *Artemisia tridentata* Dwarf-shrubland (CEGL001440, G3)
- *Atriplex gardneri* / *Monolepis nuttalliana* Dwarf-shrubland (CEGL001443, G3?)
- *Atriplex gardneri* / *Pascopyrum smithii* Dwarf-shrubland (CEGL001445, G3)
- *Eriogonum pauciflorum* - *Gutierrezia sarothrae* Badlands Sparse Vegetation (CEGL005270, G4G5)
- Eroding Great Plains Badlands Sparse Vegetation (CEGL002050, G4G5)
- *Panicum virgatum* - (*Pascopyrum smithii*) Herbaceous Vegetation (CEGL001484, G2Q)
- *Sarcobatus vermiculatus* / *Atriplex gardneri* Shrubland (CEGL001360, G4?)
- *Sarcobatus vermiculatus* / *Pseudoroegneria spicata* Shrubland (CEGL001367, G3)
- *Shepherdia argentea* Shrubland (CEGL001128, G3G4)

Alliances:

- *Arenaria hookeri* Barrens Herbaceous Alliance (A.1642)
- *Artemisia longifolia* Sparsely Vegetated Alliance (A.1874)
- *Artemisia pedatifida* Shrubland Alliance (A.1127)
- *Atriplex gardneri* Dwarf-shrubland Alliance (A.1110)

- *Eriogonum pauciflorum* Sparsely Vegetated Alliance (A.3565)
- Large Eroding Bluffs Sparsely Vegetated Alliance (A.1875)
- *Pascopyrum smithii* Temporarily Flooded Herbaceous Alliance (A.1354)
- *Sarcobatus vermiculatus* Intermittently Flooded Shrubland Alliance (A.1046)
- *Sarcobatus vermiculatus* Shrubland Alliance (A.1041)
- *Shepherdia argentea* Temporarily Flooded Shrubland Alliance (A.960)

DISTRIBUTION

Range: This system ranges throughout the northern Great Plains region of the United States and Canada. Some of the best and well-known examples occur in North and South Dakota. Its western-most occurrence in Wyoming needs to be clarified, but it does occur in the eastern portion of that state.

Divisions: 303:C

Nations: CA?, US

Subnations: MB?, MT, ND, NE, SD, WY

Map Zones: 20:C, 21:?, 22:?, 29:C, 30:C, 31:C, 33:?, 40:P

USFS Ecomap Regions: 331E:C?, 331F:CC, 331G:CC, 331H:C?, 331K:CP, 331L:CP, 331M:CC, 342A:CC, 342F:C?, 342G:C?, M331B:CC, M331I:CP, M334A:CC

TNC Ecoregions: 26:C, 34:P, 66:?, 67:P

SOURCES

References: Comer et al. 2003, Knight et al. 1987, Von Loh et al. 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722995#references

Description Author: S. Menard and K. Kindscher, mod. G. Kittel and M.S. Reid

Version: 29 Jan 2007

Concept Author: S. Menard and K. Kindscher

Stakeholders: Canada, Midwest, West
ClassifResp: Midwest