

Ecological site R071XY024NE

Subirrigated

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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.

MLRA notes

Major Land Resource Area (MLRA): 071X—Central Nebraska Loess Hills

MLRA 71 is named “The Central Nebraska Loess Hills” and is located exclusively in Nebraska. The approximately 5.3 million acre landscape covers all or parts of 21 counties, primarily Custer, Dawson, Buffalo, Sherman, Howard, Valley, Greeley, and Hall. The physical appearance of the landscape is dominated by loess hills dissected by the North, Middle, and South Loup Rivers and their tributaries. The Platte River defines the southern border. The elevation in MLRA 71 ranges from over 3,000 to less than 1,700 feet above sea level, with average local relief stretching from 20 to 200 feet. Average annual precipitation ranges from 21 to 26 inches, with the number of freeze-free days averaging around 200. Loess overlays the surface of almost all of the uplands in this MLRA. Alluvial clay, silt, sand, and gravel are deposited in the stream and river valleys and can be extensive in the major drainages. Terraces are common in the valleys along the river systems. The predominate soil orders are mesic, udic Mollisols and Entisols, commonly represented by the Coly, Uly, Cozad, Hord, Hall, and Holdrege soil series. The matrix vegetation type is mixed-grass prairie, with big and little bluestem, switchgrass, Indiangrass, and sideoats and blue grama making up the bulk of the warm-season species, while western wheatgrass is the dominant cool-season species. The primary large-patch vegetative component of the landscape is dominated by needle and thread, prairie sandreed, sand and little bluestem, and blue grama. The majority of the small-patch communities are associated with upland playas and the wetter sites found along the floodplains. Forty four percent of the land in this MLRA has been broken out of native prairie and farmed; mostly corn, alfalfa, and some soybeans, while 48 percent of the grasslands remain intact. Livestock grazing, primarily cattle, is a major industry here. Wildlife flourishes in this combination of crop and grassland environment, with both mule and white-tailed deer being the most abundant wild ungulate. A variety of smaller species, including coyote, raccoon, opossum, porcupines, muskrat, beaver, squirrel, and mink thrive in the region, as well as a suite of grassland and upland birds. The rivers, streams, and lakes harbor excellent fisheries. This landscape developed under Northern Great Plains climatic conditions, light to severe grazing by bison and other large herbivores, and repeated natural or man-caused wildfire. Other biotic and abiotic factors also typically influence soil and site development. This is a disturbance driven ecosystem, evolving under the influences of herbivory, fire, and variable climate. Historically, these processes created a heterogenous mosaic of plant communities and structure heights across the region. Any given site in this landscape experienced fire every 7 to 9 years. The fires were caused both by lightning strikes, and were set by native Americans, who used fire for warfare, signaling, and to refresh the native grasses. These people understood the value of fire as a tool, and that the highly palatable growth following a fire provided both excellent forage for their horses and attracted grazing game animals such as bison and elk. Fragmentation of the native grasslands by conversion to cropland, transportation corridors, and other development by European man has effectively disrupted the natural fire regime of this ecosystem. This has allowed encroachment by native and introduced shrubs and trees into the remnants of the native prairie throughout the MLRA. Aggressive fire suppression policies have exacerbated this process to the point that shrub and tree encroachment is a major ecological issue in the majority of both native and re-seeded grasslands. Even as post European settlement's alteration of the fire regime allows the expansion of the woody component of the native prairie, introduction of eastern redcedar as a windbreak component further facilitates invasion by this species. While eastern redcedar is native to Nebraska, the historic population in MLRA 71 was limited to isolated pockets in rugged river drainages that were subsequently insulated from fire, or non-existent. Widespread plantings of windbreaks with eastern redcedar as a primary component has established a seed source for the aggressive woody plant. The ensuing encroachment into the native grasslands degrades the native wildlife habit and causes significant forage loss for domestic livestock. However, since it is not a root-sprouter, eastern redcedar is very susceptible to fire when under six feet tall. Management with prescribed fire is exceedingly effective if applied before this stage. Larger eastern redcedars can also be controlled with fire but requires the use of specially designed ignition and suppression techniques.

Classification relationships

Major Land Resource Area (MLRA): Major Land Resource Area (MLRA)71. (USDA-Natural Resources Conservation Service, 2006)
Revision Notes: A PROVISIONAL ECOLOGICAL SITE is a conceptual grouping of soil map unit components within a Major Land Resource Area (MLRA) based on the similarities in response to management. Although there may be wide variability in the productivity of the soils grouped into a Provisional Site, the soil vegetation interactions as expressed in the State and Transition Model are similar and

the management actions required to achieve objectives, whether maintaining the existing ecological state or managing for an alternative state, are similar. Provisional Sites are likely to be refined into more precise group during the process of meeting the APPROVED ECOLOGICAL SITE DESCRIPTION criteria.

Ecological site concept

The Subirrigated ecological site occupies a run-on landscape position and is associated with stream and river valleys. The slope is less than 3 percent, and there are no visible surface salts. The depth to the water table is 12 to 42 inches.

Associated sites

R071XY028NE	Loamy Lowland The Loamy Lowland ecological site is often upslope and adjacent to the Subirrigated ecological site.
R071XY036NE	Loamy Upland The Loamy Upland ecological site is often located adjacent to but higher on the landscape than the Subirrigated ecological site.

Similar sites

R071XY052NE	Saline Subirrigated The Saline Subirrigated ecological site is similar to the Subirrigated ecological site but is saline and has a stronger presence of alkali sacaton and inland saltgrass.
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Figure 1. Block diagram

Table 2. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Andropogon gerardii</i> (2) <i>Panicum virgatum</i>

Physiographic features

The Subirrigated site occurs on nearly level to very gently sloping areas along floodplains in river valleys with moderately high water tables, and on lower levels of terraces in river valleys. It is subject to flooding unless it is positioned on stream terraces. This site receives runoff from areas higher on the landscape.

Table 3. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace
Runoff class	Negligible to medium

Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	500 – 940 m
Slope	0 %
Water table depth	30 – 110 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 22 to 26 inches per year. Hourly winds are estimated to average about 14 miles per hour annually. Occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour. Growth of native cool-season plants begins in early April and continues to about mid-June. Native warm-season plants begin growth in early June and continue to early August. Green up of cool-season plants may occur in September and October.

Table 4 Representative climatic features

Frost-free period (characteristic range)	120-130 days
Freeze-free period (characteristic range)	140-150 days
Precipitation total (characteristic range)	580-660 mm
Frost-free period (actual range)	120-140 days
Freeze-free period (actual range)	130-170 days
Precipitation total (actual range)	580-690 mm
Frost-free period (average)	130 days
Freeze-free period (average)	150 days
Precipitation total (average)	640 mm

- (1) ANSELMO 2 SE [USC00250245], Anselmo, NE
- (2) MASON CITY [USC00255250], Mason City, NE
- (3) ARNOLD [USC00250355], Arnold, NE
- (4) CENTRAL CITY [USC00251560], Central City, NE
- (5) GOTHENBURG [USC00253365], Gothenburg, NE
- (6) NORTH LOUP [USC00256040], North Loup, NE
- (7) RAVENNA [USC00257040], Ravenna, NE
- (8) BROKEN BOW 2 W [USC00251200], Broken Bow, NE
- (9) BURWELL [USC00251345], Burwell, NE
- (10) CANADAY STEAM PLT [USC00251450], Lexington, NE
- (11) COMSTOCK [USC00251835], Comstock, NE
- (12) OCONTO [USC00256167], Oconto, NE
- (13) OVERTON 3 W [USC00256439], Overton, NE
- (14) STAPLETON 5W [USC00258133], Stapleton, NE
- (15) TAYLOR [USC00258455], Taylor, NE
- (16) KEARNEY 4 NE [USC00254335], Kearney, NE
- (17) LOUP CITY [USC00254985], Loup City, NE
- (18) SAINT PAUL [USC00257515], Saint Paul, NE
- (19) GRAND ISLAND AP [USW00014935], Grand Island, NE

Influencing water features

This ecological site has a combination of physical and hydrological features that: 1) normally has partial growing season groundwater within the root zone (2 feet to 3 feet), 2) allowing relatively free movement of water and air (aerobic conditions) throughout the upper half of the root zone, and 3) normally is not ponded or flooded during the growing season in most years.

Soil features

The soils in this site are predominantly somewhat poorly drained, but inclusions of moderately well drained soils occur within some of the listed series. These soils are generally very deep, but some are shallow over coarse sand. The surface soil is generally dark colored and ranges from 7 to 38 inches thick. Less common are light colored soils with a surface soil of less than 7 inches thick. Organic matter content of the surface layer is generally moderate. The underlying material is lighter colored than the surface soil, and commonly has redoximorphic concentrations (soft masses of iron oxide) in the upper part. It ranges widely in texture from clay loam to gravelly coarse sand. Some of the soils in this site are calcareous at or near the surface.

The major soil series correlated to this ecological site include: Alda, Boel, Bolent, Caruso, Cozad (wet phase), Fonner, Gibbon, Lamo, Leshara, Lex, Libory, Lockton, Merrick, Novina, Platte, Ord, Ovina, Wann. More information can be found in the various soil survey reports. Contact the local USDA Service Center for internet links to soil survey data that includes more details specific to your location.

Figure 7. Gibbon series profile

Table 5. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Silt loam (2) Loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to moderately well drained

Permeability class	Moderately slow to rapid
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	4.83 – 23.88 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 40 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	5.6 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 30 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

This site occurs on nearly level areas that are often adjacent to streams or rivers. The site is subirrigated by groundwater that ranges from 24 to 42 inches below the surface throughout the growing season. The availability of water has a major influence on the vegetation that will persist on this site. This site is subject to occasional flooding.

Even as post European settlement's alteration of the fire regime allows the expansion of the woody component of the native prairie, introduction of eastern redcedar as a windbreak species has compounded the issue. While eastern redcedar is native to Nebraska, the historic population in MLRA 71 was limited to isolated pockets in rugged river drainages that were subsequently insulated from fire, or non-existent. Widespread plantings of windbreaks with eastern redcedar as a primary component has provided a seed source for the aggressive woody plant. The ensuing encroachment into the native grasslands degrades the native wildlife habit and causes significant forage loss for domestic livestock. However, since it is not a root sprouter, eastern redcedar is very susceptible to fire when under six feet

tall. Management with prescribed fire is exceedingly effective if applied before this stage.

Continuous grazing without adequate recovery periods following each grazing or haying occurrence will cause species such as Kentucky bluegrass and other cool-season grasses to increase. The tall- and midgrass species, such as big bluestem, little bluestem, Indiangrass, and switchgrass decrease in frequency and production. Continued defoliation without adequate recovery periods causes the plant community to shift to cool-season grass species. There will be a drastic shift in forb composition as well. The general response of this site to long term continuous grazing or annual summer haying in July is to gradually lose the vigor and reproductive potential of the tall and mid-grass species and shift the plant community toward shortgrass species.

This site and adjacent level sites are preferred by livestock, which can lead to grazing distribution problems. Water locations, salt placement, and other aids help distribute grazing on this site. Other management techniques such as prescribed grazing help distribute grazing more evenly. Grazing and haying management that includes proper stocking with adequate rest periods or alternating the frequency and timing of annual haying will maintain the production potential of the site. Where more rapid improvement is desired, a rotational grazing or haying system is desirable. Concentrated grazing, combined with needed rest periods, can be beneficial in improving forage utilization.

The reference plant community has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short-duration and time controlled grazing, and historical accounts.

The State and Transition Model (STM) is depicted below, and includes a Reference State, a Native/Invaded Grass State, an Invaded Grass State, and an Invaded Woody State. 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.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Warm-Season Tallgrass			2001-2858	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	1429-2287	25-40
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	572-1143	10-20
	switchgrass	PAVI2	<i>Panicum virgatum</i>	286-857	5-15
	prairie cordgrass	SPPE	<i>Spartina pectinata</i>	286-572	5-10
	marsh muhly	MURA	<i>Muhlenbergia racemosa</i>	0-286	0-5
2	Warm-Season Midgrass			857-1429	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	857-1429	15-25
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	0-572	0-10
	purple lovegrass	ERSP	<i>Eragrostis spectabilis</i>	0-286	0-5
3	Cool-Season Rhizomatous Grass			114-286	
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	0-286	0-5
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0-286	0-5
	plains bluegrass	POAR3	<i>Poa arida</i>	0-171	0-3
	prairie wedgescale	SPOB	<i>Sphenopholis obtusata</i>	0-171	0-3
4	Cool-Season Bunch Grass			57-286	
	Canada wildrye	ELCA4	<i>Elymus canadensis</i>	0-286	0-5
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0-286	0-5
	porcupinegrass	HESP11	<i>Hesperostipa spartea</i>	0-286	0-5
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	0-171	0-3
5	Other Grasses			0-286	

	Grass, perennial	2GP	<i>Grass, perennial</i>	0-171	0-3
	reed canarygrass	PHAR3	<i>Phalaris arundinacea</i>	0-171	0-3
6	Grass-Like			286-572	
	sedge	CAREX	<i>Carex</i>	57-400	1-7
	Sartwell's sedge	CASA8	<i>Carex sartwellii</i>	57-286	1-5
	awlfruit sedge	CAST5	<i>Carex stipata</i>	0-286	0-5
	Grass-like (not a true grass)	2GL	<i>Grass-like (not a true grass)</i>	0-286	0-5
	rush	JUNCU	<i>Juncus</i>	0-286	0-5
	bulrush	SCHOE6	<i>Schoenoplectus</i>	0-286	0-5
	spikerush	ELEOC	<i>Eleocharis</i>	0-171	0-3
Forb					
8	Forbs			286-572	
	Forb, native	2FN	<i>Forb, native</i>	57-286	1-5
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	57-171	1-3
	American licorice	GLLE3	<i>Glycyrrhiza lepidota</i>	57-171	1-3
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	57-171	1-3
	stiff sunflower	HEPA19	<i>Helianthus pauciflorus</i>	0-171	0-3
	upright prairie coneflower	RACO3	<i>Ratibida columnifera</i>	0-114	0-2
	Canada goldenrod	SOCA6	<i>Solidago canadensis</i>	0-114	0-2
	white heath aster	SYER	<i>Symphyotrichum ericoides</i>	57-114	1-2
	tall blazing star	LIAS	<i>Liatris aspera</i>	57-114	1-2
	stiff goldenrod	OLRI	<i>Oligoneuron rigidum</i>	57-114	1-2
	Pennsylvania smartweed	POPE2	<i>Polygonum pensylvanicum</i>	0-114	0-2
	showy milkweed	ASSP	<i>Asclepias speciosa</i>	57-114	1-2
	false boneset	BREU	<i>Brickellia eupatorioides</i>	0-114	0-2
	white prairie clover	DACA7	<i>Dalea candida</i>	0-114	0-2
	purple prairie clover	DAPU5	<i>Dalea purpurea</i>	57-114	1-2
	Illinois bundleflower	DEIL	<i>Desmanthus illinoensis</i>	0-114	0-2
	western yarrow	ACMIO	<i>Achillea millefolium var. occidentalis</i>	57-114	1-2
	autumn onion	ALST	<i>Allium stellatum</i>	0-114	0-2
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	57-114	1-2
	smooth horsetail	EQLA	<i>Equisetum laevigatum</i>	0-57	0-1
	swamp verbena	VEHA2	<i>Verbena hastata</i>	0-57	0-1
	prairie groundsel	PAPL12	<i>Packera plattensis</i>	0-57	0-1
Shrub/Vine					
9	Shrubs			0-286	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-171	0-3
	leadplant	AMCA6	<i>Amorpha canescens</i>	0-171	0-3
	rose	ROSA5	<i>Rosa</i>	0-171	0-3
	willow	SALIX	<i>Salix</i>	0-171	0-3
	western snowberry	SYOC	<i>Symphoricarpos occidentalis</i>	0-171	0-3
	western poison ivy	TORY	<i>Toxicodendron rydbergii</i>	0-57	0-1

Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 4.1 plant community composition

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

LIVESTOCK - GRAZING INTERPRETATIONS: 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. 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. The following table lists suggested initial stocking rates for cattle under average growing conditions. These are 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/vegetative state (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 herbivores other than cattle are involved. Under more intensive management systems, improved harvest efficiencies can result in an increased carrying capacity. Plant Community, Total Production (RV), and Carrying Capacity* Community 1.1, Reference Community: 5100 lbs./acre and 1.39 AUM/acre Community 1.2, Degraded Native Grass Community: 4000 lbs./acre and 1.09 AUM/acre Community 2.1, Rhizomatous Cool-Season Grass Community: 3250 lbs./acre and 0.89 AUM/ac * Continuous growing season-long grazing by cattle under average growing conditions (utilizing 50% of usable production or 25% harvest efficiency). AUM = The amount of forage required by one animal unit (one mature cow weighing 1000 lbs. and her calf as old as 3 months, or their equivalent) for one month or 912 pounds of air dry forage. **WILDLIFE INTERPRETATIONS:** Major Land Resource Area (MLRA) 71 lies primarily within the Mixed-grass prairie ecosystem. Though European settlers have converted about half of this landscape to farmland, a significant portion 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 brome grass, Kentucky bluegrass, nodding plumeless thistle (musk thistle), and Canada thistle further degrade the biological integrity of many areas of the prairie.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group A and B. Infiltration is moderate and runoff potential for this site varies from moderately poor to poor depending on ground cover. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to NRCS Section 4, National Engineering Handbook (NEH-4) for runoff quantities and hydrologic curves).

Recreational uses

This site provides excellent hunting areas and as it attracts many different species of birds, is popular for bird watching as well. The wide varieties 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.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel was also used. Those involved in developing this site include Dana Larsen, State Rangeland Management Specialist, NRCS; Chuck Markley, Resource Soil Scientist, NRCS; and Neil Dominy, Resource Soil Scientist, NRCS. Field Offices: Albion, Broken Bow, Burwell, Central City, Fullerton, Grand Island, Greeley, Kearney, Lexington, Loup City, North Platte, Ord, St. Paul, Thedford

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Approval

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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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Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** None. Litter movement is not expected to occur on this site.

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Soil stability ratings will be 5 to 6, typically 6. Interspaces are quite small and there should be no difference between interspaces and under canopy. High root content and organic matter will be present in the soil surface.

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): The A-horizon averages 7 inches (17.8 cm) thick, grayish brown (10YR 5/1) to very dark grayish brown (10YR 2/1) moist; weak medium, very fine granular to subangular blocky structure.

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Plant community composition of 85 to 90 percent perennial grasses and grass-like, 5 to 10 percent forbs, and 0 to 2 percent shrubs will optimize infiltration on the site. The grass and grass-like component is made up of native, perennial, warm-season, tall, rhizomatous grasses (40-50%), native, perennial, warm-season, mid-grasses (15-30%), native, perennial, cool-season, rhizomatous grasses (2-5%), native, perennial, cool-season, bunch grasses (1-5%), and grass-like (5-10%)..

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None. No compaction layers occur naturally on this site.

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 warm-season, tallgrass, 1785-2550#/ac, 35-50% (4 species minimum): big bluestem, Indiangrass, prairie cordgrass, switchgrass, marsh muhly. Phase 1.2 1. Native, perennial, warm-season, midgrass (2 species minimum): little bluestem, purple lovegrass, sideoats grama.

Sub-dominant: Phase 1.1 1. Native, perennial, warm-season midgrass, 765-1275 #/ac, 15-25% (1 species minimum): little bluestem, purple lovegrass, sideoats grama. Phase 1.2 1. Native, perennial warm-season, tallgrass (3 species minimum): big bluestem, Indiangrass, prairie cordgrass, switchgrass, marsh muhly. 2. Native, perennial, cool-season, rhizomatous grass (1 species minimum): western wheatgrass. 3. Native forbs (4 species minimum): Cuman ragweed, Baldwin's ironweed, swamp verbena, white sagebrush and other forbs which vary from location to location.

Other: Minor - Phase 1.1 1. Grass-like, 255-510 #/ac, 5-10%: sedges. 2. Native forb (annual and perennial), 255-510 #/ac, 5-10%: forbs present vary from location to location. 3. Native, perennial, cool-season, rhizomatous grass, 102-255 #/ac, 2-5%: western wheatgrass. 4. Native, perennial, cool-season, bunch grass, 51-255 #/ac, 1-5%: Canada wildrye, needle and thread, porcupinegrass, foxtail barley, slender wheatgrass, plains bluegrass. 5. Shrub, 0-255 #/ac, 0-5%: leadplant, rose, willow, western snowberry, western poison ivy. Minor - Phase 1.2 1. Native, perennial, cool-season, bunchgrass: Canada wildrye, needle and thread, porcupinegrass, foxtail barley, slender wheatgrass, plains bluegrass, prairie wedgescale. 2. Grass-like: sedges. 3. Shrubs: leadplant, rose, willow, western snowberry, western poison ivy.

Additional: The Reference Community (1.1) consists of seven F/S Groups. These groups in order of expected abundance are native, perennial, warm-season, tallgrass; native, perennial, warm-season, midgrass; grass-like; forbs (perennial and annual); native, perennial, cool-season, rhizomatous grass; native perennial, cool-season, bunch grass; and shrubs. The Degraded Native Grass Community (1.2) also consists of seven F/S Groups. These groups in order of expected abundance are native, perennial, warm-season, midgrass; native, perennial, warm-season tallgrass; native, perennial, cool-season rhizomatous grass; native forbs (perennial and annual), native, perennial, cool-season bunch grass; grass-like; and shrubs.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**
A few (less than 3 percent) dead centers may occur in bunchgrasses. 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 90 to 95 percent and at a depth of 0.75 inches (1.9 cm). Kentucky bluegrass excessive litter or tree encroachment can negatively impact the functionality of this site.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**
Production is shown in air-dry values. The Representative Value (RV) = 5,100 pounds per acre. Low production years = 4,400 pounds per acre. High production years = 5,600 pounds per acre.
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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. Kentucky bluegrass, smooth brome, Caucasian bluestem, eastern redcedar, honey locust, nodding plumeless thistle (musk thistle), Canada thistle, common mullein, and sericea lespedeza are known invasives that have the potential to be dominant or co-dominant on the site. Consult the state noxious weed and state watch lists for potential invasive species on each ecological site. **NOTE:** Invasive plants (for the purposes of the IIRH protocol) are plant species that are typically not found on the ecological site or should only be in trace or minor categories under the natural disturbance regime and have the potential to become a dominant or codominant species on the site if their establishment and growth are not actively controlled by natural disturbances or management interventions. Species listed characterize degraded states AND have the potential to become a dominant or co-dominant species.
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17. **Perennial plant reproductive capability:** All perennial species exhibit high vigor relative to climatic 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.
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