USDA Natural Resources
Conservation Service

Ecological site R064XY048NE
Badlands Terrace

Accessed: 05/18/2024

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.

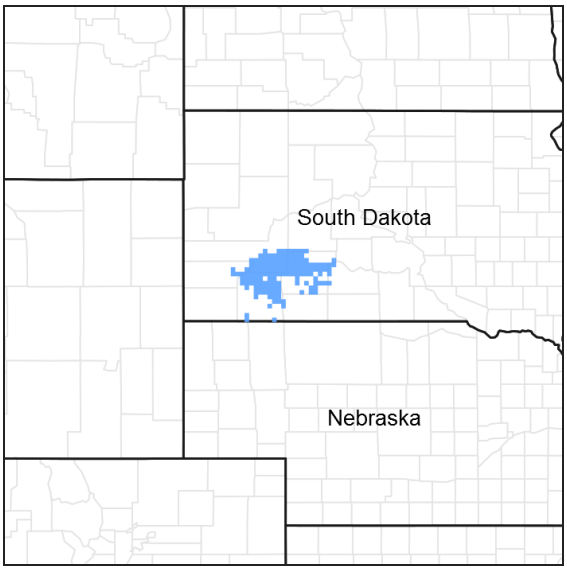


Figure 1. Mapped extent

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.

Classification relationships

Level IV Ecoregions of the Conterminous United States: 43h – White River Badlands.

Associated sites

GX064X01X036	**Loamy 17-20" PZ**
R064XY048NE	**Badlands Terrace**

Similar sites

R064XY049NE	**Badlands Overflow** [Switchgrass present; less little bluestem; more productive.]

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Elymus lanceolatus ssp. lanceolatus*

Physiographic features

This site occurs in the eroded badlands on nearly level areas that receive runoff from adjacent slopes.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Alluvial fan
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Frequent
Ponding frequency	None
Elevation	884–1,219 m
Slope	0–3%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 64 is considered to have a continental climate – 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 14 to 20 inches per year. The normal average annual temperature is about 47° F. January is the coldest month with average temperatures ranging from about 21° F (Wood, SD) to about 25° F (Hemingford, NE). July is the warmest month with temperatures averaging from about 70° F (Keeline 3 W, WY) to about 76° F (Wood, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 55° F. This large annual range attests to the continental nature of this area's climate. Hourly winds 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 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 (average)	143 days
Freeze-free period (average)	163 days
Precipitation total (average)	508 mm

Influencing water features

Stream Type: B6, C6
(Rosgen System)

Soil features

The soils of this site are very deep, well drained soils that formed in sodium enriched alluvium. These soils typically have dispersive characteristics due to the high content of sodium. This feature tends to cause these soils to be naturally erosive, as the aggregate stability is low in the surface and structure is lacking in all horizons. These soils have moderate to moderately slow permeability. The surface soil will vary from 2 to 4 inches deep and have loam or

silt loam textures. These areas receive additional water as runoff from adjacent slopes. Available water capacity is typically high. This site should show slight to 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. Sub-surface soil layers are not restrictive to water movement and root penetration.

These soils are mainly susceptible to water erosion. Headcuts may develop if adequate vegetative cover is not maintained or due to sinkholes or other soil sloughing due to piping as a result of natural features such as animal burrows, root channels, etc. A drastic loss of the soil surface layer on this site can result in a shift in species composition and/or production.

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) Silt loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	20.32–22.86 cm
Calcium carbonate equivalent (0-101.6cm)	5–30%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10–35
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

The most significant influence in the development of this site is in relation to the geologic erosion episodes that occur on this and adjacent landscape positions in the White River Badlands. Due to the proximity of weathered, loose parent material, this site is constantly in flux. The Great Plains climate plays an important role, as sporadic heavy rainfall events cause fluctuating erosion and deposition to occur on this site. Recent grazing or browsing patterns do have an effect, but only if the site is stable long enough to establish vegetation for an extended period of time. While the following 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.

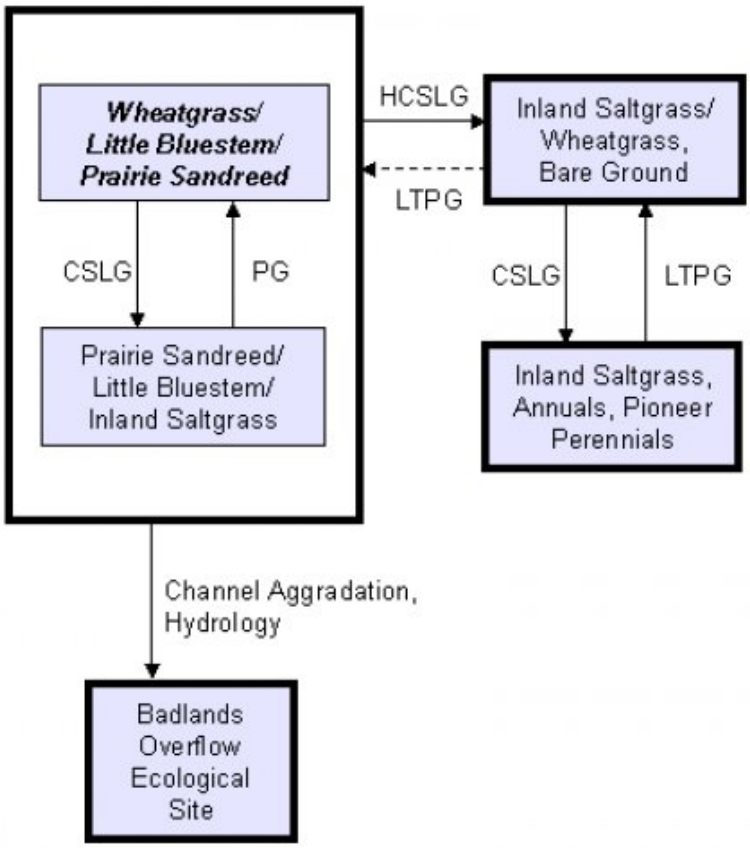
Continuous season-long grazing (during the typical growing season of May through October) and/or repeated seasonal grazing (e.g., every spring, every summer) without adequate recovery periods following each grazing occurrence causes this site to depart from the Wheatgrass/Little Bluestem/Prairie Sandreed Plant Community. Prairie sandreed and little bluestem increase initially and will eventually decrease with continuous grazing. Grasses

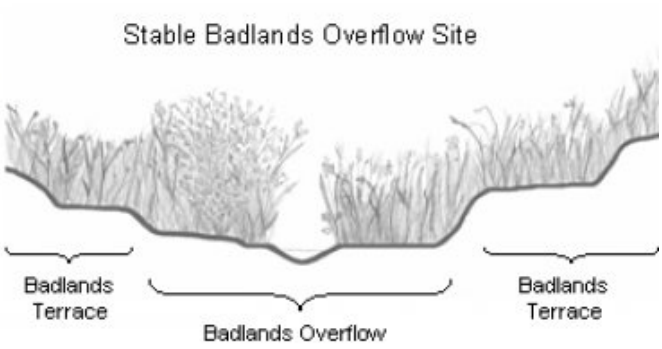
such as wheatgrass and green needlegrass will decrease in frequency and production. Reduction of vegetative cover can result in rapid degeneration of the site. Headcuts and downcutting are relatively common. With channel aggradation, this site can move to the Badlands Overflow ecological site.

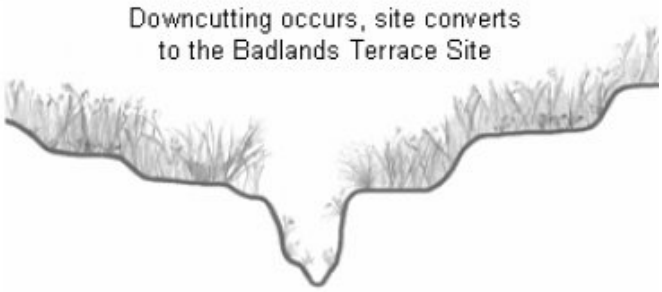
Interpretations are primarily based on the Wheatgrass/Little Bluestem/Prairie Sandreed Plant Community. It has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing regimes. Trends in plant community dynamics ranging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

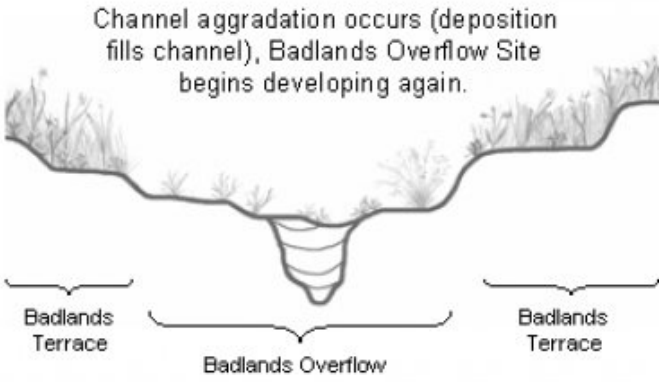
The following is a diagram that illustrates the common plant communities that can occur on the site and the transition pathways between communities. The ecological processes will be discussed in more detail in the plant community descriptions following the diagram.

State and transition model









Channel Aggradation – Deposition within channel, stabilization and increased hydrology; **CSLG** – Continuous season-long grazing (grazing a unit for an entire growing season; **HCSLG** – Heavy, continuous season-long grazing (grazing a unit for an entire growing season, well above recommended stocking rates); **LTPG** – Long-term prescribed grazing; **PG** – Prescribed grazing (planned, controlled harvest of vegetation with grazing or browsing animals – see FOTG, Section IV, 528).

State 1
Wheatgrass/Little Bluestem/Prairie Sandreed

Community 1.1
Wheatgrass/Little Bluestem/Prairie Sandreed

Interpretations are based primarily on the Wheatgrass/Little Bluestem/Prairie Sandreed Plant Community (this is also considered climax). This plant community evolved with grazing by large herbivores and occasional prairie fires. This plant community is typically derived from the Badlands Overflow site, where downcutting and entrenchment has dropped the water table and left the vegetation in a much drier terrace position. The potential vegetation is about 85% grasses and grass-like plants, 5% forbs and 10% shrubs. Major grasses include western wheatgrass and/or thickspike wheatgrass, little bluestem and prairie sandreed. Other grasses occurring on this community include green needlegrass, needleandthread and sideoats grama. Major forbs and shrubs include cudweed sagewort, goldenrod, scurfpea, rose, silver sagebrush and western snowberry. Scattered plains cottonwood may occur. This plant community is productive and diverse. The diversity in plant species allows for high drought tolerance. This is a sustainable plant community in regards to site/soil stability, watershed function, and biologic integrity as long as extreme erosion or depositional events do not occur.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1726	2130	2522
Shrub/Vine	45	141	241
Forb	22	71	123
Tree	–	12	28
Total	**1793**	**2354**	**2914**

Figure 5. Plant community growth curve (percent production by month). NE6409, Pine Ridge/Badlands, warm-season dominant, cool-season sub-dominant. Warm-season dominant, cool-season sub-dominant, lowlands.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	8	18	27	23	12	6	3		

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Wheatgrass**			235–706	
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	235–706	–
	western wheatgrass	PASM	*Pascopyrum smithii*	235–706	–
2	**Needlegrass**			118–235	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	118–235	–
	green needlegrass	NAVI4	*Nassella viridula*	118–235	–
3	**Tall Warm-Season Grasses**			353–588	
	prairie sandreed	CALO	*Calamovilfa longifolia*	235–588	–
	big bluestem	ANGE	*Andropogon gerardii*	0–118	–
4	**Warm-Season Grasses**			235–706	
	little bluestem	SCSC	*Schizachyrium scoparium*	235–588	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	47–118	–
	blue grama	BOGR2	*Bouteloua gracilis*	24–118	–

	hairy grama	BOHI2	*Bouteloua hirsuta*	0–71	–
	saltgrass	DISP	*Distichlis spicata*	0–71	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–71	–
5	**Native Grasses and Grass-likes**			0–118	
	Grass, perennial	2GP	*Grass, perennial*	0–118	–
	sedge	CAREX	*Carex*	0–118	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–71	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–71	–
	threeawn	ARIST	*Aristida*	0–24	–
Forb					
7	**Forbs**			24–118	
	Forb, perennial	2FP	*Forb, perennial*	24–71	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	24–71	–
	false boneset	BREU	*Brickellia eupatorioides*	0–71	–
	goldenrod	SOLID	*Solidago*	24–71	–
	scurfpea	PSORA2	*Psoralidium*	24–71	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	24–47	–
	American vetch	VIAM	*Vicia americana*	24–47	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	24–47	–
	white heath aster	SYER	*Symphyotrichum ericoides*	24–47	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–47	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	24–47	–
	dotted blazing star	LIPU	*Liatris punctata*	0–47	–
	common yarrow	ACMI2	*Achillea millefolium*	0–47	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–47	–
	pussytoes	ANTEN	*Antennaria*	0–24	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–24	–
	vervain	VERBE	*Verbena*	0–24	–
	deathcamas	ZIGAD	*Zigadenus*	0–24	–
	Forb, annual	2FA	*Forb, annual*	0–24	–
Shrub/Vine					
8	**Shrubs**			47–235	
	silver sagebrush	ARCA13	*Artemisia cana*	0–141	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0–118	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	24–118	–
	soapweed yucca	YUGL	*Yucca glauca*	0–71	–
	rose	ROSA5	*Rosa*	24–71	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–71	–
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	0–71	–
Tree					
9	**Trees**			0–24	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	0–24	–

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B. Infiltration rate is moderate. Runoff potential for this site varies from moderate to high depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Section 4, NRCS National Engineering Handbook).

Recreational uses

This site provides hunting, hiking, photography, bird watching and other opportunities. The wide varieties of plants that bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on this site.

Other products

None noted.

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 include: Stan Boltz, Range Management Specialist, NRCS; Kent Cooley, Soil Scientist, NRCS; Rick Peterson, Range Management Specialist, NRCS; L. Michael Stirling, Range Management Specialist, NRCS.

Other references

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Contributors

SCB

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	01/05/2010
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, or barely visible and discontinuous.

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):** 5 to 10 percent is typical.

5. **Number of gullies and erosion associated with gullies:** Gullies common, when new very little vegetation occurs initially.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None typical, but some deposition may occur after flooding events.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of smallest size class litter is possible.

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 3 to 4.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** A-horizon should be 2 to 6 inches thick, and mollic colors are not typically present. Structure typically is weak very thin platy structure in the A-horizon. Organic matter is typically very low in these soils.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool- and warm-season grasses) with fine and coarse roots positively influences infiltration.

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, A horizons can appear to be compacted as platy structure is common.

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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: Mid cool-season rhizomatous grasses > Tall warm-season rhizomatous grasses = Mid warm-season bunchgrasses >

    Sub-dominant: Mid to tall cool-season bunchgrasses = shrubs >

    Other: Short warm-season grasses > Forbs

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very little evidence of decadence or mortality. Bunch grasses have strong, healthy centers and shrubs are vigorous.

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14. **Average percent litter cover (%) and depth (in):** Litter cover is typically 50 to 70 percent, with the depth roughly 0.25 to 0.5 inches.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Total annual production ranges from 1,600 to 2,600 pounds/acre, with the reference value being 2,100 pounds/acre (air-dry basis).

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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.

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