USDA Natural Resources Conservation Service

Ecological site R060AY002SD
Wet Land

Accessed: 05/03/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

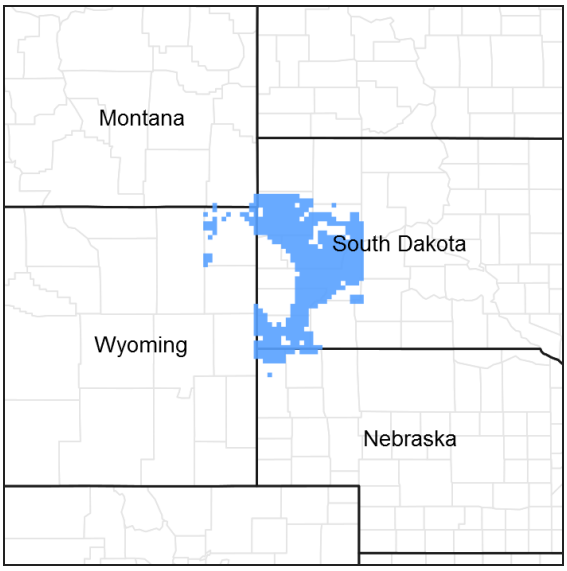


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 060A–Pierre Shale Plains

MLRA Notes:
The Pierre Shale Plains (MLRA 60A) consists of approximately 10,150 square miles, the majority of which is in South Dakota (70 percent) and small portions are in Montana (2 percent), Nebraska (8 percent), and Wyoming (20 percent). It encircles the Black Hills (MLRA 62) and the Dakota Hogback (MLRA 61). MLRA 60A includes portions of the Oglala, Buffalo Gap, and Thunder Basin National Grasslands. It also includes small sections of the Pine Ridge Indian Reservation, Badlands National Park, and Black Hills National Forest. The Cheyenne and Belle Fourche Rivers flow through the MLRA.

MLRA 60A is in the unglaciated section of the Missouri Plateau, of the Great Plains Province of the Interior Plains. It is an area of old plateaus and terraces that have been deeply eroded. Cretaceous Pierre Shale underlies almost all of this MLRA. This is a marine sediment with layers of volcanic ash that has been altered to smectitic clay. These clays shrink as they dry and swell as they receive moisture. Soils are shallow to very deep and generally are well drained and clayey.
Elevations generally range from 2,620 to 3,610 feet throughout the MLRA, but can range up to 4,260 feet. The average annual precipitation for the western side of the MLRA is 13 to 16 inches, whereas the eastern side receives 16 to 18 inches. A suite of ecological sites has been written specifically for these two precipitation zones. The Locator Map shows the break between the two precipitation zones.

This area supports a mixed natural prairie vegetation consisting of both cool- and warm-season grasses and forbs. Wyoming big sagebrush occurs primarily in the drier western portion of the MLRA, however, small remnant stands can be found in the eastern portion. Dominant land uses of the area are primarily ranching and, to a lesser extent, farming. Major resource concerns to this MLRA are wind erosion and surface water quality.

Classification relationships

USDA - Land Resource Region G – Western Great Plains Range and Irrigated Region, Major Land Resource Area (MLRA) 60A – Pierre Shale Plains.

EPA - Level IV Ecoregions of the Continental United States: 43e – Sagebrush Steppe, 43g Semiarid Pierre Shale Plains, and 43k – Dense Clay Prairie.

Ecological site concept

The Wet Land Ecological Site occurs throughout MLRA 60A. It is a run-in site located on floodplains, oxbows, and sloughs. Slopes range from 0 to 2 percent. The soils are formed in clayey alluvium, are very poorly drained, and have a water table that fluctuates between 0 and 2 feet. Vegetation in reference consists of grasses, sedges, and rushes that are classified as obligate or facultative wet.

Associated sites

R060AY003SD	**Subirrigated**
R060AY020SD	**Loamy Overflow**
R060AY021SD	**Clayey Overflow**
R060AY042SD	**Lowland**

Similar sites

R060AY003SD	**Subirrigated** Lower production; less frequent ponding and lower water table

Table 1. Dominant plant species

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

Physiographic features

This site occurs on level to nearly level river valleys and uplands.

Table 2. Representative physiographic features

Landforms	(1) Oxbow (2) Depression (3) Slough
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	762–1,311 m
Slope	0–3%

Ponding depth	0–30 cm
Water table depth	0–46 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate in this MLRA is typical of the drier portions of the Northern Great Plains, where sagebrush steppes to the west yield to grassland steppes to the east. Annual precipitation, for the entire MLRA, ranges from 13 to 18 inches per year, with most occurring during the growing season. Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air masses from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but the more severe occur during late fall, late winter, and spring. The normal average annual temperature is about 46°F. January is the coldest month with average temperatures ranging from about 19°F (Moorcroft CAA, WY) to about 22°F (Belle Fourche, SD). July is the warmest month with temperatures averaging from about 70°F (Moorcroft CAA, WY) to about 72°F (Belle Fourche, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 51°F. Hourly winds are estimated to average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds generally are 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 cool-season plants begins in early to mid-March, slowing or ceasing in late June. Warm-season plants begin growth about mid-May and can continue to early or mid-September. 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 (average)	115 days
Freeze-free period (average)	133 days
Precipitation total (average)	432 mm

Climate stations used

- (1) BELLE FOURCHE [USC00390559], Belle Fourche, SD
- (2) UPTON [USC00489205], Upton, WY
- (3) ARDMORE 1 NW [USC00390236], Edgemont, SD
- (4) WASTA [USC00398911], Owanka, SD
- (5) REDBIRD [USC00487555], Lance Creek, WY
- (6) MOORCROFT 3S [USW00024088], Moorcroft, WY

Influencing water features

The Wet Land Ecological Site is considered a wetland, (Cowardin, et al., 1979.)

Soil features

The soils in this site are very poorly or poorly drained and formed in clayey or silty alluvium. The surface layer is five to six inches thick. The texture of the subsurface ranges from silty clay loam to silty clay. This site should show no evidence of rills, wind-scoured areas or pedestalled plants. Water flow paths are broken, irregular in appearance, or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact.

Soils correlated to the Wet Land ecological site: Herdcamp, Bigwinder

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.

Table 4. Representative soil features

Surface texture	(1) Silty clay (2) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Poorly drained
Permeability class	Very slow to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–13
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed under Northern Great Plains climatic conditions, natural influences of large herbivores, occasional fire, and other biotic and abiotic factors that typically influence soil/site development. Changes will occur in the plant communities due to short-term weather variations, impacts of native and/or exotic plant and animal species, and management actions. While the following plant community descriptions describe more typical transitions between communities that will occur, severe disturbances, such as periods of well-below average precipitation, can cause significant shifts in plant communities and/or species composition. This site occurs in seep/spring areas, scoured areas along streams or in drainageways, oxbows, and wet drainageways.
Changes will occur in the plant communities primarily due to periodic fluctuations in hydrologic cycles. As this site deteriorates, such as when excessive litter accumulates and plants become decadent, species such as spikerush and Baltic rush will increase. Grasses and grass-likes such as Nebraska sedge, northern reedgrass, and bluejoint reedgrass will decrease in frequency and production. When this occurs, the plant composition will be similar to the Spikerush-Bulrush/Cattails Plant Community, but the total production will be significantly reduced.
This site can be significantly impacted when used as primary watering sources by livestock and, to a lesser degree, wildlife. Compaction can occur, which can lead to pedestaling and increased bare ground. This does not significantly affect composition, but can lead to reduced production.
The plant community upon which interpretations are primarily based is the Prairie Cordgrass-Reedgrass/Sedge Plant Community (1.1). This Plant Community Phase (PCP) has been determined by studying 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 also have been used. Plant communities, states, transitional pathways, and thresholds have been determined through similar studies and experience.

The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model

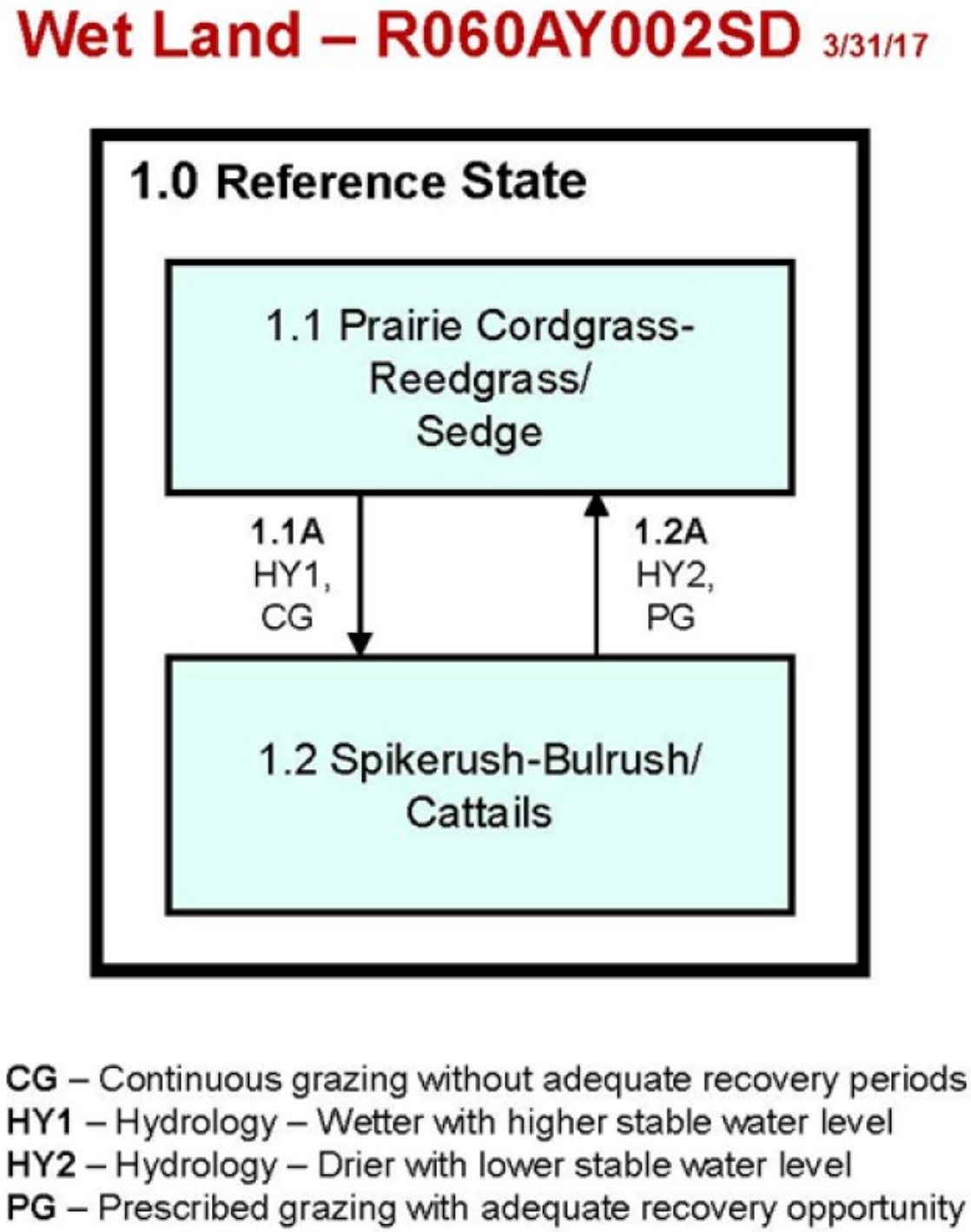


Figure 6. Wet Land - R060AY002SD

Diagram Legend - Wet Land - R060AY002SD		
CP 1.1A	1.1 - 1.2	Change to a wetter hydrologic cycle with a higher stable water level and continuous grazing without adequate recovery periods.
CP 1.2A	1.2 - 1.1	Return to a normal or slightly drier hydrologic cycle and prescribed grazing that provided change in season of use and adequate recovery time.

Figure 7. Wet Land - R060AY002SD

State 1
Reference State

This State represents what is believed to show the natural range of variability that dominated the dynamics of the ecological site prior to European settlement. This site, in reference, is dominated by grasses, grass-like species, and forbs. Variations in annual precipitation, and length of time the site is ponded, greatly influence the species composition from year to year. During wet years the plant community will respond to higher surface water levels and cattails will increase. During drier years the plant community will be dominated by obligate sedges and rushes. Grazing pressure on this site and surrounding sites also influence the plant community dynamics. Hoof action during dry periods can cause soil compaction and reduce rooting depth and soil saturation levels. Heavy animal concentrations or cropping on the surrounding landscapes can increase runoff and sedimentation.

Community 1.1
Prairie Cordgrass-Reedgrass/Sedge

Figure 8. Plant Community Phase 1.1

This plant community occurs during the more normal to drier precipitation/hydrology cycles. During these periods, grasses become more dominant in the plant community. Grasses will make up about 50 to 75 percent, with grass-likes at 20 to 35 percent, forbs 5 to 10 percent, and shrubs and/or trees at 0 to 5 percent. Dominant species are prairie cordgrass, bluejoint reedgrass, rough barnyardgrass, sedge, and dock.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	3564	3853	4035
Forb	1233	1695	2242
Shrub/Vine	247	462	673
Tree	–	155	336
Total	**5044**	**6165**	**7286**

Figure 10. Plant community growth curve (percent production by month). SD6008, Pierre Shale Plains, lowland cool season/warm season co-dominant. Cool season, warm season co-dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Community 1.2
Spikerush-Bulrush/Cattails

Figure 11. Plant Community Phase 1.2

This plant community occurs during the wetter precipitation/hydrology cycles that naturally occur on this site. During these periods, the species composition shifts to domination by the grass-like species. The plant community is made up of about 10 to 35 percent grasses, 40 to 60 percent grass-likes, 15 to 35 percent forbs, and 0 to 5 percent shrubs and/or trees. Dominant species include bulrush, Baltic rush, spikerush, and cattail.

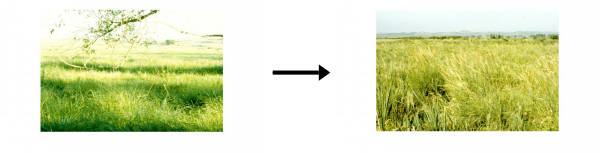
Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	2018	2522	3026
Shrub/Vine	785	1540	1793
Grass/Grasslike	560	827	1569
Tree	–	155	336
Total	**3363**	**5044**	**6724**

Figure 13. Plant community growth curve (percent production by month). SD6008, Pierre Shale Plains, lowland cool season/warm season co-dominant. Cool season, warm season co-dominant, lowland..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	4	11	19	23	20	12	6	5	0	0

Pathway 1.1A
Community 1.1 to 1.2

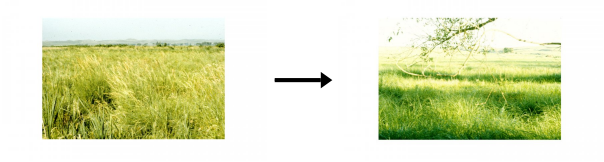


Prairie Cordgrass-Reedgrass/Sedge

Spikerush-Bulrush/Cattails

Continuous grazing without adequate recovery periods between grazing occurrences, and/or a wetter hydrologic cycle will shift this community to the Spikerush-Bulrush/Cattails Plant Community.

Pathway 1.2A
Community 1.2 to 1.1



Spikerush-Bulrush/Cattails

Prairie Cordgrass-Reedgrass/Sedge

Prescribed grazing that provided change in season of use and adequate recovery time and/or a return to a normal or slightly drier precipitation/hydrologic cycle will shift this plant community to the Prairie Cordgrass-Reedgrass/Sedge Plant Community.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Grasses**			3391–4007	
	prairie cordgrass	SPPE	*Spartina pectinata*	2466–3391	–
	bluejoint	CACA4	*Calamagrostis canadensis*	616–1541	–
	rough barnyardgrass	ECMU2	*Echinochloa muricata*	308–925	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	123–616	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	123–616	–
2	**Other Native Grasses**			308–616	
	Grass, perennial	2GP	*Grass, perennial*	0–308	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	0–308	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–308	–
	switchgrass	PAVI2	*Panicum virgatum*	0–308	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–308	–
	bluegrass	POA	*Poa*	0–308	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–185	–
	saltgrass	DISP	*Distichlis spicata*	0–62	–
3	**Grass-Likes**			1233–2158	
	wheat sedge	CAAT2	*Carex atherodes*	308–925	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	308–925	–
	sedge	CAREX	*Carex*	308–616	–
	spikerush	ELEOC	*Eleocharis*	308–616	–
	bulrush	SCHOE6	*Schoenoplectus*	308–616	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	0–308	–
	rush	JUNCU	*Juncus*	0–308	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–308	–

Forb					
4	**Forbs**			308–616	
	dock	RUMEX	*Rumex*	0–308	–
	Forb, annual	2FA	*Forb, annual*	0–308	–
	Forb, perennial	2FP	*Forb, perennial*	62–308	–
	wild mint	MEAR4	*Mentha arvensis*	0–185	–
	stinging nettle	URDI	*Urtica dioica*	0–185	–
	aster	SYMPH4	*Symphyotrichum*	0–123	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–123	–
	cattail	TYPHA	*Typha*	0–123	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	0–123	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–123	–
	cinquefoil	POTEN	*Potentilla*	0–123	–
	longbeak buttercup	RALO2	*Ranunculus longirostris*	0–123	–
	pale dock	RUAL4	*Rumex altissimus*	0–123	–
	swamp milkweed	ASIN	*Asclepias incarnata*	0–123	–
	spotted water hemlock	CIMA2	*Cicuta maculata*	0–123	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–123	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–123	–
Shrub/Vine					
5	**Shrubs**			0–185	
	willow	SALIX	*Salix*	0–185	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–62	–
Tree					
6	**Trees**			0–62	
	cottonwood	POPUL	*Populus*	0–62	–

Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Tall Grasses**			308–1233	
	prairie cordgrass	SPPE	*Spartina pectinata*	308–925	–
	bluejoint	CACA4	*Calamagrostis canadensis*	0–616	–
	northern reedgrass	CASTI3	*Calamagrostis stricta ssp. inexpansa*	0–308	–
	slimstem reedgrass	CASTS5	*Calamagrostis stricta ssp. stricta*	0–308	–
	rough barnyardgrass	ECMU2	*Echinochloa muricata*	0–308	–
2	**Other Native Grasses**			308–925	
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	0–308	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–308	–
	Grass, perennial	2GP	*Grass, perennial*	0–308	–
	reed canarygrass	PHAR3	*Phalaris arundinacea*	0–308	–
	bluegrass	POA	*Poa*	0–308	–

	saltgrass	DISP	*Distichlis spicata*	0–62	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–62	–
	switchgrass	PAVI2	*Panicum virgatum*	0–62	–
3	**Grass-Likes**			2466–3699	
	spikerush	ELEOC	*Eleocharis*	616–1541	–
	bulrush	SCHOE6	*Schoenoplectus*	616–1233	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	308–925	–
	rush	JUNCU	*Juncus*	308–925	–
	wheat sedge	CAAT2	*Carex atherodes*	308–925	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	308–925	–
	sedge	CAREX	*Carex*	308–616	–
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–616	–
Forb					
4	**Forbs**			925–2158	
	cattail	TYPHA	*Typha*	616–1233	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	123–616	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0–308	–
	dock	RUMEX	*Rumex*	0–308	–
	stinging nettle	URDI	*Urtica dioica*	0–308	–
	marsh arrowgrass	TRPA28	*Triglochin palustris*	0–308	–
	Forb, annual	2FA	*Forb, annual*	0–308	–
	Forb, perennial	2FP	*Forb, perennial*	0–308	–
	swamp smartweed	POHY2	*Polygonum hydropiperoides*	0–308	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–308	–
	cinquefoil	POTEN	*Potentilla*	0–185	–
	swamp milkweed	ASIN	*Asclepias incarnata*	0–185	–
	spotted water hemlock	CIMA2	*Cicuta maculata*	0–185	–
	pale dock	RUAL4	*Rumex altissimus*	0–185	–
	wild mint	MEAR4	*Mentha arvensis*	0–185	–
	aster	SYMPH4	*Symphyotrichum*	0–123	–
	longbeak buttercup	RALO2	*Ranunculus longirostris*	0–123	–
Shrub/Vine					
5	**Shrubs**			0–185	
	willow	SALIX	*Salix*	0–185	–
	false indigo bush	AMFR	*Amorpha fruticosa*	0–62	–
Tree					
6	**Trees**			0–62	
	cottonwood	POPUL	*Populus*	0–62	–

Animal community

The following table lists annual suggested initial stocking rates with average growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of conservation planning. Often, the current plant composition does not entirely match any particular plant community (as described in this Ecological

Site Description). Therefore, a resource inventory is necessary to document plant composition and production. More accurate carrying capacity estimates should eventually be calculated using the following stocking rate information along with animal preference data and actual stocking records, 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.

Plant Community = Prairie Cordgrass-Reedgrass/Sedge (1.1)
Average Annual Production (lbs./ac, air-dry) = 5500
Stocking Rate (AUM/ac) = 1.51

Plant Community = Spikerush-Bulrush/Cattails (1.2)
Average Annual Production (lbs./ac, air-dry) = 4500
Stocking Rate (AUM/ac) = 1.23

*Based on 912 lbs. /acre (air-dry weight) per Animal Unit Month (AUM), and on 25 percent harvest efficiency of preferred and desirable forage species (refer to USDA NRCS, National Range and Pasture Handbook).

Total annual production on-site may contain vegetation deemed undesirable or untargeted by the grazing animal. Therefore, AUM values may have been reduced to reflect only preferred or desirable forage species.

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage. During the dormant period, the forage for livestock will likely be lacking protein to meet livestock requirements, and added protein will allow ruminants to better utilize the energy stored in grazed plant materials. A forage quality test (either directly or through fecal sampling) should be used to determine the level of supplementation needed.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic groups C and D. Infiltration and runoff potential for this site varies from negligible to high depending upon soil hydrologic group, slope and water table. Runoff will be high on this site since the soil may be saturated (refer to Section 4, NRCS National Engineering Handbook, for runoff quantities and hydrologic curves).

Recreational uses

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

Other products

Seed harvest of native plant species can provide additional income on this site.

Other information

Revision Notes: “Previously Approved” Provisional
This Provisional ecological site concept has passed Quality Control (QC) and Quality Assurance (QA) to ensure that the site meets the 2014 NESH standards for a Provisional ecological site. This is an updated “Previously Approved” ESD which represents a first-generation tier of documentation that, prior to the release of the 2014 National Ecological Site Handbook (NESH), met all requirements as an “Approved” ESD as laid out in the 1997, rev.1, 2003 National Range and Pasture Handbook (NRPH). The document fully described the Reference State and Community Phase in the State-and-Transition model. All other alternative states are at least described in narrative form. The “Previously Approved” ESD has been field-tested for a minimum of five years and is a proven functional document for conservation planning. The “Previously Approved” ESD does not contain all tabular and narrative entries as required in the current “Approved” level of documentation but it is expected that the “Previously Approved” ESD will continue refinement towards an “Approved” status.

Site Development and Testing Plan:

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

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Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used. Those involved in developing this site description include: Stan Boltz, Range Management Specialist, NRCS; Jill Epley, Range Management Specialist, NRCS; Cheryl Nielsen, Range Management Specialist, NRCS; Rick Peterson, Range Management Specialist, NRCS; and Mike Stirling, Range Management Specialist, NRCS.

Other references

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Contributors

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ESD updated by Rick L. Peterson 3/31/17

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	07/14/2008
Approved by	Stan Boltz
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

2. **Presence of water flow patterns:** None.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 5 percent is typical. During periods of above average precipitation and run-on, this site may be ponded for longer than normal durations, and typical vegetation may be temporarily reduced, creating areas of bare ground for relatively short periods of time.

5. **Number of gullies and erosion associated with gullies:** None.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter falls in place.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings should typically be 5 to 6, normally 6. This site typically has an O-horizon (roots and partly decomposed stems and leaves of plants) that is 0-3 inches thick. 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):** A-horizon should be 12 to 24 inches thick with dark gray or gray colors when moist. Structure typically is medium to fine angular blocky in the A-horizon.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Deep rooted species (tall rhizomatous cool- and warm-season grasses and grass-likes) with fine and coarse roots positively influences infiltration. Infiltration is somewhat limited naturally due to poor drainage and relatively low permeability.

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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 – when dry, B horizons can be hard and appear to be compacted, but no platy structure will 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: Grass-likes >

    Sub-dominant: Forbs > tall warm-season rhizomatous grasses > tall cool-season rhizomatous grasses >

    Other: Short/mid cool-season grasses = shrubs/trees

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Little evidence of decadence or mortality.

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Production ranges from 4,500-6,500 lbs./acre (air-dry weight). Reference value production is 5,500 lbs./acre (air-dry weight).

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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:** State and local noxious weeds; Kentucky bluegrass may be prevalent during dry cycles, but will typically not dominate the site. Most invasive species will occupy the perimeter of this site.

17. **Perennial plant reproductive capability:** All species exhibit high vigor relative to climatic conditions. Do not rate based solely on seed production. Perennial grasses and grass-likes should have vigorous rhizomes or tillers.