14950

Western Great Plains Depressional Wetland Systems

BpS Model/Description Version: Aug. 2020

Vegetation Type

Herbaceous Wetland

Map Zones

38

Geographic Range

This systems group occurs across the western Great Plains from ND and KS west to MT and south to TX.

This system occurs in ECOMAP sections 331F, 331C, 332C, 332E, 332F and subsection 332Bd. It occurs in northern part of MZ31 and west of the sandhills, subsections 331Fs and 331Fh. There might be some of this system in subsection 332Bd and other areas of MZs 39 and 40. In MZ38, this BpS ranges from northern NE (in Section 332C) south to north-central OK (in Section 332F).

Biophysical Site Description

These are semi-arid unglaciated depressional wetlands. This system includes wetlands that form in upland and lowland depressions across the western Great Plains. Isolated depression wetlands (including playa lakes) form in small basins within upland landscapes that are rarely linked to outside groundwater sources and do not have an extensive watershed. Open depression wetlands form in lowlands, including lake borders and stream margins, that have more open basins, usually have a larger watershed, and a permanent water source throughout most of the year (except during exceptional drought years). The isolated depressions are typified by the presence of an impermeable layer such as a dense clay, hydric soil and are usually recharged by rainwater and nearby runoff. (Nature Serve 2007).

Isolated ponds and lakes can experience periodic drawdowns during drier seasons and years and are often replenished by spring rains. In areas of saline soils, both isolated and open depressions will be more brackish, with associated vegetation differences. Salt encrustations can occur on the surface in some of these depressions. Soils are severely affected by the saline conditions and have poor structure.

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 basin via groundwater flow from/into the pond or lake. Isolated ponds and lakes can experience periodic drawdowns during drier seasons and years and are often replenished by spring rains.

Vegetation Description

In MZ38, *Eleocharis* spp., *Hordeum jubatum*, and common forbs such as *Coreopsis tinctoria*, *Symphyotrichum subulatum* (=*Aster subulatus*), and *Polygonum pensylvanicum* (=*Polygonum bicorne*) are common vegetation in the wetter and deeper depressions, while *Pascopyrum smithii* and *Buchloe dactyloides* are more common in shallow depressions in rangeland. Open depression wetlands include submergent and emergent marshes with *Typha* spp. and *Schoenoplectus* spp., and associated wet meadows and wet prairies. In areas of saline soils, both isolated and open depressions will be more brackish, with associated vegetation differences. Salt encrustations can occur on the surface in some depressions, and the soils are severely affected and have poor structure. Species that typify these systems are salt-tolerant and halophytic species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum*. Other commonly occurring taxa include *Puccinellia nuttalliana*, *Salicornia rubra*, *Suaeda calceoliformis*, *Spartina* spp., and shrubs such as *Sarcobatus vermiculatus* and *Krascheninnikovia lanata* (NatureServe 2007).

The PASM/ELXE (ELXE is a component of the ELPA3 complex) complex dominate diagnostically. That is the complex that is only in this BpS and not generally in prairie potholes. *Hordeum jubatum* and *Polygonum coccineum* is also diagnostic, although those might occur in prairie potholes too.

BpS Dominant and Indicator Species

Species names are from the NRCS PLANTS database. Check species codes at http://plants.usda.gov.

Disturbance Description

Flooding, grazing, drought and fire represent significant disturbances to this group of ecosystems.

Fire: Plant communities providing saltgrass habitat are diverse and exhibit a wide range of fire frequencies. Saltgrass is found in desert shrub communities that have fire return intervals of less than 35 to over 100yrs (Hauser 2006). Some saltgrass communities occur rarely in western and central southern NE (i.e. Salt Creek in the vicinity of Lincoln, NE).

Depending on alkalinity, fire frequency would vary – high alkalinity would prevent sufficient accumulation of fuel much of the time, especially where the graminoid community is sparse or absent.

At least in NE, fire frequency might have been similar to the surrounding prairie which is more likely to have been everythree to four years (Bragg 1995).

Historical fire size is dependent on the surrounding vegetation and the size of the depressional wetland. Fire could burn an entire small area if fuel occurred across it. Generally, however, fires would burn less than the entire depression if water or bare soil prevented a fire from sweeping across the center. Fire size would vary from less than a hectare to severalha. The frequency of burning would largely mimic the MFRI of the surrounding prairie unless the vegetation of the depressional wetland does not support graminoids that approximate the fuels of the surrounding vegetation. In this case the MFRI would be longer (Collins and Uno 1983).

Hydrology: Hydrology affects this system. However, it is dry for more years than wet. The flooding frequency would put this into a different system than the surrounding grassland. It floods often enough with predictable regularity. It usually behaves like the surrounding grassland in terms of fire. It would experience more fire than other wet communities, such as prairie potholes, because it is drier. The small wetlands would burn more frequently than the large ones, since the large ones might have more bare ground or be deeper.

Drought occurs in this system, and there are regular wet/dry cycles. This system is either all wet or all dry, which is simpler than how the prairie pothole system functions.

Grazing: Grazing might have had an effect on this system. There would be trampling disturbance due to the softness of the soil. Trampling would be more severe than the surrounding grassland because of the wetness. Grazing by native ungulates such as buffalo and antelope can affect non-saline ecosystems where the grazers may be particularly likely to congregate at any time of the year but particularly during droughts. Non-alkaline sites may be more affected by grazing that alkaline sites.

Return interval for fire could be extended by ungulate grazing if ungulates graze the depressions.

Other: Episodic disturbance is caused by insect infestation (grasshoppers, range caterpillars, Mormon crickets). This was not modeled.

Fire Frequency

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

In SD, historically, this system is mostly 20-100ac, and maybe as small as ten acres. Where these systems occur currently they may be even smaller due to land management.

Historical fire size is very dependent upon the surrounding vegetation.

Adjacency or Identification Concerns

This system is typically embedded within a matrix of mixed-grass prairie (Central Mixed-grass Prairie). It can be surrounded by tallgrass prairies but generally occurs west of the range of tallgrass communities. Some occurrences will be adjacent to either Central Tallgrass Prairie or Western Great Plains Tallgrass Prairie.

This System can be confused with Eastern Great Plains Wet Meadow, Prairie, and Marsh where the transition between these two occurs. The transition line between these two Systems is along the line between ECOMAP Provinces 332 and 251.

The Nebraska Sandhill wetlands or lakes differ from other depressional wetlands; however, this 1495 description focuses on combining several small ecosystems (i.e. the various types of depressional wetlands) which (1) individually are very small in extent and (2) typically are embedded within a larger surrounding plant community that would dictate the general fire regime for the region. Sandhills wetlands are very small; some should be included within this BpS 1495 Western Great Plains Depressional Wetland Systems, but some should just be lumped with an adjacent system such as tallgrass prairie.

The rainwater basins of Nebraska are mostly lowland prairie. They are connected to groundwater or associated with Platte River water. However, these are relatively small ecosystems and are not modeled separately but should rather just be a part of their adjacent system. They are generally embedded in the larger landscape.

These wetlands are affected by hydrological changes, grazing, and conversion to agricultural use. Species richness can vary considerably among individual examples and is especially influenced by adjacent land use. Agriculture is often adjacent and may provide nutrient and herbicide runoff (NatureServe 2007).

This system might not be that departed from how it appeared historically. There are not many exotics. It has been plowed and drained some. And it probably burns less frequently than its historical occurrence.

For saline wetlands, other than losses to human activity, the systems may be somewhat similar to historic conditions since they were probably not substantively affected by biotic factors. For non-saline ecosystems, differences could be substantial with greater woody plant cover, greater disturbance by cattle, and concomitant changes in composition and erosion.

There is a current problem with reed canary grass (PHAR).

Since the early 1900s, fire has been excluded and nonnative species such as Japanese brome (*Bromus japonicus*), smooth brome, Kentucky bluegrass, crested wheatgrass (*Agropyron cristatum*), and Canada thistle (*Cirsium arvense*) have taken a strong hold in the Great Plains mixed-grass prairies where saltgrass occurs (Hauser 2006).

Non-native invasive species (e.g. *Bromus inermis* and *B. japonicus*) may be confused with native successional species although, more likely, these species will have changed the successional dynamics both with respect to the dominant vegetation and to the likelihood of fire (e.g. if there is a greater cover of grasses).

*Bromus japonicus* is the most likely exotic to become common in this type.

Issues or Problems

There is very little research on this system and its dynamics especially in the Great Plains area.

Native Uncharacteristic Conditions

Comments

For MZs 38 and 43 this model was adopted from the same BpS in MZ40 by Randy Swaty (rswaty@tnc.org).

Succession Classes

**Mapping Rules**

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

**Description**

Class A 47 Early Development 1 - All Structures

Indicator Species

Description

This class is dominated by resprouts and seedlings of grasses and post-fire associated forbs of low to medium height with variable canopy cover. This class revegetates quickly and fills up, and annuals come in quickly after disturbance (thus the 0-50% cover, unlike the models from previous mapzones).

Rhizomatous perennials are in this class. The system can be flooded out, and when the water goes down, there is bare soil. But then it is rapidly colonized by HOJU or other annuals. Then in a few years (*Eleocharis* persists in the seed bank and sprouts up), western wheatgrass comes in over time, and this becomes more like a grassland, until it gets flooded again. This class would persist for probably only about five years, as vegetation establishes quickly in the Dakotas and Nebraska. It might stay as open water for a short while, but once it gets out of the open water stage, it would go to a developed grassy stage quickly.

The only way this class would persist in this class longer would be if there was some fairly heavy livestock grazing.

Fire would cause little change in species composition except possible a temporary decline in *Puccinellia* and *Hordeum* (bunch grasses).

Native grazing and herbivory could be heavy.

Replacement fire occurs with a frequency similar to that in the adjacent grassland communities and more frequent than that for prairie potholes, because this system is drier more often than prairie potholes. It is thought that it would take longer for fire to rotate among all of the wetlands than the grassland, however, which is why a less frequent interval than grassland was chosen. (Previous mapzones modeled a less frequent return interval; however, that thinking was rejected for MZs 31, 39, 40).

Class B 53 Mid Development 1 - Closed

Indicator Species

Description

This class establishes quickly after disturbance. Scattered shrubs may be present. Other species could include *Schoenoplectus* (bulrush) or *Typha*.

Drought also occurs.

Native grazing and herbivory could be heavy.

Replacement fire occurs with a frequency similar to that in the adjacent grassland communities and more frequent than that for prairie potholes, because this system is drier more often than prairie potholes. It is thought that it would take longer for fire to rotate among all of the wetlands than the grassland, however, which is why a less frequent interval than grassland was chosen.

Model Parameters

Deterministic Transitions

Probabilistic Transitions

Optional Disturbances

Optional 1: drought

References

Bragg, T.B. 1995. Climate, soils and fire: The physical environment of North American grasslands. 49-81. In: The Changing Prairie. Keeler, K. and A. Joern, eds. Oxford University Press, New York.

Brown, J.K. and J. Kapler Smith, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42. vol 2. Ogden, UT: USDA Forest Service, Rocky Mountain Research Station. 257 pp.

Collins, S.L. and G.E. Uno. 1983. The Effect of Early Spring Burning on Vegetation in Buffalo Wallows Bulletin of the Torrey Botanical Club 110(4). 474-481.

Covich, A.P., S.C. Fritz, P.J. Lamb, R.D. Marzolf, W.J. Matthews, K.A. Poiani, E.E. Prepas, M.B. Richman and T.C. Winter. 1997. Potential Effects of Climate Change on Aquatic Ecosystems of The Great Plains of North America. Hydrological Processes 11:993-1021.

Dick-Peddie, W.A. 1993. New Mexico vegetation, past, present and future. University of New Mexico Press. Albuquerque, NM. Xxxii. 244 pp.

Ford, P. L. 1999. Response of buffalograss (Buchloe dactyloides) and blue grama (Bouteloua gracilis) to fire. Great Plains Research 9:261-276.

Haukos, D.A. and L.M. Smith. 2003. Past And Future Impacts Of Wetland Regulations On Playa Ecology In The Southern Great Plains. Wetlands 23(3):577–589.

Hauser, A. Scott. 2006. Distichlis spicata. In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ (2006, March 09).

Hoaglund, B.W. and S.L. Collins. 1997. Heterogeneity in shortgrass prairie vegetation: the role of playa lakes. Journal of Vegetation Science 8(2):277-286

Howard, Janet L. 1995. Buchloe dactyloides. In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2005, May 4].

Knight, D.H. 1994. Mountains and Plains, The Ecology of Wyoming Landscapes. Yale University Press, New Haven, CT.

Lesica 1993. Using plant community…..Biological Conservation

Miller, Greg et al. (1993) Terrestrial Ecosystem Survey of the Santa Fe National Forest USDA Forest Service Southwestern Region.

Munn, L.C. and C.S. Arneson. 1998. Soils of Albany County: A Digital County Map at 1:100,000-Scale. Agricultural Experiment Station Report B-1071AL. University of Wyoming, College of Agriculture, Laramie, Wyoming. From: http://www.uwyo.edu/ces/PUBS/b-1071AL.pdf

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 10 February 2007.

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.4. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: May 4, 2005).

Polley, H.W. and S.L. Collins. 1984. Relationships of Vegetation and Environment in Buffalo Wallows. American Midland Naturalist 112(1):178-186.

Smith. L.M. 2003. Playas of the Great Plains. University of Texas Press.

Austin, TX.

Trager, M.D., G.W.T. Wilson and D.C. Hartnett. 2004. Concurrent Effects of Fire Regime, Grazing and Bison Wallowing on Tallgrass Prairie Vegetation. Am. Midl. Naturalist 152:237–247.