Ecological site R066XY044NE
Wet Land

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General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

MLRA notes

Major Land Resource Area (MLRA): 066X–Dakota-Nebraska Eroded Tableland

The Dakota-Nebraska Eroded Tableland (MLRA 66) occurs in north-central Nebraska (56 percent) and south-central South Dakota (44 percent). MLRA 66 is approximately 3.6 million acres and covers all or parts of 12 counties between the two states. The northern border of the MRLA bisects Tripp County, South Dakota, just south of the town of Winner. Valentine is in the northeastern corner of Cherry County, Nebraska and is located on the MLRA's southwestern border. From there, the MLRA stretches southeast to the northwestern corner of Antelope County, Nebraska and the town of O'Neil, Nebraska in Holt County its southeastern border. The MLRA occupies a smooth fluvial plain primarily consisting of broad intervalley areas with terraces, river breaks, and local badlands along the well-defined major drainages. The slopes range from nearly level tablelands to steep ridges and drainages. The elevation ranges from 1,970 to 2,950 feet. The Keya Paha, Elkhorn, and the Niobrara Rivers flow through the MLRA. The Niobrara is a designated National Scenic River. Layers of shaly chalk and limestone marine sediments overlaying the Cretaceous Niobrara Formation make up the bulk of the MLRA, though the western and southwestern portions exhibit surface eolian deposits. The floors of the major drainages are underlain by deposits of alluvial sand and gravel. The dominant soil orders in this MLRA are mesic, ustic or aridic Mollisols and Entisols. Loamy and sandy are the primary soil textures in this landscape. Twenty-seven percent of the land in this MLRA has been broken out of native prairie and farmed, while sixty-six percent of the grasslands remain intact. The remaining acres are divided between forest, urban development, and other uses. Livestock grazing, primarily by cattle, is a major industry. Corn, winter wheat, and grain sorghum are the primary commodity crops but a significant number of acres are planted to forage sorghum and alfalfa for harvest as hay. With limited irrigation available, and annual precipitation averaging from 18 inches in the west to 25 inches in the east, crop production is marginal across most of the MLRA. The historical matrix vegetation type is mixed-grass prairie. Big bluestem, sand bluestem, prairie sandreed, little bluestem, sideoats grama, and blue grama make up the bulk of the warm-season species. Western wheatgrass, green needlegrass, and needle and thread are the dominant cool-season grasses. Large- and small-patch vegetative communities are found primarily along the riparian zones, on lowland sites, and in closed depressions. Woodlands make up about 3 percent of MLRA 66 and consist primarily of green ash, bur oak, and hackberry. Ponderosa pines can be found on steeper sites in the western portion of the landscape. Wildlife flourishes in this combination of crop and grassland environments. In a landscape historically occupied by bison herds, white-tailed and mule deer are now the most abundant wild ungulates. Pronghorns also number among the remaining native grazers. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel, prairie dogs, and mink, thrive in the region. Grassland birds, including several upland game birds, are common across the MLRA. This landscape serves as a backdrop for a disturbance-driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogeneous mosaic of plant communities and structure heights across the region. Any given site in this landscape burned every six to ten years, with most of the MLRA experiencing a six to eight year fire regime. The fires were caused by lightning strikes and were also set by Native Americans, who used fire for warfare, signaling, and to refresh the native grasses. Indigenous inhabitants understood the value of fire as a tool, and that the highly palatable growth following a fire provided excellent forage for their horses and attracted grazing game animals such as bison and elk. Land use patterns by post-European settlers have greatly altered the historical fire regime, allowing the expansion of woody species. Fragmentation of the native grasslands by conversion to cropland, transportation corridors, and other developments has contributed to disruption of the natural fire regime of this ecosystem. The most common encroaching woody species is eastern redcedar. While eastern redcedar is native to the landscape, the historic population in MLRA 66 was limited to isolated pockets in rugged river drainageways that were protected from wildfire. Widespread plantings of windbreaks with eastern redcedar as a primary component provide a seed source for the aggressive woody plant which further facilitates woody encroachment. Encroachment of native and introduced shrubs and trees into the native grasslands degrades wildlife habit and causes significant forage loss for domestic livestock. Aggressive fire suppression policies have exacerbated this process to the point that shrub and tree encroachment is a major ecological threat to grasslands throughout most of the MLRA.

Classification relationships

?EPA? Level IV Ecoregions of the Conterminous United States 43—Northwestern Great Plains: 43i—Keya Paha Tablelands. ?USDA? Land Resource Regions and Major Land Resource Areas (USDA-NRCS, 2006) Land Resource Region: G—Western Great Plains Range and Irrigated Region: Major Land Resource Area (MLRA): 66 Dakota-Nebraska Eroded Tableland.

Ecological site concept

The Wet Land ecological site is a run-on site found primarily on wet swales, and in river and stream valleys on slopes of 0 to 2 percent. The site is saturated or ponded for a long duration on or near the surface during the growing season. The soils are poorly to very poorly drained, and the water table is within 20 inches of the surface. Vegetation in the Reference Plant Community (1.1) is dominated by a mixture of warm-season tallgrasses and grass-likes. Dominant grasses and grass-likes include prairie cordgrass, northern reedgrass, and various sedges. Forbs are common and diverse. The site is susceptible to invasion of non-native, cool-season grasses.

Associated sites

R066XY046NE	**Subirrigated** The Subirrigated ecological site is often located adjacent to the Wet Land ecological site but on a slightly higher landscape position.

Similar sites

R066XY046NE	**Subirrigated** The Subirrigated ecological site has a deeper water table, usually 20 to 36 inches, while the water table on Wetland ecological sites ranges from the surface to 20 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Spartina pectinata* (2) *Calamagrostis*

Physiographic features

The Wet Land ecological site is a run-on site and is typically located on floodplains of river valley. It may also occur on stream terraces and on nearly level wet swales of interdunes on uplands.

Figure 1. Block diagram for the Wetland site.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace (3) Swale
Runoff class	Negligible to very high

Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	580 – 910 m
Slope	0 %
Ponding depth	0 – 20 cm
Water table depth	0 – 50 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 66 is considered to have a continental climate with cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature may also abound. The climate is the result of this MLRA's location near the geographic center of North America. There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature.

Annual precipitation ranges from 18 to 25 inches per year. The normal average annual temperature is about 48°F. January is the coldest month with average temperatures ranging from about 19°F (Bonesteel, SD) to about 23°F (Ainsworth, NE). July is the warmest month with temperatures averaging from about 73°F (Harrington, SD) to about 75°F (Gregory, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 54°F. This large annual range attests to the continental nature of the climate this area. Hourly winds average about ten miles per hour annually, ranging from about 11 miles per hour during the spring to about nine miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour.

Growth of native cool-season plants begins mid to late March and continues to late June. Native warm-season plants begin growth in early May and continue to late August. Green-up of cool-season plants may occur in September and October when adequate soil moisture is present.

Table 3 Representative climatic features

Frost-free period (characteristic range)	110-130 days
Freeze-free period (characteristic range)	130-150 days
Precipitation total (characteristic range)	530-640 mm
Frost-free period (actual range)	100-130 days

Freeze-free period (actual range)	120-150 days
Precipitation total (actual range)	510-660 mm
Frost-free period (average)	120 days
Freeze-free period (average)	140 days
Precipitation total (average)	580 mm

- (1) MARTIN 5 E [USC00395285], Martin, SD
- (2) HARRINGTON [USC00393574], Tuthill, SD
- (3) KILGORE 1NE [USC00254432], Kilgore, NE
- (4) VALENTINE MILLER FLD [USW00024032], Valentine, NE
- (5) SPRINGVIEW [USC00258090], Springview, NE
- (6) AINSWORTH [USC00250050], Ainsworth, NE
- (7) NEWPORT [USC00255925], Newport, NE
- (8) ATKINSON 3SW [USC00250420], Atkinson, NE
- (9) O NEILL [USC00256290], Oneill, NE
- (10) BUTTE [USC00251365], Butte, NE

Influencing water features

The hydrology of this site is directly affected by the water table which ranges from the surface to a depth of 20 inches.

Wetland description

According to the Cowardin system, The Wet Land ecological site can be either Lacustrine or Palustrine. The Lacustrine phase is littoral, permanently, semi-permanently, or seasonally flooded with an unconsolidated shoreline. The Palustrine phase is a Persistent Emergent Wetland, and permanently, semi-permanently, or seasonally flooded, or saturated. These wetland types include fens, and abandoned ox-bows.

Soil features

The soils associated with the Wet Land ecological site are very deep, somewhat poorly to very poorly drained on slopes that range from 0 to 2 percent. A number of soils have surfaces of mucky peat and slightly decomposed plant material. The majority of the soils are formed in loamy or sandy alluvium but some soils are formed from silty or clayey alluvium or from eolian deposits.

Runoff as evidenced by patterns of rill, gully, or other water flow is negligible due to the low slope gradient and high intake rate of these soils. Pedestalling of plants does not typically occur on this site.

The primary soil series correlated to the Wet Land site are Barney, Norway, Blackloup, and Loup. Other series correlated to the site include Almeria, Fedora, Herdcamp, Kezan, and Tryon. More information can be found in the various soil survey reports. Contact the local USDA Service Center for soil survey reports that include more detail specific to your location or visit Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov).

Figure 8. Loup series profile

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Eolian deposits
Surface texture	(1) Loam (2) Loamy fine sand (3) Fine sandy loam (4) Silt loam (5) Silty clay loam
Family particle size	(1) Loamy (2) Sandy
Drainage class	Somewhat poorly drained to very poorly drained
Permeability class	Moderately slow to rapid
Soil depth	200 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	5.08 – 20.07 cm
Calcium carbonate equivalent (Depth not specified)	0 – 20 %
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified

Soil reaction (1:1 water) (Depth not specified)	5.6 – 9.6
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

Typically, the Wet Land ecological site is extremely stable. Species composition and production are typically constant under most management scenarios. Changes may occur in the plant communities due to short-term weather variations and impacts of native and exotic plant and animal species but the primary cause of change is ditching to drain the wetland. This practice usually results in a shift to another ecological site, usually the Subirrigated ecological site.

The State and Transition Model (STM) is depicted below and includes a Reference State (1) and a Mechanically Altered State (2). Each state represents the crossing of a major ecological threshold due to the alteration of the functional dynamic properties of the ecosystem. The primary properties observed to determine this change are soil stability, vegetative communities, and the hydrologic cycle. Each state may have one or more plant communities that fluctuate in species composition and abundance within the normal parameters of the state. Within each state, communities may degrade or recover in response to natural and man caused disturbances such as variation in the degree and timing of herbivory, presence or absence of fire, and climatic and local fluctuations in the precipitation regime. The processes that cause the movement between the states and communities are discussed in more detail in the state and community descriptions following the diagram.

Interpretations are primarily based on the Reference Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts have been used as well. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

State and transition model

Figure 9. State and Transition Model Diagram. MLRA 66, Wet Land Ecological Site.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-Season Tallgrass**			1765-2774	
	prairie cordgrass	SPPE	*Spartina pectinata*	1261-2522	–
	marsh muhly	MURA	*Muhlenbergia racemosa*	0-252	–
	Grass, perennial	2GP	*Grass, perennial*	0-101	–
2	**Cool-Season Grasses**			252-1009	
	bluejoint	CACA4	*Calamagrostis canadensis*	0-1009	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	252-1009	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	0-757	–
	plains bluegrass	POAR3	*Poa arida*	252-504	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	0-504	–
	foxtail barley	HOJU	*Hordeum jubatum*	0-252	–

	Grass, perennial	2GP	*Grass, perennial*	0-101	–
3	**Grass-Likes**			1261-1765	
	sedge	CAREX	*Carex*	757-1513	–
	rush	JUNCU	*Juncus*	0-504	–
	bulrush	SCHOE6	*Schoenoplectus*	0-252	–
	spikerush	ELEOC	*Eleocharis*	0-252	–
	Grass-like, perennial	2GLP	*Grass-like, perennial*	0-252	–
Forb					
4	**Forbs**			252-757	
	willowleaf aster	SYPR5	*Symphyotrichum praealtum*	0-252	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	0-252	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0-252	–
	white panicle aster	SYLA6	*Symphyotrichum lanceolatum*	0-252	–
	cinquefoil	POTEN	*Potentilla*	0-101	–
	Virginia strawberry	FRVI	*Fragaria virginiana*	0-101	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0-101	–
	wild mint	MEAR4	*Mentha arvensis*	0-101	–
	Forb, annual	2FA	*Forb, annual*	0-101	–
	Forb, perennial	2FP	*Forb, perennial*	0-101	–
Shrub/Vine					
5	**Shrubs**			0-252	
	false indigo bush	AMFR	*Amorpha fruticosa*	0-151	–
	Missouri River willow	SAER	*Salix eriocephala*	0-151	–
	narrowleaf willow	SAEX	*Salix exigua*	0-151	–
	meadow willow	SAPE5	*Salix petiolaris*	0-151	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-101	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long forage for cattle, sheep, or horses. During the dormant period, the protein levels of the forage may be lower than the minimum needed to meet livestock (primarily cattle and sheep)requirements. The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. With consultation of the land manager, more intensive grazing management may result in improved harvest efficiencies and increased carrying capacity. The Wet Land site is typically only grazed during dry periods when the water table drops to the lower range of the depth for this site. Since the water table is still relatively high production during these drier periods can be near the representative value for the site. Production and Carrying Capacity* Community 1.1, Reference Community: 4,500 lbs/acre, 1.23 AUM/acre *Based upon the following conditions: continuous season-long grazing by cattle under average growing conditions, 25 percent harvest efficiency. Air dry forage requirements based on 3 percent of animal body weight, or 912 lbs/AU/month. WILDLIFE INTERPRETATIONS: Major Land Resource Area (MLRA) 66 lies primarily within the Mixed-grass prairie ecosystem. Though European settlers have converted about a quarter of this landscape to farmland, the majority of the prairie is still intact. This area still consists of diverse grassland habitats interspersed with varying densities of depressional wetlands and limited woody riparian corridors. These habitats historically provided critical life cycle components for the grassland birds, prairie dogs, and herds of roaming bison, elk, and pronghorn. Bobcats, wolves, and mountain lions occupied the apex predator niche. Diverse populations of small mammals and insects still provide a bountiful prey base for raptors and omnivores such as coyotes, foxes, raccoons, and opossums. In addition, a wide variety of reptiles and amphibians thrive in this landscape. The Mixed-Grass Prairie was a disturbance-driven ecosystem with fire, herbivory, and climate functioning as the primary disturbances. Following European settlement,

elimination of fire, overgrazing, and some habitat fragmentation significantly altered the appearance and functionality of the entire ecosystem. Bison and prairie dogs were historically keystone species, but free-roaming bison herds have been extirpated in this region. The loss of bison and fire as ecological drivers greatly influenced the character of the remaining native grasslands and the habitats that they provide. Fragmentation has reduced habitat quality for numerous area-sensitive species, as highlighted by the decline of the greater prairie chicken. Historically, an ecological mosaic of the sites provided habitat for species requiring unfragmented grasslands. Most of these important habitat features and components are intact, providing upland nesting habitat for grassland birds and game birds; nesting and escape cover for waterfowl; forbs and insects for brood-rearing habitat; and a forage source for small and large herbivores. Disruption of the natural fire regime and lack of appropriate grazing management are the greatest threats to the ecosystem dynamics today. Tree and shrub encroachment from lack of fire creates habitat that favors generalist species such as American robin and mourning dove, and provides perches for raptors, increasing the predation mortality on native bird populations. Introduced species such as smooth bromegrass, Kentucky bluegrass, nodding plumeless thistle (musk thistle), and Canada thistle further degrade the biological integrity of many areas of the prairie. The Wet Land ecological site usually occupies small areas on the landscape. These small areas provide excellent habitat for waterfowl and shorebirds and are important during the migration season for a wide variety of avian species as well as for a smaller number of species during the breeding season.

Hydrological functions

Excessive water is the principal factor limiting forage production on the Wetland site. Soils on this site are in Hydrologic Soil Group D due to high water tables. Although soils are permeable, high water tables limit infiltration. Surrounding upland areas tend to have very permeable soils that cause surface inflow peaks to these sites to be muted. Outflows typically occur as a result of intense storms or seepage inflows during very wet years. Many areas are frequently to continuously flooded. For the interpretive plant community, rills and gullies are not typically present. Water flow patterns should be barely distinguishable if at all present. Pedestals are not typically present. Litter falls in place, and signs of movement are not common. Litter often accumulates to create muck peat like conditions. Chemical and physical crusts are rare. Cryptogamic crusts are present but are not expected to significantly affect hydrologic considerations. Overall, this site has the appearance of being stable and productive.

Recreational uses

This site provides hunting opportunities for upland game and waterfowl species. The wide variety of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Field Offices (Counties) Nebraska: Ainsworth, (Brown, Keya Paha, and Rock) Bloomfield, (Knox,) Spencer (Boyd) Neligh (Antelope) O'Neill, (Holt) Valentine, (Cherry) South Dakota: Burke, (Gregory) Martin, (Bennett and Shannon) Winner, (Tripp) White River, (Mellette and Todd)

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range- trained personnel also were used. Those involved in developing this site include Wayne Bachman, Soil Scientist, NRCS; Stan Boltz, Range Management Specialist, NRCS; Anna Ferguson, Soil Conservationist, NRCS; Roger Hammer, Soil Scientist, NRCS; Dana Larsen, Range Management Specialist, NRCS; Dave Schmidt, Rangeland Management Specialist, NRCS; Kim Stine, Rangeland Management Specialist, NRCS.

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	11/18/2024
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **None. Rills are not expected on this site.**

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2. **Presence of water flow patterns:** **None. Water flow patterns are not expected on this site.**

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3. **Number and height of erosional pedestals or terracettes:** **None. Pedestals and terracettes are not expected on this site.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground is typically less than 5 percent. Bare ground is exposed mineral soil that is not covered by vegetation (basal and/or foliar canopy), standing dead vegetation, gravel/rock, and visible biological crust (e.g., lichen, mosses, algae).**

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5. **Number of gullies and erosion associated with gullies:** **None. Gullies are not expected on this site.**

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6. **Extent of wind scoured, blowouts and/or depositional areas:** **None. Wind-scoured areas and depositional areas are not expected on this site.**

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7. **Amount of litter movement (describe size and distance expected to travel):** **Litter should fall in place. Slight amount of movement of fine litter (less than 12 inches) from water is possible, but not normal. Litter movement from wind is not expected.**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** **Soil stability ratings should typically be 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface fragments will typically retain structure indefinitely when dipped in distilled water.**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **The A-horizon should be 4 to 10 inches (10-25 cm) thick. Soil colors range from gray to dark gray (values of 3 to 6) when dry and very dark gray to black (values of 2 to 4) when moist. Structure varies significantly with soil series and ranges from weak fine granular, strong medium granular, weak coarse prismatic, to weak thin platy. The primary soil series correlated to the Wet Land ecological site are Barney, Norway, Blackloup, and Loup. Other soil series correlated to the site are Almeria, Fedora, Herdcamp, Kezan, and Tryon.**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** **The functional/structural groups provide a combination of rooting depths and structure which positively**

influences infiltration. A combination of shallow and deep rooted species with fine and coarse roots positively influences infiltration. Invasion of introduced cool-season grasses may have an adverse impact on infiltration and runoff. Woody encroachment may also negatively influence infiltration. The expected composition of the plant community is approximately 50 to 60 percent perennial grasses, 25 to 35 percent grass-likes, 5 to 15 percent forbs, and 0 to 5 percent shrubs. The perennial grass component is made up of C4, tall rhizomatous grasses (35-50%) and C3 grasses (5 to 20%).

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None. A compaction layer should not be present,**

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Phase 1.1 1. Native, perennial, C4 tallgrass, 1575-2475 #/ac, 35-50% (1 species minimum): prairie cordgrass, marsh muhly. 2. Grass-likes, 1125-1575, 25-35% (1 species minimum): sedge, rush, bulrush, spikerush.

    Sub-dominant: Phase 1.1 1. Native, perennial, C3 grass, 225-900 #ac, 5-20% (2 species minimum): bluejoint, northern reedgrass, slimstem reedgrass, plains bluegrass, slender wheatgrass, foxtail barley. 2. Native forbs, 225-675 #/ac, 5-15% (4 species minimum): willowleaf aster, swamp smartweed, Pennsylvania smartweed, American licorice, white panicle aster, and other forbs that vary from location to location.

    Other: Minor - Phase 1.1 1. Shrubs, 0-225 #/ac, 0-5%: false indigo bush, Missouri River willow, narrowleaf willow, meadow willow, and other shrubs.

    Additional: The Reference Community (1.1) consists of five F/S groups. These groups are in order of relative abundance native, perennial, warm-season tallgrass; grass-likes; native, perennial, cool-season grass; forbs, and shrubs.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Bunch grasses have strong, healthy centers with few (less than 3 percent) dead centers. Shrubs may show some dead branches (less than 5 percent) as plants age.**

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14. **Average percent litter cover (%) and depth (in): Plant litter cover is evenly distributed throughout the site and is expected to be 80 to 90 percent and at a depth of 0.50 to 1.5 inch (1.3-4 cm).**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): The representative value (RV) for annual production is 4,500 pounds per acre on an air dry weight basis. Low and High production years should yield 3,850 to 5,200 pounds per acre respectively.**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: No non-native invasive species are present. Canada thistle, reed canarygrass, creeping foxtail, common watercress, leafy spurge, quackgrass, redtop, and purple loosestrife are known invasives that have the potential to become dominant or co-dominant on this site. Consult the state noxious weed**

and state watch lists for potential invasive species. Note: species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants.

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17. **Perennial plant reproductive capability: All perennial species exhibit high vigor relative to recent weather conditions. Perennial grasses should have vigorous rhizomes or tillers; vegetative and reproductive structures are not stunted. All perennial species should be capable of reproducing annually.**
