USDA Natural Resources
Conservation Service

Ecological site R066XY032NE
Sandy 18-22" P.Z.

Accessed: 05/05/2024

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.

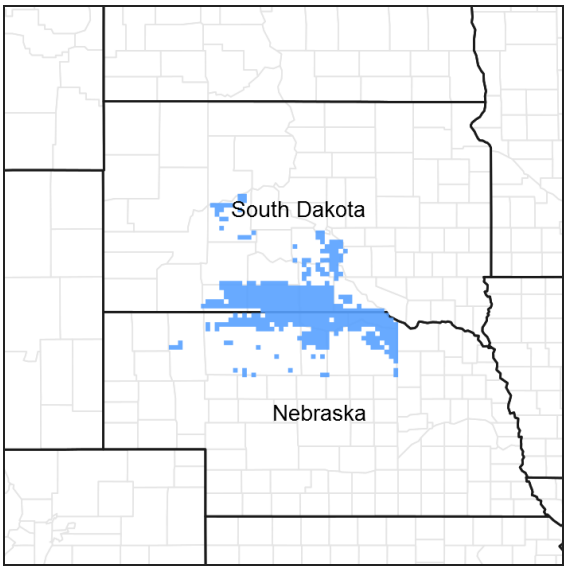


Figure 1. Mapped extent

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: 43i - Keya Paha Tablelands.

Associated sites

R066XY033NE	**Sands 18-22 P.Z.** Sands 18-22" P.Z.
R066XY046NE	**Subirrigated** Subirrigated
R066XY054NE	**Sandy 22-25 P.Z.** Sandy 22-25" P.Z.
R066XY062NE	**Shallow To Gravel** Shallow to Gravel

Similar sites

R066XY033NE	**Sands 18-22 P.Z.** Sands 18-22" P.Z. (steeper slope; lower production; sand bluestem dominant; less little bluestem)

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on tablelands, ancient high terraces, interdunes of uplands and on the sides of valleys.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Hill (3) Interdune
Elevation	579–914 m
Slope	0–15%
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 66 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 18 to 22 inches per year. The normal average annual temperature is about 47° F. January is the coldest month with average temperatures ranging from about 20° F (Valentine, NE) to about 23° F (Ainsworth, NE). July is the warmest month with temperatures averaging from about 73° F (Harrington, SD) to about 75° F (Ainsworth, NE). The range of normal average monthly temperatures between the coldest and warmest months is about 53° F. This large annual range attests to the continental nature of this area's climate. Hourly winds average about 10 miles per hour annually, ranging from about 11 miles per hour during the spring to about 9 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)	154 days
Freeze-free period (average)	172 days
Precipitation total (average)	559 mm

Influencing water features

No significant water features influence this soil.

Soil features

The features common to all soils in this site are the loam to fine sand textured surface layers and slopes of 0 to 15 percent. The soils in this site are from well drained to excessively drained. They formed primarily in eolian deposits,

sandy and gravelly alluvium, and material weathered from petrocalcic horizons. Pivot soils are formed in sandy and gravelly alluvium. O'Neill soils formed in loamy material over sandy and gravelly alluvium. Anselmo soils formed in mixed loamy and sandy eolian material. Dunday soils formed in eolian sands. Brunswick, Duda, Holt, and Ronson soils formed in material weathered from petrocalcic horizons. McKelvie soils formed in eolian sands and sandy material weathered from petrocalcic horizons. The surface layer is 3 to 19 inches thick. The texture of the control section generally ranges from loam to fine sand. 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. The hazard of water erosion increases on slopes greater than about 10 percent.

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.

Ecological dynamics

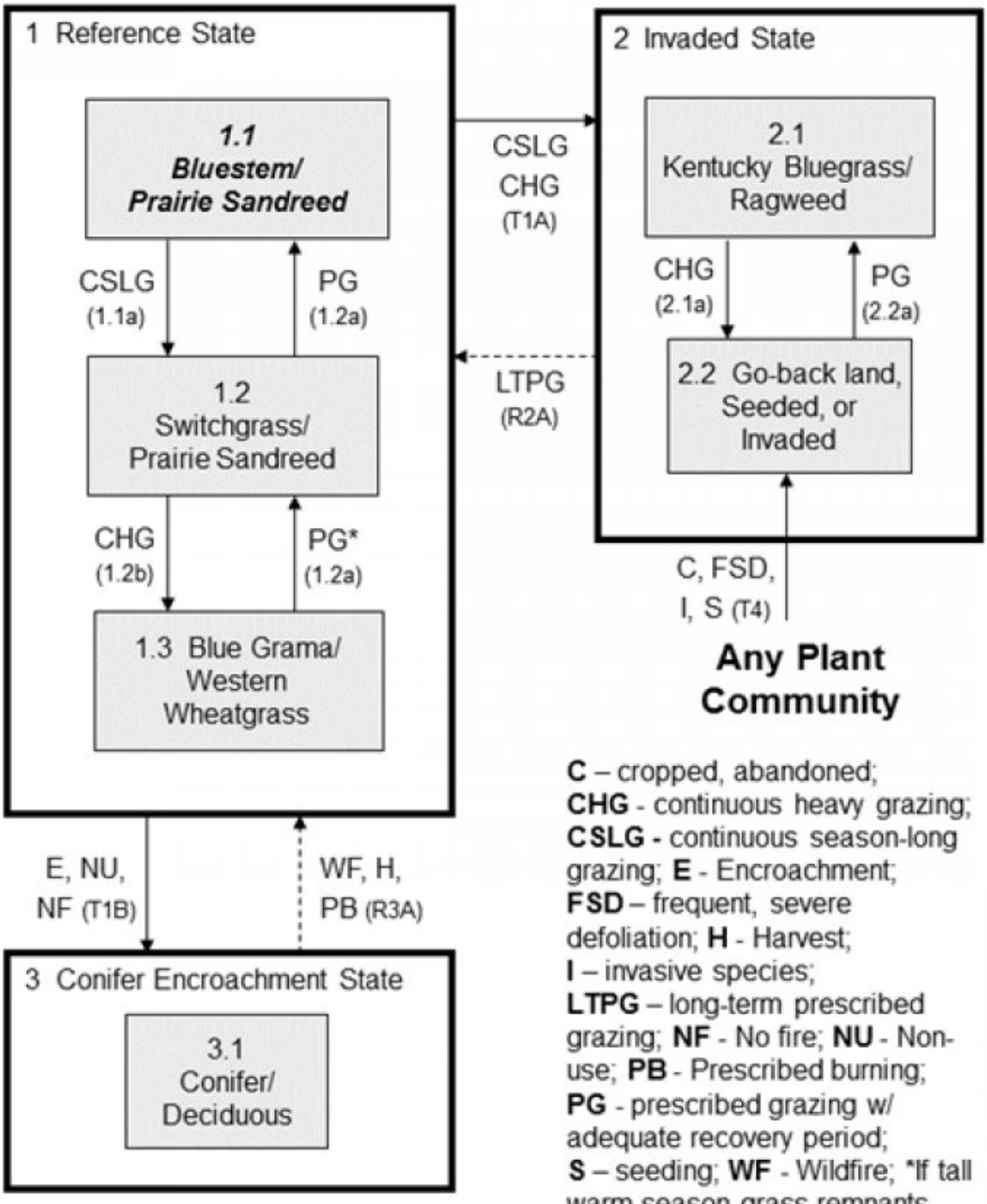
This plant community developed under Northern Great Plains climatic conditions, and included natural influence of large herbivores and occasional fire. Changes will occur in the plant communities due to management actions and/or climatic conditions.

This site is the most dominant site in the MLRA. Natural fire played a significant role in the maintenance of this site by limiting conifer establishment. The recent control of fire, and the increased seed source from shelterbelts results in occasional juniper and/or ponderosa pine encroachment.

The plant community upon which interpretations are primarily based is the Bluestem/Prairie Sandreed Plant Community. This plant community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, and areas managed 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.

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



C – cropped, abandoned; **CHG** - continuous heavy grazing; **CSLG** - continuous season-long grazing; **E** - Encroachment; **FSD** – frequent, severe defoliation; **H** - Harvest; **I** – invasive species; **LTPG** – long-term prescribed grazing; **NF** - No fire; **NU** - Non-use; **PB** - Prescribed burning; **PG** - prescribed grazing w/ adequate recovery period; **S** – seeding; **WF** - Wildfire; *If tall warm-season grass remnants are present

Figure 4. Sandy State and Transition Diagram

State 1
Invaded State

Community 1.1
Kentucky Bluegrass/Ragweed

With sustained excessive herbivory during the summer months the plant community will become dominated by cool season grasses and forbs. The potential vegetation is about 70% grasses or grass-like plants, 20% forbs, and 10% shrubs. Dominant grasses include Kentucky bluegrass, blue grama, Scribner panicum and sand dropseed. Other grasses or grass-likes include needleandthread, sedges and cheatgrass. Dominant forbs include green sagewort, western ragweed, Rocky Mountain beeplant and thistles. The tall warm season grasses are replaced by blue grama and sand dropseed. Cool season grasses such as Scribner's panicum, annual brome, and bluegrass will increase and fill the void left by the disappearing tall warm season grasses. Sedges will flourish in the understory. Western ragweed and green sagewort increase in abundance. Invader thistles and annual forbs increase along with grazing resistant shrubs such as cactus and small soapweed. This is a relatively stable plant community that requires a considerable amount of time and/or energy to transition this plant community. If this plant community becomes dominated by Kentucky bluegrass (greater than 40%), an ecological threshold will be crossed and return to another plant community will be extremely difficult.

Figure 6. Plant community growth curve (percent production by month). NE6635, Eroded Tableland, cool-season dominant, warm-season subdominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	25	30	15	5	5	5		

State 2
Conifer Encroachment State

Community 2.1
Conifer/Decidous

This plant community can develop whenever conifer and/or deciduous trees occur adjacent to the originating plant community, and encroachment of various species occurs. On the upper slopes where this site occurs, ponderosa pine and/or eastern redcedar are typically the first species to encroach/increase. On the lower slopes, typically various deciduous trees followed by eastern redcedar are the first to encroach/increase. In any case, eastern redcedar can become dominant. When this occurs a closed canopy of eastern redcedar may result. Because of fire suppression over many years, this plant community will develop extensive ladder fuels which can lead to a removal of most tree species with a wildfire. With properly managed intensive grazing, encroachment of deciduous trees will be minimal; however, this will not impact encroachment of conifer species. This plant community is made up of trees with a canopy cover of 50% or greater consisting of trees generally 12 feet or taller. The herbaceous component decreases proportionately in relation to the percent canopy cover, with the reduction being greater under a conifer overstory. This plant community is resistant to change, and resilient given normal disturbances. In higher canopy cover situations, the soil erosion will increase in relation to most of the plant communities from which this plant community originated. The water cycle is also significantly altered under higher canopy cover. Infiltration is reduced because of a lack of herbaceous cover and the rooting structure provided by the herbaceous species. Runoff is not greatly increased, as the soil is still capable of absorbing the rainfall that reaches the soil surface.

Figure 8. Plant community growth curve (percent production by month). NE6644, Eroded Tableland, heavy conifer canopy.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	7	10	20	28	15	5	4	4	2	1

Transition 4

State 2 to 1

Cropping abandonment, introduction of invasive species, or seeding of introduced species for agricultural purposes will lead to the Go-back Land, Seeded, or Invaded plant community.

Additional community tables

Table 4. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
2	**Prairie Sandreed**			0–50	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–50	–
4	**Needleandthread**			50–151	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	50–151	–
5	**Grama**			101–252	
	blue grama	BOGR2	*Bouteloua gracilis*	101–252	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–101	–
6	**Other Warm-Season Grasses**			101–252	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	101–202	–
	mat sandbur	CELO3	*Cenchrus longispinus*	0–50	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	0–50	–
7	**Native Grasses/Grass-Likes**			202–353	
	sedge	CAREX	*Carex*	50–151	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	50–151	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–50	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–20	–
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
8	**Non-Native Grasses/Grass-Likes**			50–404	
	bluegrass	POA	*Poa*	50–404	–
	cheatgrass	BRTE	*Bromus tectorum*	0–151	–
Forb					
9	**Forbs**			50–202	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	50–202	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–50	–
	thistle	CIRSI	*Cirsium*	0–30	–
	Rocky Mountain beeplant	CLSE	*Cleome serrulata*	0–30	–
	common sunflower	HEAN3	*Helianthus annuus*	0–30	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–30	–
	vervain	VERBE	*Verbena*	0–30	–
	Forb, annual	2FA	*Forb, annual*	0–20	–
	Forb, perennial	2FP	*Forb, perennial*	0–20	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–10	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–10	–

	beardtongue	PENST	*Penstemon*	0–10	–
	scurfpea	PSORA2	*Psoralidium*	0–10	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	0–10	–
Shrub/Vine					
10	**Shrubs**			10–101	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–50	–
	rose	ROSA5	*Rosa*	0–30	–
	soapweed yucca	YUGL	*Yucca glauca*	0–30	–
	pricklypear	OPUNT	*Opuntia*	0–20	–

Table 5. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Bluestem**			0–56	
	big bluestem	ANGE	*Andropogon gerardii*	0–56	–
	sand bluestem	ANHA	*Andropogon hallii*	0–56	–
2	**Prairie Sandreed**			0–22	
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–22	–
3	**Little Bluestem**			56–112	
	little bluestem	SCSC	*Schizachyrium scoparium*	56–112	–
4	**Needleandthread**			112–168	
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	112–168	–
5	**Grama**			56–112	
	blue grama	BOGR2	*Bouteloua gracilis*	56–112	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–56	–
6	**Other Warm-Season Grasses**			168–280	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	22–112	–
	switchgrass	PAVI2	*Panicum virgatum*	0–56	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–56	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	11–56	–
	mat sandbur	CELO3	*Cenchrus longispinus*	0–34	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	0–34	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–22	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–22	–
7	**Native Grasses/Grass-Likes**			112–224	
	western wheatgrass	PASM	*Pascopyrum smithii*	22–112	–
	sedge	CAREX	*Carex*	22–90	–
	Grass, perennial	2GP	*Grass, perennial*	0–56	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–56	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–11	–
	fall rosette grass	DIWI5	*Dichanthelium wilcoxianum*	0–11	–
8	**Non-Native Grasses/Grass-Likes**			11–56	
	cheatgrass	BRTE	*Bromus tectorum*	0–56	–

	bluegrass	POA	*Poa*	11–56	–
Forb					
9	**Forbs**			56–112	
	Forb, annual	2FA	*Forb, annual*	0–56	–
	Forb, perennial	2FP	*Forb, perennial*	0–34	–
	tarragon	ARDR4	*Artemisia dracunculus*	11–34	–
	Missouri goldenrod	SOMI2	*Solidago missouriensis*	11–34	–
	vervain	VERBE	*Verbena*	11–34	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	11–22	–
	white heath aster	SYER	*Symphyotrichum ericoides*	11–22	–
	spiderwort	TRADE	*Tradescantia*	0–22	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–22	–
	thistle	CIRSI	*Cirsium*	0–22	–
	blazing star	LIATR	*Liatris*	0–11	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–11	–
	beardtongue	PENST	*Penstemon*	0–11	–
	scurfpea	PSORA2	*Psoralidium*	0–11	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–11	–
Shrub/Vine					
10	**Shrubs**			56–168	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–56	–
	leadplant	AMCA6	*Amorpha canescens*	11–56	–
	rose	ROSA5	*Rosa*	11–56	–
	pricklypear	OPUNT	*Opuntia*	11–34	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–11	–
	soapweed yucca	YUGL	*Yucca glauca*	0–11	–
Tree					
11	**Trees**			56–168	
	eastern redcedar	JUVI	*Juniperus virginiana*	56–168	–

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. 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 well drained portions of this site. Normal rainfall is limited to 18-22 inches per year. Soils on this site are in Hydrologic Soil Group A and B. Some areas have high water tables. On well drained portions of this site, infiltration potential is high. On well drained areas, significant runoff is expected to occur only during intense storms (refer to Section 4, NRCS National Engineering Handbook for runoff quantities and hydrologic curves).

For the interpretive plant community, rills and gullies should not typically be present. Water flow patterns should be

barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses such as little bluestem. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present but only cover 1-2% of the soil surface. Overall this site has the appearance of being very stable and productive.

Recreational uses

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

Other products

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

Other references

High Plains Regional Climate Center, University of Nebraska, 830728 Chase Hall, Lincoln, NE 68583-0728. (http://hpccsun.unl.edu)

USDA, NRCS. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://wcc.nrcs.usda.gov)

USDA, NRCS. National Range and Pasture Handbook, September 1997

USDA, NRCS. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (http://nasis.nrcs.usda.gov)

USDA, NRCS, 2002. National Soil Survey Handbook, title 430-VI. (http://soils.usda.gov/procedures/handbook/main.htm)

Contributors

Dana Larsen

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	08/01/2006
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.

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3. **Number and height of erosional pedestals or terracettes:** Typically non-existent, but steeper areas may have limited pedastalling of bunchgrasses. No exposed roots should be present.

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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.

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

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

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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 smallest size class litter is possible, but not normal.

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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 aggregate 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 (pre-wetting may be necessary to initially hold aggregates together).

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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 6 to 20 inches thick (or greater) with mollic (dark) colors when moist. Structure typically is medium to fine granular at least in the upper A-horizon (some soils may be subangular blocky parting to granular).

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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.

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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.

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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: Tall warm-season rhizomatous grasses >>

    Sub-dominant: Mid, warm-season bunchgrasses > mid, cool-season grasses >

    Other: Short, warm-season grasses = grass-like species = forbs > shrubs

Additional: Other grasses in other functional groups occur in minor amounts.

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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 typically 60 to 80 percent, with depth 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 1,800 to 3,000 pounds/acre, with the reference value being 2,400 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, Kentucky bluegrass.

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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.
