USDA United States Department of Agriculture

Natural Resources Conservation Service

Ecological Site Description (Provisional)

Major Land Resource Area 107B

Iowa and Missouri Deep Loess Hills

Natric Floodplain Prairie

Distichlis spicata – Hordeum jubatum

A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise groups during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

The PROVISIONAL ECOLOGICAL SITE has been developed to meet the standards established in the National Ecological Site Handbook. The information associated with this ecological site does not meet the Approved Ecological Site Description Standard, but it has been through a Quality Control and Quality Assurance process to assure consistency and completeness. Further investigations, reviews and correlations are necessary before it becomes an Approved Ecological Site Description.

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Front cover: Left photo is of saltgrass (*Distichlis spicata*) (© N.L. Britton and A. Brown, 1913, *An illustrated flora of the northern United States, Canada and the British Possessions*, USDA-NRCS PLANTS Database); right photo is of foxtail barley (*Hordeum jubatum*) (© Jennifer Anderson, USDA-NRCS PLANTS Database).

Table of Contents

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General Information

Ecological Site Name

Abiotic: Natric Floodplain Prairie

Biotic: *Distichlis spicata – Hordeum jubatum*
Saltgrass – Foxtail Barley

Ecological Site ID: R107BY023IA

Hierarchical Framework Relationships

Major Land Resource Area (MLRA): Iowa and Missouri Deep Loess Hills (107B) (USDA-NRCS 2006)

USFS Subregions: Central Dissected Till Plains Section (251C); Missouri River Alluvial Plain (251Cg) (Cleland et al. 2007)

U.S. EPA Level IV Ecoregion: Missouri Alluvial Plain (47d) (USEPA 2013)

MLRA Notes

The Iowa and Missouri Deep Loess Hills (MLRA 107B) includes the Missouri Alluvial Plain, Loess Hills, Southern Iowa Drift Plain, and Central Dissected Till Plains landform regions (Prior 1991; Nigh and Schroeder 2002). It spans four states (Iowa, 53 percent; Missouri, 32 percent; Nebraska, 12 percent; and Kansas 3 percent), encompassing over 14,000 square miles (Figure 1). The elevation ranges from approximately 1,565 feet above sea level (ASL) on the highest ridges to about 600 feet ASL along the Missouri River near Glasgow in central Missouri. Local relief varies from 10 to 20 feet in the major river floodplains, to 50 to 100 feet in the dissected uplands, and loess bluffs of 200 to 300 feet along the Missouri River. Loess deposits cover most of the area, with deposits reaching a thickness of 65 to 200 feet in the Loess Hills and grading to about 20 feet in the

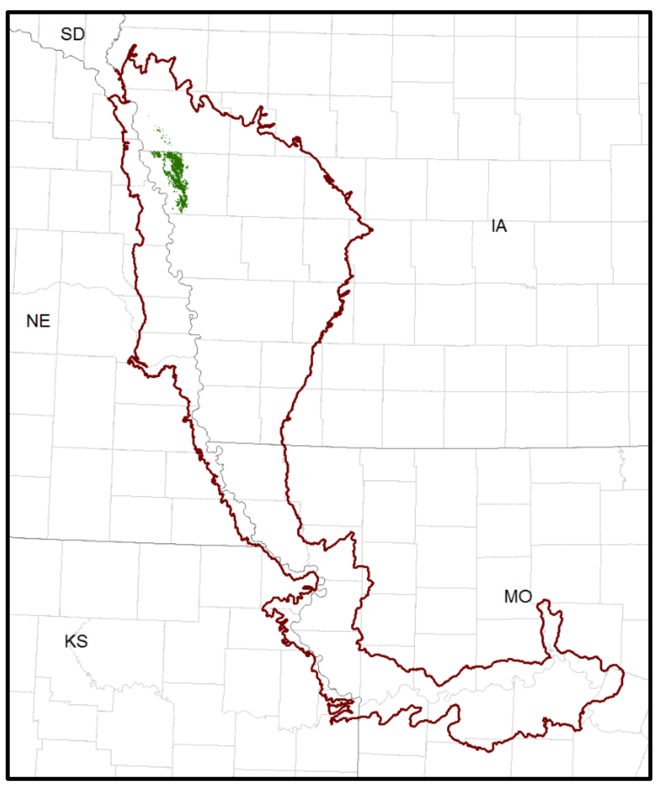


Figure 1. *Location of Natric Floodplain Prairie ecological site within MLRA 107B.*

eastern extent of the region. Pre-Illinoian till, deposited more than 500,000 years ago, lies beneath the loess and has experienced extensive erosion and dissection. Pennsylvanian and Cretaceous bedrock, comprised of shale, mudstones, and sandstones, lie beneath the glacial material (USDA-NRCS 2006).

The vegetation in the MLRA has undergone drastic changes over time. Spruce forests dominated the landscape 30,000 to 21,500 years ago. As the last glacial maximum peaked 21,500 to 16,000 years ago, they were replaced with open tundras and parklands. The end of the Pleistocene Epoch saw a warming climate that initially prompted the return of spruce forests, but as the warming continued, spruce trees were replaced by deciduous trees (Baker et al. 1990). Not until approximately 9,000 years ago did the vegetation transition to prairies as climatic conditions continued to warm and subsequently dry. Between 4,000 and 3,000 years ago, oak savannas began intermingling within the prairie landscape, while the more wooded and forested areas maintained a foothold in sheltered areas. This prairie-forest transition ecosystem formed the dominant landscapes until the arrival of European settlers (Baker et al. 1992).

Ecological Site Concept

Natric Floodplain Prairies are located within the green areas on the map (Figure 1). They occur on floodplains in shallow depressions. Soils are Mollisols and Vertisols that are poorly-drained and very deep. These soils formed from clayey alluvium that are slightly to moderately affected by soluble salts, which accumulated from seeps associated with the underlying Dakota Sandstone bedrock (Steinauer and Rolfsmeier 2010). As a result, the associated vegetation is typically dominated by salt-tolerant species.

The historic pre-European settlement vegetation on this site was dominated by graminoids and annual herbs adapted to conditions of varying salinity. Species diversity occurs on a gradient with diversity increasing as salinity decreases. Saltgrass (*Distichlis spicata* (L.) Greene) and foxtail barley (*Hordeum jubatum* L.) are the dominant and diagnostic species for the site. Prairie junegrass (*Koeleria macrantha* (Ledeb.) Schult.), blue grama (*Bouteloua gracilis* (Willd. ex Kunth) Lag. ex Griffiths), western wheatgrass (*Pascopyrum smithii* (Rydb.) Á. Löve), and prairie cordgrass (*Spartina pectinata* Bosc ex Link) are other common grass associates. Few herbaceous species can be found within this site. Those present include Pursh seepweed (*Suaeda calceoliformis* (Hook.) Moq.), annual marsh elder (*Iva annua* L.), and red swampfire (*Salicornia rubra* A. Nelson) (Steinauer and Rolfsmeier 2010; NatureServe 2015). Historically, fluctuating high water tables and seasonal flooding were the primary disturbance factors of this ecological site (LANDFIRE 2009; Steinauer and Rolfsmeier 2010; NatureServe 2015).

Physiographic Features

Natric Floodplain Prairies occur on shallow depressions in floodplains associated with large riverine systems (Figure 2). They are situated on elevations ranging from approximately 700 to 1,200 feet ASL on slopes that are generally less than two percent. These sites are subject to rare, brief flooding.

Figure 2. *Representative block diagram of Natric Floodplain Prairie and associated ecological sites.*

Table 1. *Physiographic features of Natric Floodplain Prairie.*
(Data and information presented here are based on NRCS integrated plot data and the National Soil Information System.)

	Minimum	Maximum
Elevation (feet)	698	1200
Slope (percent)	0	2
Water Table Depth (inches)	0	14
Flooding		
Frequency	None	Rare
Duration	Brief	Brief
Ponding		
Depth (inches)	N/A	N/A
Frequency	None	None
Duration	None	None

Landforms: floodplains
Slope Shape: linear (across slope); linear (down slope)
Hillslope (profile position): toeslope
Aspect: does not affect site

Climatic Features

The Iowa and Missouri Deep Loess Hills falls into two Köppen-Geiger climate classifications (Peel et al. 2007): hot humid continental climate (Dfa) dominates the majority of the MLRA with small portions in the south falling into the humid subtropical climate (Cfa). In winter, dry, cold air masses periodically shift south from Canada. As these air masses collide with humid air, snowfall and rainfall result. In summer, moist, warm air masses from the Gulf of Mexico migrate north, producing significant frontal or convective rains (Decker 2017). Occasionally, high pressure will stagnate over the region, creating extended droughty periods. These periods of drought have historically occurred on 22-year cycles (Stockton and Meko 1983).

The soil temperature regime of MLRA 107B is classified as mesic, where the mean annual soil temperature is between 46 and 59°F (USDA-NRCS 2006). Temperature and precipitation occur along a north-south gradient, where temperature and precipitation increase the further south one travels. The average freeze-free period of this ecological site is about 165 days, while the frost-free period is about 150 days (Table 2). The majority of the precipitation occurs as rainfall in the form of convective thunderstorms during the growing season. Average annual precipitation is 31 inches, which includes rainfall plus the water equivalent from snowfall (Table 3). The average annual low and high temperatures are 36 and 61°F, respectively.

Climate data and analyses are derived from 30-year average gathered from one National Oceanic and Atmospheric Administration (NOAA) weather station contained within the range of this ecological site (Table 4).

Table 2. *Frost-free and freeze-free days.*
(Data were obtained from NOAA weather stations within the range of this ecological site, using 30-year averages.)

	Average days
Frost-free period (32.5°F or greater, 90% probability)	150
Freeze-free period (Less than 28.5°F, 90% probability)	165

Table 3. *Monthly and annual precipitation and temperature in the range of Natric Floodplain Prairie.*
(Data were obtained from NOAA weather stations within the range of this ecological site, using 30-year averages.)

	Monthly Moisture (Inches) and Temperature (°F) Distribution				
	----------Precipitation----------			----------Temperature----------	
	Low	**Med**	**High**	**Average Low**	**Average High**
January	0.15	0.59	0.96	8.6	31.6
February	0.37	0.57	1.00	13.0	36.5
March	0.64	1.56	3.05	23.4	49.5
April	1.85	2.90	4.19	35.1	63.5
May	2.56	4.03	6.11	48.1	73.9
June	2.74	4.22	6.47	58.2	83.0
July	2.02	3.15	5.62	62.6	86.5
August	2.06	2.99	3.62	59.7	84.2
September	1.22	3.38	4.36	49.7	77.6
October	1.10	1.83	3.39	37.0	65.1
November	0.67	1.16	2.07	23.8	47.7
December	0.41	0.63	1.10	11.9	11.9
Annual	-	30.53	-	35.9	61.0

Table 4. *NOAA climate stations used for data analysis, located within the range of this ecological site.*

Climate Station ID	Location (County)	From	To
ONAWA [USC00136243]	Monona, IA 51040	1981	2010

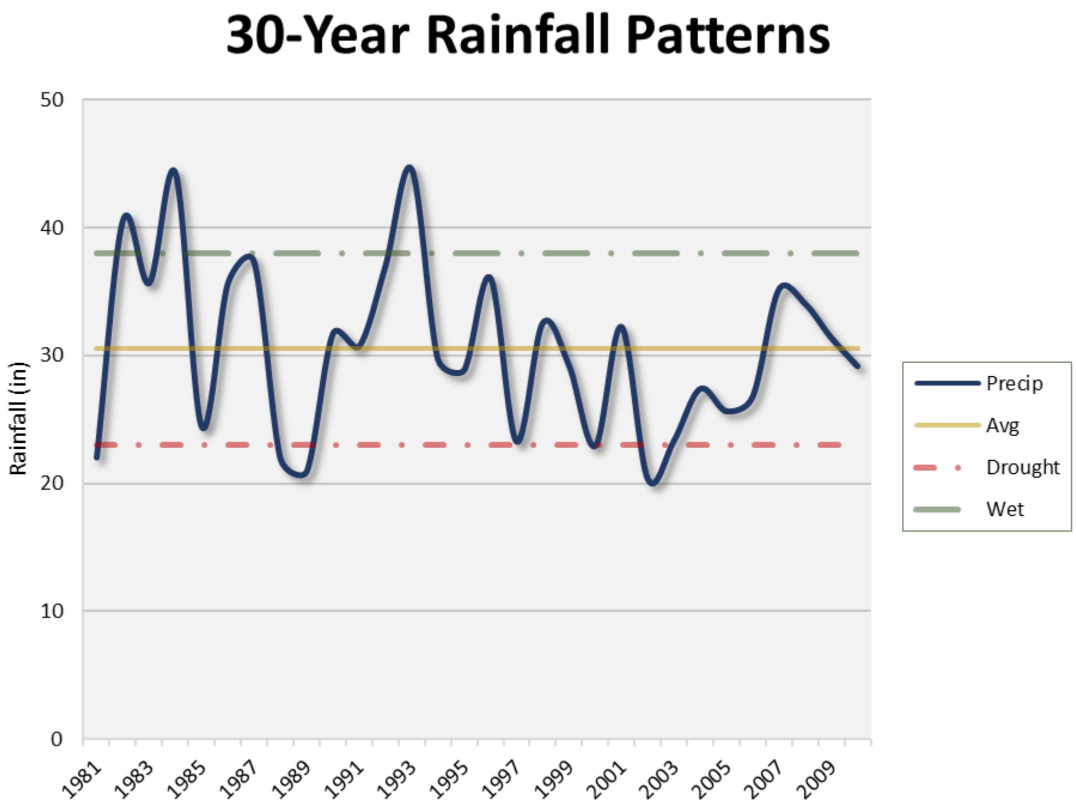


Figure 3. *Natric Floodplain Prairie 30-year rainfall amounts, 1981-2010.*

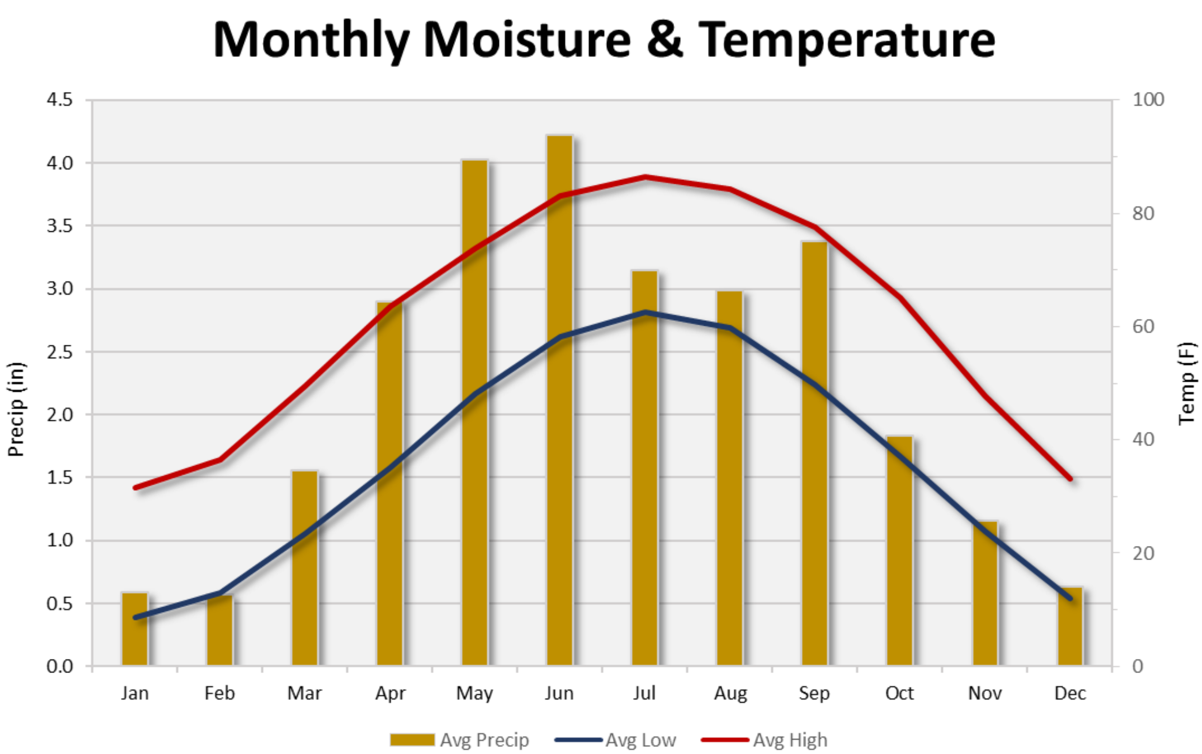


Figure 4. *Natric Floodplain Prairie average monthly precipitation and temperature, 1981-2010.*

Influencing Water Features

Natric Floodplain Prairies are classified as a DEPRESSIONAL wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008) and as an Emergent Palustrine, Temporarily Flooded wetland under the National Wetlands Inventory (FGDC 2013). Seasonal fluctuations in the water table are the main source of water for this ecological site but can also receive water from precipitation, upland surface runoff, and flood waters from the nearby stream (Smith et al. 1995). Infiltration is very slow (Hydrologic Group D) for undrained soils, and surface runoff is very high.

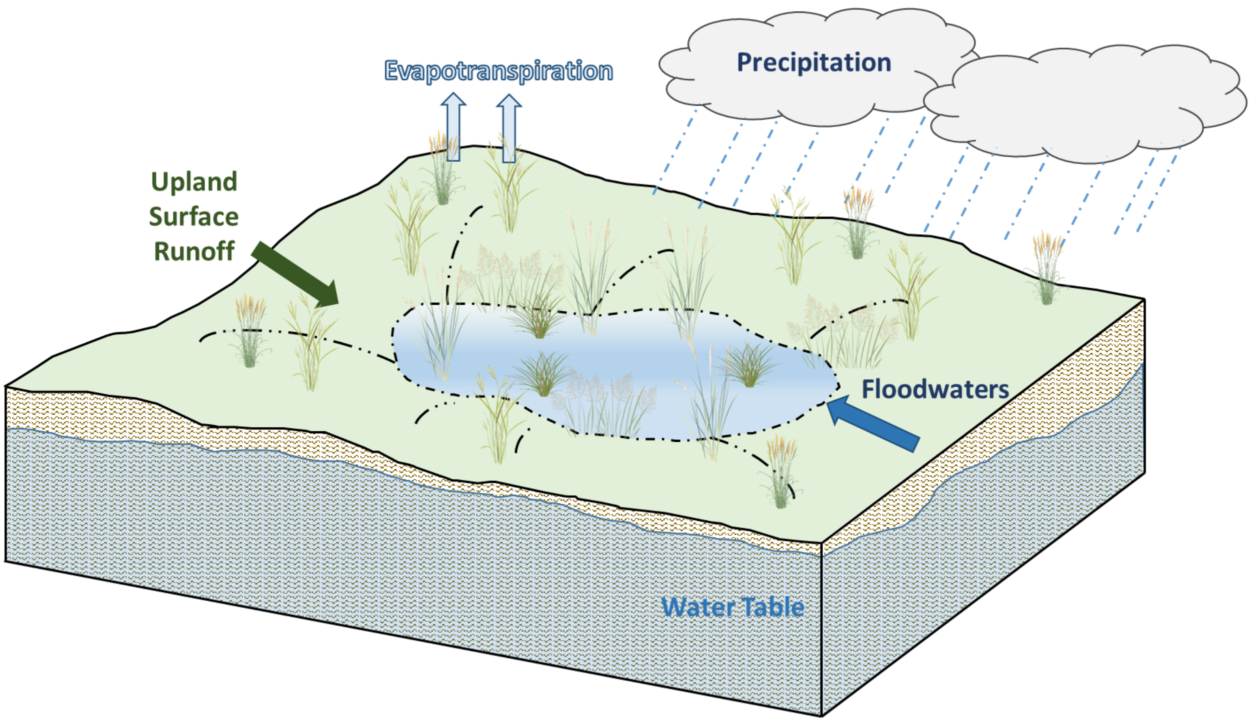


Figure 5. *Hydrologic cycling in Natric Floodplain Prairie ecological site.*

Representative Soil Features

Soils of Natric Floodplain Prairies are in the Mollisol and Vertisol orders, further classified as Typic Natraquerts and Vertic Endoaquolls, with impermeable infiltration and very high runoff potential. The soil series associated with this site includes Napa. The soils were formed under herbaceous vegetation and have an eluviated surface horizon. The parent material is alluvium that is slightly to moderately affected by soluble salts, and the soils are poorly-drained and very deep with seasonal high water tables. Soil pH classes are neutral to strongly alkaline. No rooting restrictions are noted for the soils of this ecological site.

Table 5. *Representative soil features of Natric Floodplain Prairie.*
(Data and information presented here are based on NRCS integrated plot data and the National Soil Information System.)

	Minimum	**Maximum**
Surface Fragments less than 3” (percent cover)	None	None
Surface Fragments greater than 3” (percent cover)	None	None
Subsurface Fragments less than 3” (percent volume)	None	None
Subsurface Fragments greater than 3” (percent volume)	None	None
Soil Depth (inches)	80	80
Electrical Conductivity (mmhos/cm)	0	16
Gypsum (percent)	1	10
Sodium Absorption Ratio	0	18
Soil Reaction/pH (1:1 water)	6.6	9.0
Available Water Capacity (inches)	6	6
Calcium Carbonate Equivalent (percent)	0	30

Drainage Class: poorly
Permeability Class: impermeable
Parent Material – Kind: clayey alluvium
Parent Material – Origin: alluvial
Surface Texture: N/A
Surface Texture Modifier: N/A
Subsurface Texture Group: N/A
Soil Series: Napa
Taxonomic Class: Typic Natraquerts, Vertic Endoaquolls

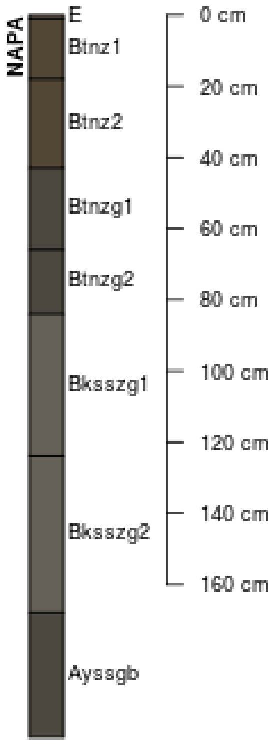


Figure 6. *Profile sketch of soil series associated with Natric Floodplain Prairies.*

State and Community Phases

The information in this Ecological Site Description, including the state-and-transition model (STM), was developed based on historical data, current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

Ecological Dynamics

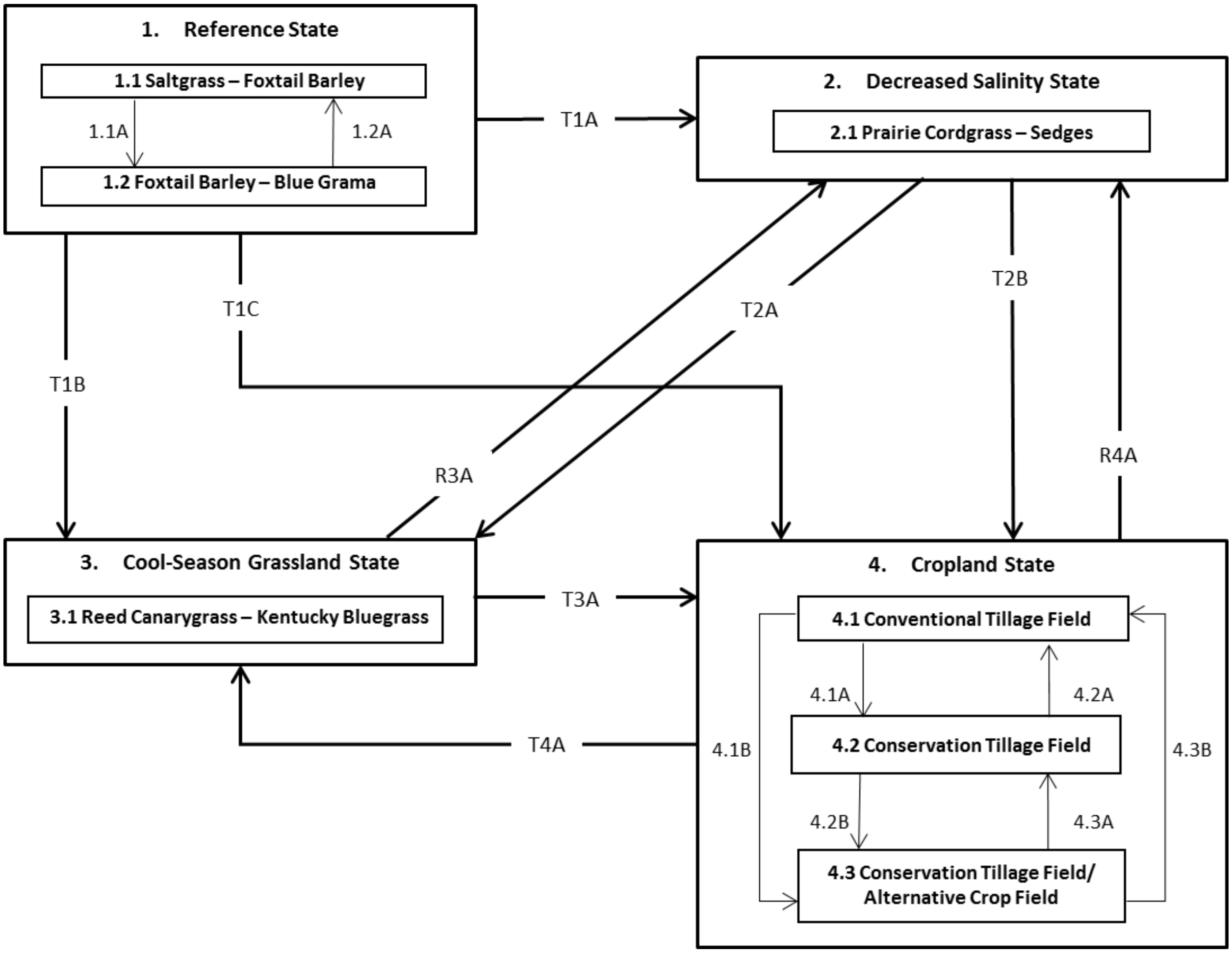
The Loess Hills region lies within the transition zone between the eastern deciduous forests and the Great Plains, with the Missouri River flowing through the middle. The heterogeneous topography of the area results in variable microclimates and fuel matrices that in turn are able to support prairies, savannas, woodlands, and forests. Natric Floodplain Prairies form an aspect of this vegetative continuum. This ecological site occurs on floodplains and stream terraces on poorly drained soils affected by soluble salts. Species characteristic of this ecological site consist of halophytic herbaceous vegetation.

Fluctuating high water tables and periodic flooding are the dominant disturbance factors in Natric Floodplain Prairies. The Dakota Sandstone (with origins in underlying formations of Pennsylvanian and Permian age) forms the bedrock beneath this ecological site, and salts naturally occur within the bedrock. As groundwater flows through the aquifer, the bedrock is dissolved and salts accumulate in the water. This saline groundwater is carried to the soil surface via increases in water tables from hydrologic cycling. As the water table recedes, the water drops but the salts remain (Harvey et al. 2007). These salt-affected sites can impact plant community composition and production by limiting growth and productivity (Gupta and Huang 2014). Higher salt concentrations are typically inhabited by virtually only halophytic (salt-tolerant) species while lower concentrations can be inhabited with both halophytic and non-halophytic prairie species (Steinauer and Rolfsmeier 2010).

Fire and drought played smaller, secondary roles as disturbance factors in this ecological site. Fire was infrequent, as the alkaline conditions would prevent high accumulation of vegetation and associated fuel loads. Average fire return intervals are modeled to occur approximately every twenty years (LANDFIRE 2009). Drought, likewise, impacted the kinds and amounts of vegetation. Coupled with fire, periods of drought likely prevented woody vegetation from populating this site (Pyne et al. 1996).

Today, most, if not all, original Natric Floodplain Prairies have been reduced as a result of drainage and clearing for agriculture and livestock production. Sites have also been degraded by stream channelization which results in streambed incision. In turn, that has lowered the salinity, which changes the reference plant community. Invasive species, such as reed canarygrass (*Phalaris arundinacea* L.), smooth brome (*Bromus inermis* Leyss.), Kentucky bluegrass (*Poa pratensis* L.), and cheatgrass (*Bromus tectorum* L.), have been invading this site and reducing native species diversity (Steinauer and Rolfsmeier 2010).

F107BY023IA NATRIC FLOODPLAIN PRAIRIE



Code	Process
T1A	Hydrologic changes that reduces the water table and permanently reduces the salinity
T1B, T2A, T4A	Interseeding non-native cool-season grasses, non-selective herbicide, and grazing
T1C, T2B, T3A	Agricultural conversion via drain tile installation, tillage, seeding, and non-selective herbicide
1.1A	Decreased water table and reduced salinity
1.2A	Increased water table and increased salinity
R3A, R4A	Site preparation, native seeding, invasive species control
4.1A	Less tillage, residue management
4.1B	Less tillage, residue management, and implementation of cover cropping
4.2B	Implementation of cover cropping
4.2A, 4.3B	Intensive tillage, remove residue, and reinitiate monoculture row cropping
4.3A	Remove cover cropping

STATE 1 – REFERENCE STATE

The reference plant community is categorized as a wet prairie dominated by salt-tolerant vegetation. The two community phases within the reference state are dependent on high water tables and periodic flooding. The duration and depth of water moving through the site alters salinity levels which affects species composition, cover, and extent. Periodic fire and drought had less of an impact, but still contributed to overall species composition, diversity, cover, and productivity.

<u>Community Phase 1.1 Saltgrass – Foxtail Barley</u> – This reference community phase represents a high water table from a recent flood event. This phase can also occur within the lowest point of the depression, known as the salt-flat zone. The site is sparsely vegetated with species tolerant of moist, saline conditions. Saltgrass and foxtail barley are the dominant species in this phase. Little, if any, species diversity exists, and salt crusts may form on the soil surface (Steinauer and Rolfsmeier 2010).

> Pathway 1.1A – Natural succession as a result of no flooding in ten years or a prolonged lowered water table.

<u>Community Phase 1.2 Foxtail Barley – Blue Grama</u> – This reference community phase represents a lowered water table or an extended flood-free period of generally more than ten years (LANDFIRE 2009). This phase can also occur along the higher edges of the depression, known as the saltgrass zone. Species tolerant of slightly to moderate saline, dry conditions dominate the ground cover, including foxtail barely and blue grama (Steinauer and Rolfsmeier 2010).

> Pathway 1.2A – Natural succession as a result of recent flood event or raised water table.
>
> *Transition 1A* – Changes in landscape hydrology transition this site to the decreased salinity state (2).
>
> *Transition 1B* – Interseeding of cool-season grasses, non-selective herbicide, and grazing transition this site to the cool-season grassland state (3).
>
> *Transition 1C* – Installation of drain tiles, tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (4).

STATE 2 – DECREASED SALINITY STATE

Large-scale stream channelization efforts along the Missouri River and its tributaries have resulted in excessive streambed incision and changes in landscape hydrology. This has reduced the water table and flood frequency of Natric Floodplain Prairies, causing the salinity to decrease over time. As salinity levels are reduced, the reference community transitions into a state that can be co-occupied by halophytes and non-halophytes alike (Harvey et al. 2007; Steinauer and Rolfsmeier 2010).

Community Phase 2.1 Prairie Cordgrass – Sedges – In this community phase, the landscape hydrology has been altered to the extent that salinity amounts have decreased and remained below pre-European settlement amounts. The site is still populated with halophytic species, such as prairie cordgrass, foxtail barley, and switchgrass (*Panicum virgatum* L.), but these species are not obligates of saline environments. Non-halophytic species diversity begins to increase and can include various sedges (*Carex* L.), big bluestem (*Andropogon gerardii* Vitman), tall tickseed (*Coreopsis tripteris* L.), and great St. Johnswort (*Hypericum ascyron* L.) (Soil Survey Staff 2015).

> *Transition 2A* – Interseeding of cool-season grasses, non-selective herbicide, and grazing transition this site to the cool-season grassland state (3).

> *Transition 2B* – Installation of drain tiles, tillage, seeding of agricultural crops, and non-selective herbicide transition this site to the cropland state (4).

STATE 3 – COOL-SEASON GRASSLAND STATE

The cool-season grassland state occurs when the reference state has been anthropogenically-altered for livestock production. Interseeding of non-native cool-season grasses, annual mowing, and grazing by domesticated livestock transition and maintain this simplified grassland state. Over time, as lands were continually grazed by large herds of cattle, native plant species diversity decreased and the non-native species were able to spread and expand across the prairie habitat (Steinauer and Rolfsmeier 2010).

Community Phase 3.1 Reed Canarygrass – Kentucky Bluegrass – Sites in this community phase arise from interseeding non-native forage species followed by grazing. Degradation from overgrazing can also allow invasion of non-native species, further altering the species composition of the site. Native wet prairie species can still occur in this phase, but are greatly outcompeted by exotics. Species typical of this phase include reed canarygrass, Kentucky bluegrass, smooth brome, and cheatgrass (LANDFIRE 2009; Steinauer and Rolfsmeier 2010).

> *Restoration 3A* – Site preparation, native seeding, and invasive species control transition this site to the decreased salinity state (2).

> *Transition 3A* – Site preparation, native seeding, and invasive species control transition this site to the decreased salinity state (2).

STATE 4 – CROPLAND STATE

The Midwest is well-known for its highly-productive agricultural soils, and as a result, much of the MLRA has been converted to cropland, including portions of this ecological site (USGS 1999). Agricultural tile drains used to lower the water table and continuous use of tillage, row-crop planting, and chemicals (i.e., herbicides, fertilizers, etc.) have effectively eliminated the reference community and many of its natural ecological functions in favor of crop production. Corn (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.) are the dominant crops for the site. These areas are likely to remain in crop production for the foreseeable future.

Community Phase 4.1 Conventional Tillage Field – Sites in this community phase typically consist of monoculture row-cropping maintained by conventional tillage practices. They are cropped in either continuous corn or corn-soybean rotations. The frequent use of deep tillage, low crop diversity, and bare soil conditions during the non-growing season negatively impact soil health. Under these practices, soil aggregation is reduced or destroyed, soil organic matter is reduced, erosion and runoff are increased, and infiltration is decreased, which can ultimately lead to undesirable changes in the hydrology of the watershed (Tomer et al. 2005).

Pathway 4.1A – Tillage operations are greatly reduced, crop rotation occurs on a regular schedule, and crop residue is allowed to remain on the soil surface.

Pathway 4.1B – Tillage operations are greatly reduced or eliminated, crop rotation is either reduced or eliminated, and crop residue is allowed to remain on the soil surface, and cover crops are implemented to prevent soil erosion.

Community Phase 4.2 Conservation Tillage Field – This community phase is characterized by rotational crop production that utilizes various conservation tillage methods to promote soil health and reduce erosion. Conservation tillage methods include strip-till, ridge-till, or vertical-till planting systems. Strip-till keeps seedbed preparation to narrow bands less than one-third the width of the row where crop residue and soil consolidation are left undisturbed in-between seedbed areas. Strip-till planting may be completed in the fall and nutrient application either occurs simultaneously or at the time of planting. Ridge-till uses specialized equipment to create ridges in the seedbed and vegetative residue is left on the surface in between the ridges. Weeds are controlled with herbicides and/or cultivation, seedbed ridges are rebuilt during cultivation, and soils are left undisturbed from harvest to planting. Vertical-till systems employ machinery that lightly tills the soil and cuts up crop residue, mixing some of the residue into the top few inches of the soil while leaving a large portion on the surface. No-till management is the most conservative, disturbing soils only at the time of planting and fertilizer application. Compared to conventional tillage system, conservation tillage methods can reduce soil erosion, increase organic matter and water availability, improve water quality, and reduce soil compaction.

Pathway 4.2A – Intensive tillage is utilized and monoculture row-cropping is established.

Pathway 4.2B – Cover crops are implemented to prevent soil erosion.

Community Phase 4.3 Conservation Tillage Field/Alternative Crop Field – This condition applies conservation tillage methods as described above as well as adds cover crop practices. Cover crops typically include nitrogen-fixing species (e.g., legumes), small grains (e.g., rye, wheat, oats), or forage covers (e.g., turnips, radishes, rapeseed). The addition of cover crops not only adds plant diversity but also promotes soil health by reducing soil erosion, limiting nitrogen leaching, suppressing weeds, increasing soil organic matter, and improving the overall soil. In the case of small grain cover crops, surface cover and water infiltration are increased, while forage covers can be used to graze livestock or support local wildlife. Of the three community phases for this state, this phase promotes the greatest soil sustainability and improves ecological functioning within a cropland system.

Pathway 4.3A – Cover crop practices are abandoned.

Pathway 4.3B – Intensive tillage is utilized, cover crops practices are abandoned, monoculture row-cropping is established, and crop rotation is reduced or eliminated.

Restoration 4A – Removal of drain tiles, site preparation, native seeding, and invasive species control transition this site to the decreased salinity state (2).

Transition 4A – Interseeding of cool-season grasses, non-selective herbicide, and grazing transition this site to the cool-season grassland state (3).

Supporting Information

Relationship to Other Established Classifications

Biophysical Setting (LANDFIRE 2009); the reference community of this ecological site is most similar to:

Western Great Plains Depressional Wetland Systems (3914950)

Ecological Systems (National Vegetation Classification System, Nature Serve 2015): the reference community of this ecological site is most similar to:

Western Great Plains Saline Depression Wetland (CES303.669)

Nebraska Game and Parks Commission (Steinauer and Rolfsmeier 2010): the reference community of this ecological site is most similar to:

Eastern Saline Meadow

Plant Associations (National Vegetation Classification System, Nature Serve 2015): the reference community of this ecological site is most similar to:

Distichilis spicata – Hordeum jubatum – (Poa arida, Iva annua) Wet Meadow (CEGL002031)

Associated Ecological Sites

Ecological Site Name	Site ID	Narrative
Wet Floodplain Prairie	R107BY019MO	Poorly-drained alluvial soils on floodplains far from the stream channel including Ackmore, Aquents, Bremer, Calco, Colo, Cooper, Fluvaquents, Fluvaquents-sandy, Fluvaquents-silty, Forney, Grantcenter, Holly Springs, Kezan, Lakeport, Larpenteur, Lawson, Mt. Sterling, Nishna, Orthents, Solomon, Tieville, Uturin, Vesser, Wabash, Woodbury, and Zook
Loamy Terrace Savanna	R107BY020MO	Moderately well-drained soils on terraces including Ankeny, Anthon, Cott, Cotter, Keg, Norborne, Salix, and Wiota
Wet Terrace Savanna	R107BY021MO	Poorly-drained soils on terraces including Blackoar, Blencoe, Bremer, Burcham, Hornick, Luton, and Nevin

Similar Ecological Sites

Ecological Site Name	Site ID	Narrative
Loamy Floodplain Prairie	R107BY025IA	Loamy Floodplain Prairies have moderately well-drained soils and are not affected by salt/gypsum

Wet Floodplain Prairie	R107BY019MO	Wet Floodplain Prairies have somewhat poorly to poorly-drained soils but are not affected by salts/gypsum
Ponded Floodplain Prairie	R107BY018MO	Ponded Floodplain Prairies experience flooding and ponded, but soils are not affected by salts/gypsum

Ecological Site Correlation Issues and Questions

- Reference and alternative states within the state-and-transition model are not yet well-documented or supported and will require additional field sampling for refinement.

Inventory Data References

No field plots were available for this site. A review of the scientific literature and professional experience to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in ecological site description.

Other References

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Future work, as described in the Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.

Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.