USDA Natural Resources Conservation Service

Ecological site R067AY162WY
Shallow (Sw)

Last updated: 9/07/2023
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.

MLRA notes

Major Land Resource Area (MLRA): 067A–Central High Plains, Northern Part

MLRA 67A-Central High Plains, Northern Part is located in southeastern Wyoming (58 percent), the southwestern portion of the Nebraska panhandle (38 percent), and extreme northeastern Colorado (4 percent). It is comprised of rolling plains, upland breaks, and river valleys. The major rivers are the North Platte and Laramie. The headwaters of these systems are in the Rocky Mountains. Other tributaries include Crow, Horse, and Lodgepole Creeks. This MLRA is traversed by Interstate 25 and Interstate 80, and by U.S. Highways 26, 30 and 85. Major land uses include rangeland (71 percent), cropland (21 percent), pasture and hayland (1 percent), urban (3 percent), and miscellaneous (4 percent). Cities in this area include Cheyenne, Torrington, and Wheatland, WY; and Kimball, Oshkosh, and Scottsbluff, NE. Land ownership is mostly private. Areas of interest include Scotts Bluff National Monument, Chimney Rock and Fort Laramie National Historic Sites; Hawk Springs, Lake Minatare, and Wildcat Hills State Recreation Areas; Ash Hollow and Guernsey State Parks.

The elevations in MLRA 67A range from approximately 3,300 to 6,200 feet. The average annual precipitation in this area ranges from 13 to17 inches per year, but may increase up to 18 inches per year, in localized areas. Precipitation occurs mostly during the growing season from rapidly developing thunderstorms. Mean annual air temperature ranges from 47 degrees Fahrenheit in the western part to 52 degrees Fahrenheit in the eastern part. Summer temperatures may exceed 100 degrees Fahrenheit. Winter temperatures may drop to sub-zero, and snowfall varies from 20 to 50 inches per year.

Classification relationships

MLRA 67A is in the Western Great Plains Range and Irrigation Land Resource Region. It is in the High Plains Section, of the Great Plains Province, of the Interior Plains (USDA, 2006). MLRA's can be defined by climate, landscapes, geology, and annual precipitation zones (PZ). Other features such as landforms, soil properties, and key vegetation further refine these concepts, and are described at the Ecological Site Description (ESD) level.

Revision Notes:
The Shallow site was developed by an earlier version of the Shallow Loamy and Shallow Sandy ESD's (2005, updated 2008). The earlier version of the Shallow Loamy and Shallow Sandy ESD's were based on input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Shallow Limy Range Site Description (1981). This ESD meets the Provisional requirements of the National Ecological Site Handbook (NESH). This ESD will continue refinement towards an Approved status according to the NESH.

Ecological site concept

The Shallow ecological site is a run-off site with a soil surface that is 10 to 20 inches above sandstone or siltstone bedrock.

Associated sites

R067AY122WY	**Loamy (Ly)** This ecological site is commonly adjacent.
R067AY150WY	**Sandy (Sy)** This ecological site is commonly adjacent.
R067AY176WY	**Very Shallow (VS)** This ecological site is commonly adjacent.

Similar sites

R067AY150WY	**Sandy (Sy)** The Sandy Ecological Site has a soil surface that is more than 20 inches over bedrock.
R067AY122WY	**Loamy (Ly)** The Loamy Ecological Site has a soil surface that is more than 20 inches over bedrock.
R067AY176WY	**Very Shallow (VS)** The Very Shallow Ecological Site has a soil surface that is less than 10 inches over bedrock and often has exposed bedrock.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Cercocarpus montanus* (2) *Krascheninnikovia lanata*
Herbaceous	(1) *Hesperostipa comata* (2) *Schizachyrium scoparium*

Physiographic features

This site occurs on shoulders or summits of hills, crests or side slopes of ridges, and escarpments on upland breaks. The slopes on these landforms range from 6 to 30 percent, and some areas can range as high as 60 percent.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Escarpment
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,067–2,134 m
Slope	6–30%
Water table depth	203–508 cm
Aspect	Aspect is not a significant factor

Climatic features

Wide fluctuations in precipitation may occur from year to year, as well as occasional periods of drought (longer than one year in duration). Two-thirds of the annual precipitation occurs during the growing season from April to September. The mean annual air temperature (MAAT) ranges from 47 degrees Fahrenheit in the western part to 52 degrees Fahrenheit in the eastern part. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may also occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during

the late winter and spring months. High-intensity afternoon thunderstorms may arise in summer. Wind speed averages about 8 miles per hour, ranging from 10 during the spring to 7 during late summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 75 mph. The average length of the freeze-free period (28 degrees Fahrenheit) is 150 days from May 4 to October 1. The average frost-free period (32 degrees Fahrenheit) is 128 days from May 16 to September 21. Growing season increases from west to east (Wyoming to Nebraska). Growth of native cool-season plants begins about April 1 and continues to mid-June. Native warm-season plants begin growth about May 15 and continue to about August 15. Regrowth of cool-season plants occur in September in most years, depending upon moisture.

Table 3. Representative climatic features

Frost-free period (characteristic range)	85-117 days
Freeze-free period (characteristic range)	119-135 days
Precipitation total (characteristic range)	406-432 mm
Frost-free period (actual range)	84-123 days
Freeze-free period (actual range)	116-137 days
Precipitation total (actual range)	356-457 mm
Frost-free period (average)	103 days
Freeze-free period (average)	128 days
Precipitation total (average)	406 mm

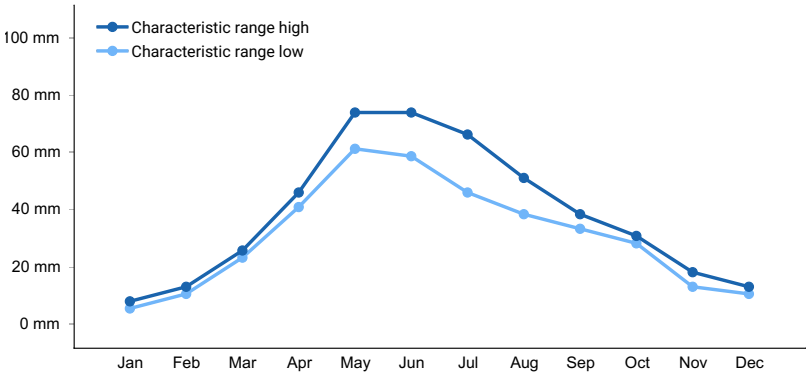


Figure 1. Monthly precipitation range

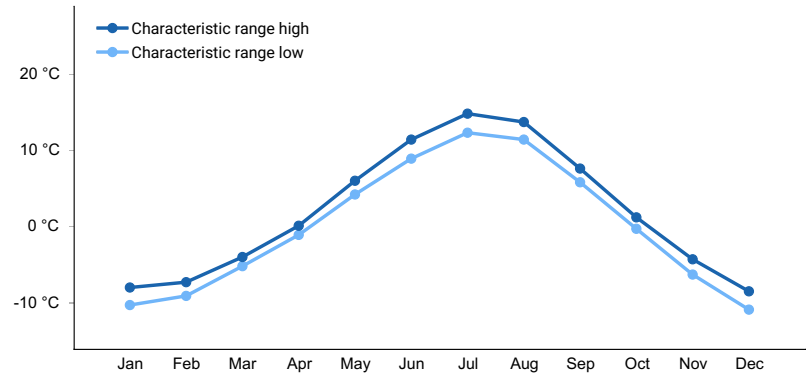


Figure 2. Monthly minimum temperature range

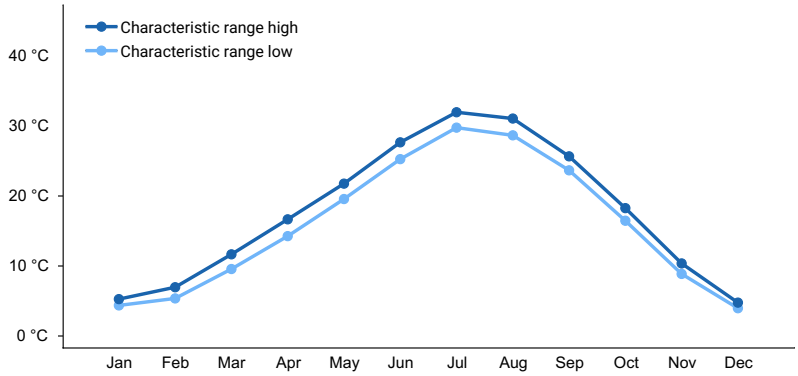


Figure 3. Monthly maximum temperature range

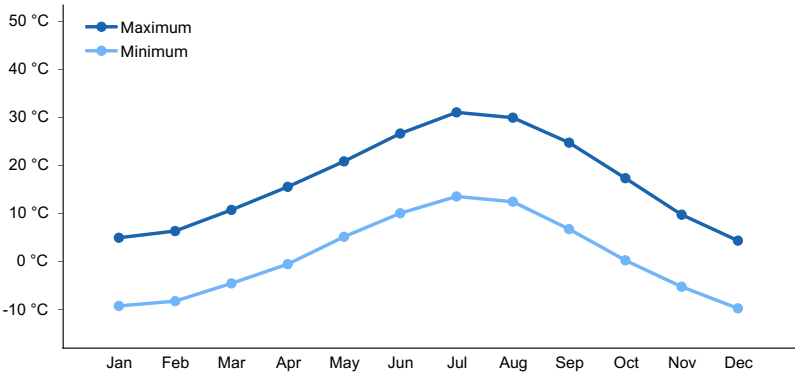


Figure 4. Monthly average minimum and maximum temperature

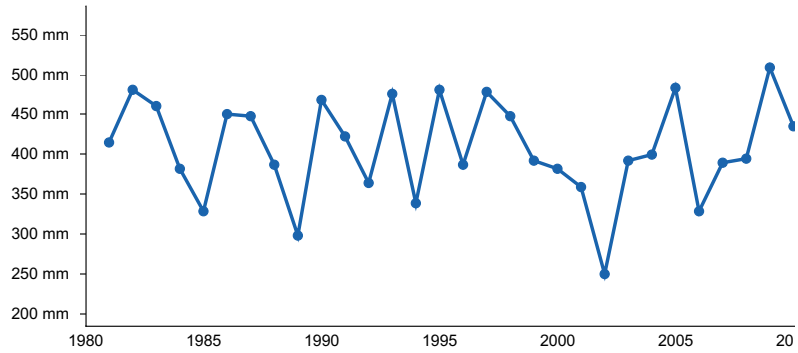


Figure 5. Annual precipitation pattern

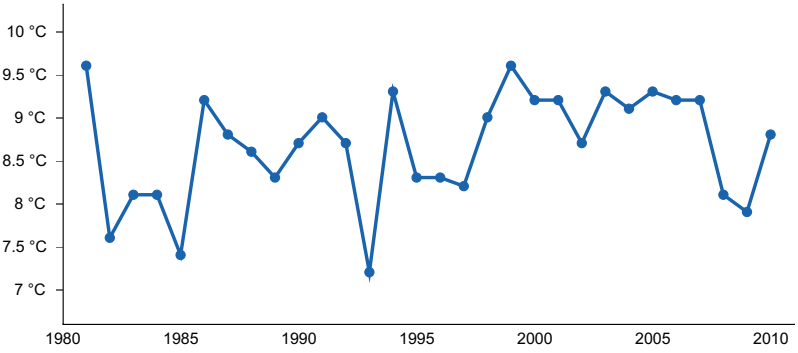


Figure 6. Annual average temperature pattern

Climate stations used

- (1) CHUGWATER [USC00481730], Chugwater, WY
- (2) OLD FT LARAMIE [USC00486852], Yoder, WY
- (3) PHILLIPS [USC00487200], LaGrange, WY

- (4) WHEATLAND 4 N [USC00489615], Wheatland, WY
- (5) SCOTTSBLUFF HEILIG AP [USW00024028], Scottsbluff, NE
- (6) CHEYENNE [USW00024018], Cheyenne, WY
- (7) BRIDGEPORT [USC00251145], Bridgeport, NE
- (8) KIMBALL 2NE [USC00254440], Kimball, NE
- (9) OSHKOSH [USC00256385], Oshkosh, NE
- (10) HARRISBURG 12WNW [USC00253605], Harrisburg, NE

Influencing water features

There are no water features associated with this ecological site that influence the vegetation or management of the site.

Soil features

The soils on this site are shallow, well to somewhat excessively drained soils that formed from residuum derived from sandstone or siltstone. They typically have a moderate to moderately rapid permeability class, but range to moderately slow in some soils. The available water capacity is very low to low. Available water is the portion of water in a soil that can be readily absorbed by plant roots. The soil moisture regime is typically aridic ustic. The soil temperature regime is mesic.

The surface layer of the soils in this site are typically fine sandy loam, loam, or silt loam, but may include very fine sandy loam or loamy fine sand. The surface layer ranges from a depth of 4 to 8 inches thick. The subsoil is typically fine sandy loam, silt loam, or loam, but may include very fine sandy loam, loamy very fine sand, or clay loam that may contain rock fragments. Soils in this site typically have carbonates throughout and to the soil surface, but some soils may be leached 3 to 6 inches. These soils are susceptible to erosion by water and wind. The potential for water erosion accelerates with increasing slope. Exposed areas of sandstone or siltstone bedrock are inherent to this site.

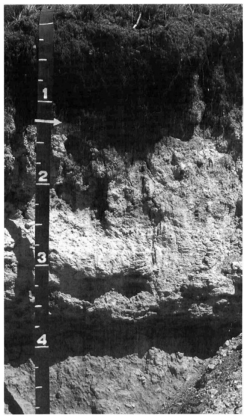
Surface soil structure is fine to medium granular, and structure below the surface is massive or subangular blocky. Soil structure describes the manner in which soil particles are aggregated and defines the nature of the system of pores and channels in a soil.

Major soil series correlated to this ecological site include: Blazon, Brownson, Canyon, Epping, Taluce, Tassel, and Treon.

Other soil series that have been correlated to this site include: Brownrigg, Lambman, Shingle, Tieside, and Wendover.

The attributes listed below represent 0-40 inches in depth or to the first restrictive layer.

Note: Revisions to soil surveys are on-going. For the most recent updates, visit the Web Soil Survey, the official site for soils information: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.



A typical profile of Tassel fine sandy loam, which formed In weathered calcareous sandstone. The arrow Indicates the top of the sandstone bedrock. Depth Is marked in feet.

Figure 7. Tassel fine sandy loam, Garden Co., NE

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and siltstone
Surface texture	(1) Fine sandy loam (2) Loam (3) Silt loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	25–51 cm
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–10%
Available water capacity (0-101.6cm)	2.54–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The information in this ESD, including the State-and-Transition Model (STM) diagram, was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a dynamic set of plant communities that represent the complex interaction of several ecological processes. The plant composition has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short duration/time controlled grazing strategies, and historical accounts.

The Shallow Ecological Site is characterized by three states: The Reference, Sod-bound, and Increased *Bare Ground*. The Reference State is characterized by cool-season mid rhizomatous grasses (western wheatgrass and streambank wheatgrass, also known as "thickspike" wheatgrass), warm-season mid rhizomatous (prairie sandreed) on sandier soils, warm-season and cool-season mid bunchgrasses (sideoats grama, little bluestem, and needle and thread) and warm-season shortgrass (blue grama). A minor component of grass-likes (threadleaf sedge), forbs, and shrubs, are also present. The Sod-bound State is characterized by warm-season shortgrass (blue grama) and grass-likes (threadleaf sedge). The Increased *Bare Ground* State is characterized by annual grasses (sixweeks fescue), forbs (curlycup gumweed, fringed sagewort, hairy false goldenaster, and annuals) and shrubs (snakeweed, yucca, and pricklypear). Invasives include cheatgrass.

As this site begins to deteriorate from a combination of frequent and severe grazing during the growing season, grasses such as little bluestem, sideoats grama, and needle and thread decrease in both frequency and production. Grasses such as blue grama and threadleaf sedge increase. Under continued frequent and severe defoliation with no rest periods, rhizomatous wheatgrasses and prairie sandreed also begin to decrease. Forbs and shrubs such as fringed sagewort, hairy false goldenaster, and broom snakeweed increase. If continued, the plant community will become sod-bound, and all mid- to tall grasses can eventually be removed from the plant community. Over the long-term, this continuous use in combination with high stock densities results in a broken sod, with areas of bare ground developing, and species such as broom snakeweed and annual bromes (cheatgrass) invading.

The degree of grazing has a significant impact on the ecological dynamics of the site. This region was historically occupied by large grazing animals, such as bison, elk, pronghorn, and mule deer. Grazing by these large herbivores, along with climatic and seasonal weather fluctuations, had a major influence on the ecological dynamics of the site. Deer and pronghorn are widely distributed throughout the MLRA. Secondary influences of herbivory by species such as prairie dogs and other small rodents, insects, and root-feeding organisms continues to impact the vegetation.

Historically, grazing patterns by herds of large ungulates were driven by water distribution, precipitation events, drought events, and fire. It is believed that grazing periods would have been shorter, followed by longer recovery periods. These large migrating herds impacted the ecological processes of nutrient and hydrologic cycles, by urination, trampling (incorporation of litter into the soil surface), and breaking of surface crust, (which increases water infiltration).

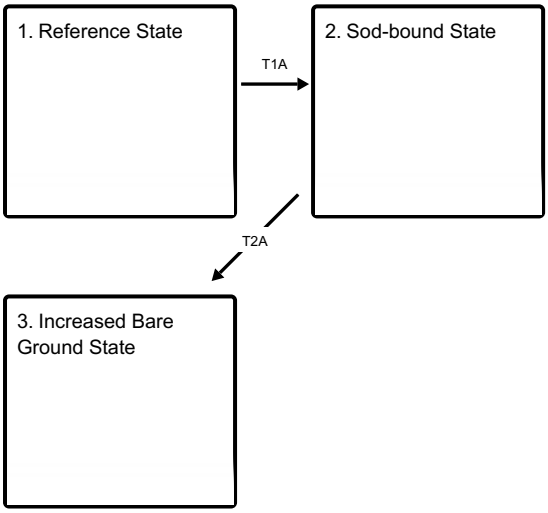
Today, livestock grazing, especially beef cattle has been a major influence on the ecological dynamics of the site. Grazing management, coupled with the effects of annual climatic variations, largely dictates the plant communities for the site.

Recurrent drought has historically impacted the vegetation of this region. Changes in species composition vary depending upon the duration and severity of the drought cycle and prior grazing management. Drought events since 2002 have significantly increased mortality of blue grama and buffalograss in some locales.

This site developed with occasional fire as part of the ecological processes. Historic fire frequency (pre-industrial) is estimated at 10 to14 years (Guyette, 2012), randomly distributed, and started by lightning at various times throughout the growing season. Early human inhabitants also were likely to start fires for various reasons (deliberate or accidental). It is believed that fires were set as a management tool for attracting herds of large migratory herbivores (Stewart, 2002). The impact of fire over the past 100 years has been relatively insignificant due to the human control of wildfires and the lack of acceptance of prescribed fire as a management tool.

State and transition model

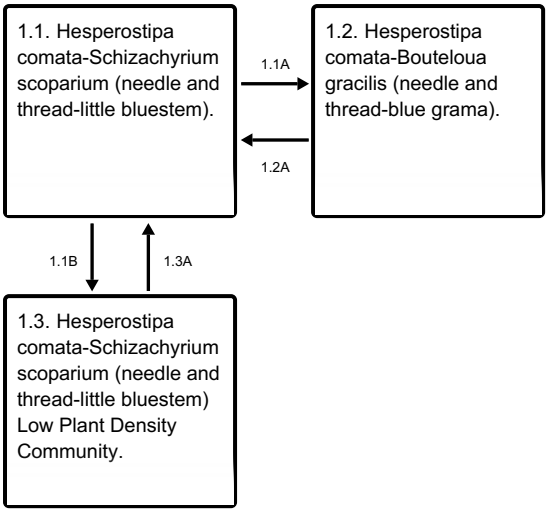
Ecosystem states



T1A - Excessive grazing. Lack of fire.

T2A - Excessive grazing. Lack of fire.

State 1 submodel, plant communities



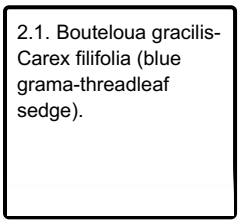
1.1A - Excessive grazing. Lack of fire.

1.1B - Non-use. Lack of fire.

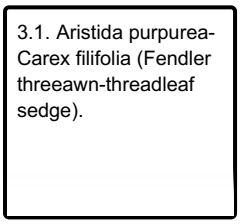
1.2A - Prescribed grazing. Prescribed fire.

1.3A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

The Reference State is characterized by three distinct plant community phases. The plant communities, and various successional stages between them, represent the natural range of variability within the Reference State.

Dominant plant species

- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- needle and thread (*Hesperostipa comata*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1
Hesperostipa comata-Schizachyrium scoparium (needle and thread-little bluestem).

This is the interpretive plant community for this site. It is well adapted to the Northern Great Plains climate. This community developed with grazing by large herbivores and is suited to grazing by domestic livestock. Historically, fires likely occurred infrequently, and were randomly distributed. This plant community can be found on areas where grazed plants receive adequate periods of recovery during the growing season. The potential vegetation is about 75

to 80 percent grasses and grass-likes, 10 to 15 percent forbs, and 0 to 5 percent woody plants. In the western portion of the MLRA, the plant community is predominately cool-season mid-grasses, with a significant component of warm-season mid-grasses. In the eastern portion of the MLRA, the plant community is predominantly warm-season with a significant cool-season component. The major grasses and grass-likes include needle and thread, little bluestem, blue grama, and rhizomatous wheatgrasses such as streambank (thickspike) and western wheatgrass. Secondary grasses include sideoats grama and prairie sandreed (on sandier soils). See Species Composition list for other grasses, forbs and shrubs. In the 12 to 14 inch Precipitation Zone (PZ), the total annual production (air-dry weight) is about 900 pounds per acre during an average year, but ranges from about 600 pounds per acre in unfavorable years to about 1,200 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 1,100 pounds per acre during an average year, but ranges from about 750 pounds per acre in unfavorable years to about 1,500 pounds per acre in above-average years. Community dynamics (nutrient and water cycles, and energy flow) are functioning properly. Infiltration rates are moderate, and soil erosion is low. Litter is properly distributed where vegetative cover is continuous. Some litter movement may occur on steeper, wind-swept slopes. Decadence and natural plant mortality are low. This community is resistant to many disturbances except heavy, continuous grazing, tillage, or development into urban or other uses. Areas having lost all vegetation, such as livestock and vehicle trails, are subject to wind and water erosion.

Dominant plant species

- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- needle and thread (*Hesperostipa comata*), grass
- little bluestem (*Schizachyrium scoparium*), grass

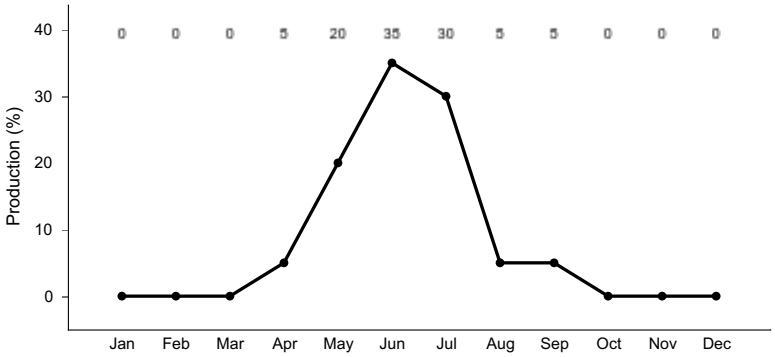


Figure 9. Plant community growth curve (percent production by month). WY1104, 12-14SP upland sites w/ warm. 12-14" Precipitation Zone, Southern Plains (SP) with warm-season (grass) species.

Community 1.2
Hesperostipa comata-Bouteloua gracilis (needle and thread-blue grama).

Grazing-tolerant species such as blue grama and threadleaf sedge have noticeably increased. On sandier soils, prairie sandreed has decreased. Little bluestem and sideoats grama are usually present as secondary grasses, especially on steeper slopes. Prairie clover species, and other palatable forbs are present in reduced amounts. Needle and thread may initially increase or decrease depending upon the season of grazing use. A cool-season/warm-season shift may occur depending on the pre-dominant season of use. Recurrent continuous grazing in the spring eventually reduces the cool-season grasses such as the needle and thread and the rhizomatous wheatgrasses. Likewise, recurrent continuous grazing in the summer reduces the warm-season bunchgrasses such as little bluestem and sideoats grama. Prairie clover species and other palatable forbs are present in reduced amounts. White sagebrush, Cuman ragweed (western ragweed), hairy false goldenaster, scurfpea species, small soapweed, and fringed sagewort have increased. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 700 pounds per acre during an average year, but ranges from about 450 pounds per acre in unfavorable years to about 950 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 850 pounds per acre during an average year, but ranges from about 550 pounds per acre in unfavorable years to about 1,150 pounds per acre in above-average years. Nearly all the plant species typically found in the Reference Plant Community are present and will respond to changes in grazing management. This plant community can become somewhat resistant to change, depending on how sod-bound the plant

community has become.

Dominant plant species

- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- needle and thread (*Hesperostipa comata*), grass
- blue grama (*Bouteloua gracilis*), grass

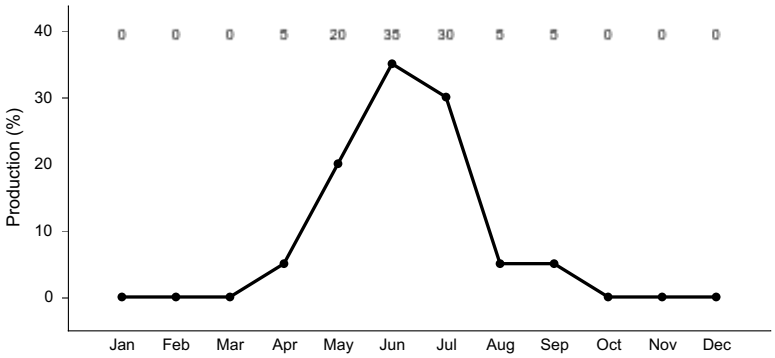


Figure 10. Plant community growth curve (percent production by month). WY1104, 12-14SP upland sites w/ warm. 12-14" Precipitation Zone, Southern Plains (SP) with warm-season (grass) species.

Community 1.3
Hesperostipa comata-Schizachyrium scoparium (needle and thread-little bluestem) Low Plant Density Community.

This plant community developed under many years of non-use and lack of fire. Plant species resemble the Reference Plant Community however, frequency and production are reduced. Eventually, litter levels can become high enough to cause decadence and mortality of the stand. Bunchgrasses such as little bluestem typically develop dead centers and rhizomatous grasses can form small decadent communities due to a lack of impact by grazing animals. Eventually, the interspaces between the plants increase in size leaving more soil surface exposed, causing an erosion concern. Cool-season grasses and cactus typically have increased. Blue grama is reduced. Noxious weeds such as leafy spurge and Dalmatian toadflax invade if a seed source is readily available. Invasive grasses such as cheatgrass tend to encroach under these conditions. In advanced stages of non-use or lack of fire, plants begin to die off and bare areas increase causing an erosion concern. Water flow patterns and pedestalling become apparent. Infiltration is reduced and runoff is increased. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 800 pounds per acre during an average year, but ranges from about 550 pounds per acre in unfavorable years to about 1,050 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 1,000 pounds per acre during an average year, but ranges from about 650 pounds per acre in unfavorable years to about 1,350 pounds per acre in above-average years.

Dominant plant species

- alderleaf mountain mahogany (*Cercocarpus montanus*), shrub
- winterfat (*Krascheninnikovia lanata*), shrub
- needle and thread (*Hesperostipa comata*), grass
- little bluestem (*Schizachyrium scoparium*), grass

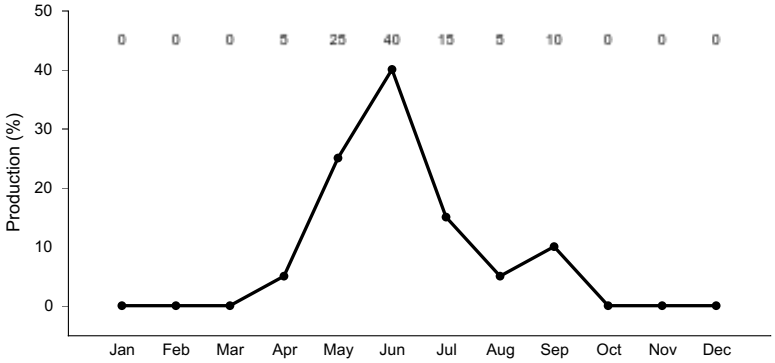


Figure 11. Plant community growth curve (percent production by month). WY1101, 12-14SP Upland sites w/o warm seasons. 12-14" Precipitation Zone, Southern Plains (SP) without warm season (grass) species.

Pathway 1.1A
Community 1.1 to 1.2

Continuous, heavy grazing without adequate recovery between grazing events, and lack of fire shifts this plant community to the 1.2 Community. Drought accelerates this process. Biotic integrity, water, and nutrient cycles may become impaired as a result of this community pathway

Pathway 1.1B
Community 1.1 to 1.3

Non-use and lack of fire cause the Reference Plant Community to shift to the 1.3 Community. Plant decadence and standing dead plant material impede energy flow. Initially, excess litter increases. Eventually, native plant density begins to decrease and weeds and introduced species may begin to invade. Water and nutrient cycles are impaired as a result of this community pathway.

Pathway 1.2A
Community 1.2 to 1.1

Grazing that allows for adequate recovery opportunity between grazing events, proper stocking rates, and prescribed fire shift the 1.2 community back to the Reference Plant Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

The return of grazing with adequate recovery and normal fire frequency shifts this plant community to the Reference Plant Community. This change can occur in a relatively short timeframe with the return of these disturbances.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Sod-bound State

Species diversity and production have been significantly decreased due to the major reduction of mid- and tallgrass species and key shrubs. Energy flow, water cycle, and mineral cycle have been negatively affected. Litter levels are

very low and unevenly distributed. Soil erosion may be a concern on steeper slopes and exposed areas. Greatly reduced infiltration and increased runoff typically cause off-site gully erosion and an ecological threshold has been crossed. Significant biotic and soil changes have negatively impacted energy flow and nutrient and hydrologic cycles. The loss of functional/structural groups such as warm-season midgrass reduces the biodiversity and productivity of this site.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass

Community 2.1
Bouteloua gracilis-Carex filifolia (blue grama-threadleaf sedge).

The mid-grasses and palatable forbs have been eliminated. The dominant species are blue grama and threadleaf sedge. These species have developed into a sod-bound condition occurring in localized colonies exhibiting a mosaic appearance. Prairie sandreed may exist in remnant amounts on sandier soils. Needle and thread may persist if seasonal grazing use occurs after awn development. Sideoats grama and little bluestem may still be present in small amounts on steeper slopes. There may also be remnants of rhizomatous wheatgrasses. Fendler threeawn has increased. Forbs and shrubs that continue to increase are Cuman ragweed (western ragweed), hairy golden aster, prairie sagewort (fringed sagebrush), broom snakeweed, and small soapweed. Plant diversity is very low. In the 12 to 14 Inch PZ, the total annual production (air-dry weight) is about 550 pounds per acre during an average year, but ranges from about 350 pounds per acre in unfavorable years to about 750 pounds per acre in above-average years. In the 15 to 17 Inch PZ, the total annual production (air-dry weight) is about 650 pounds per acre during an average year, but ranges from about 450 pounds per acre in unfavorable years to about 850 pounds per acre in above-average years. This plant community is extremely resistant to change. Many plant species are missing and a seed source is not readily available. Also, sod-forming grasses tend to maintain themselves due to their resistance to any further overgrazing.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass

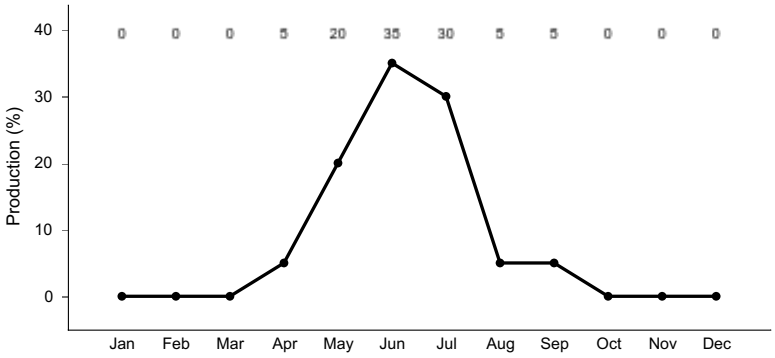


Figure 12. Plant community growth curve (percent production by month). WY1104, 12-14SP upland sites w/ warm. 12-14" Precipitation Zone, Southern Plains (SP) with warm-season (grass) species.

State 3
Increased Bare Ground State

Soil erosion can be highly variable depending on the amount of ground cover. Typically, there is a large amount of bare ground unless covered by annuals. Runoff is high and infiltration is low. An ecological threshold has been crossed. Erosion and loss of organic matter and carbon reserves are concerns.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- threadleaf sedge (*Carex filifolia*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 3.1
Aristida purpurea-Carex filifolia (Fendler threeawn-threadleaf sedge).

The plant composition is made of annuals with a few species of perennial forbs and grasses that are very tolerant to frequent and severe defoliation. The dominant grasses include blue grama, threadleaf sedge, and threeawns. Annual grasses such as cheatgrass and sixweeks fescue have increased. The dominant forbs include curlycup gumweed, green sagewort, phlox, sandwort, hairy false goldenaster, and annuals. Broom snakeweed is increasing. Compared to the Reference Plant Community, all perennial plants have been greatly reduced with only remnants of the most grazing tolerant species present. Plant diversity is very low if annuals and invasive species are not considered. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 450 pounds per acre during an average year, but ranges from about 300 pounds per acre in unfavorable years to about 600 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 550 pounds per acre during an average year, but ranges from about 350 pounds per acre in unfavorable years to about 750 pounds per acre in above-average years.

Resilience management. This plant community is very resistant to change. Even with the best range management, this plant community may never return to the Reference Plant Community. If disturbed, it will usually return to the plant community found prior to the treatment, sometimes only affecting production for a short time.

Dominant plant species

- soapweed yucca (*Yucca glauca*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- threadleaf sedge (*Carex filifolia*), grass
- blue grama (*Bouteloua gracilis*), grass

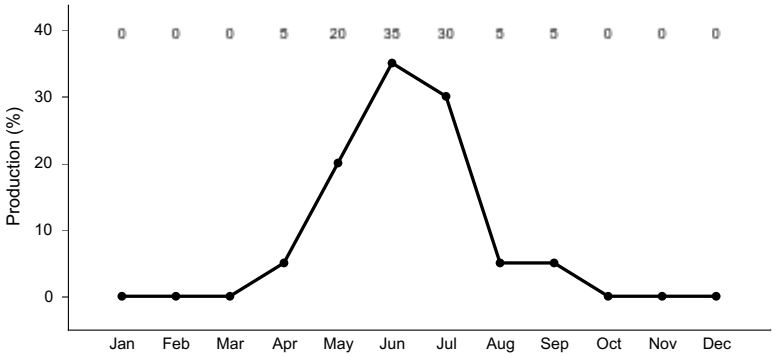


Figure 13. Plant community growth curve (percent production by month). WY1104, 12-14SP upland sites w/ warm. 12-14" Precipitation Zone, Southern Plains (SP) with warm-season (grass) species.

Transition T1A
State 1 to 2

Continuous, heavy grazing without adequate recovery periods between grazing events and lack of fire shifts this plant community across an ecological threshold to the Sod-bound State. Biotic integrity and hydrologic function are impaired as a result of this transition.

Transition T2A
State 2 to 3

Long-term heavy, continuous grazing without adequate recovery between grazing events and lack of fire cause a shift across an ecological threshold to the Increase *Bare Ground* State. Erosion and loss of organic matter and carbon reserves are concerns. Annual plants such as sixweeks fescue and cheatgrass are likely to increase or invade as a result of this transition.

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**12"-14"**			151–303	
	little bluestem	SCSC	*Schizachyrium scoparium*	101–202	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–101	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	0–101	–
2	**12"-14"**			101–303	
	needle and thread	HECO26	*Hesperostipa comata*	123–308	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–185	–
3	**12"-14"**			151–252	
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	50–252	–
	western wheatgrass	PASM	*Pascopyrum smithii*	50–252	–
4	**12"-14"**			151–202	
	blue grama	BOGR2	*Bouteloua gracilis*	101–202	–
5	**12"-14"**			50–101	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–50	–
	threeawn	ARIST	*Aristida*	0–50	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–50	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–50	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–50	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–50	–
	Grass, perennial	2GP	*Grass, perennial*	0–20	–
6	**12"-14"**			50–101	
	threadleaf sedge	CAFI	*Carex filifolia*	50–151	–
	sedge	CAREX	*Carex*	0–50	–
9	**15"-17"**			185–370	
	little bluestem	SCSC	*Schizachyrium scoparium*	123–247	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–123	–
10	**15"-17"**			123–370	
	needle and thread	HECO26	*Hesperostipa comata*	123–185	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0–185	–
11	**15"-17"**			185–308	
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	62–308	–
	western wheatgrass	PASM	*Pascopyrum smithii*	62–308	–
12	**15"-17"**			185–247	
	blue grama	BOGR2	*Bouteloua gracilis*	123–247	–
13	**15"-17"**			62–123	

	Grass, perennial	2GP	*Grass, perennial*	0–62	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–62	–
	threeawn	ARIST	*Aristida*	0–62	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–62	–
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	0–62	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–62	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–62	–
14	**15"-17"**			62–123	
	threadleaf sedge	CAFI	*Carex filifolia*	62–185	–
	sedge	CAREX	*Carex*	0–62	–
Forb					
7	**12"-14"**			50–101	
	ragwort	SENEC	*Senecio*	0–50	–
	Forb, perennial	2FP	*Forb, perennial*	0–50	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–50	–
	field sagewort	ARCA12	*Artemisia campestris*	0–50	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–50	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–50	–
	milkvetch	ASTRA	*Astragalus*	0–50	–
	prairie clover	DALEA	*Dalea*	0–50	–
	buckwheat	ERIOG	*Eriogonum*	0–50	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–50	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–50	–
	dotted blazing star	LIPU	*Liatris punctata*	0–50	–
	beardtongue	PENST	*Penstemon*	0–50	–
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	0–50	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–50	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–50	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–20	–
	goldenrod	SOLID	*Solidago*	0–20	–
15	**15"-17"**			62–123	
	Forb, perennial	2FP	*Forb, perennial*	0–62	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–62	–
	field sagewort	ARCA12	*Artemisia campestris*	0–62	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–62	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–62	–
	milkvetch	ASTRA	*Astragalus*	0–62	–
	prairie clover	DALEA	*Dalea*	0–62	–
	buckwheat	ERIOG	*Eriogonum*	0–62	–
	scarlet beeblossom	GACO5	*Gaura coccinea*	0–62	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–62	–
	dotted blazing star	LIPU	*Liatris punctata*	0–62	–
	beardtongue	PENST	*Penstemon*	0–62	–
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	0–62	–

	ragwort	SENEC	*Senecio*	0–62	–
	goldenrod	SOLID	*Solidago*	0–62	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–62	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–62	–
Shrub/Vine					
8	**12"-14"**			0–50	
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–50	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–50	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–50	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–50	–
	soapweed yucca	YUGL	*Yucca glauca*	0–50	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–50	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–20	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–20	–
16	**15"-17"**			0–62	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–62	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–62	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–62	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–62	–
	soapweed yucca	YUGL	*Yucca glauca*	0–62	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–25	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–25	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–25	–

Animal community

Wildlife Interpretations:

Reference Plant Community - Needle and Thread, Little Bluestem, Blue Grama, Rhizomatous Wheatgrasses:

The predominance of grasses plus high forb diversity in this community favors large grazers such as pronghorn and elk. Suitable thermal and escape cover for mule deer is limited due to low shrub cover. White-tailed and black-tailed jackrabbit, badger, and coyote commonly use this community. This community also provides habitat for a wide array of smaller mammals, so diverse prey populations are available for raptors such as ferruginous and Swainson’s hawks. Birds such as western kingbird, western meadowlark, lark bunting, and grasshopper sparrow utilize this community for nesting and foraging.

1.2 Community - Blue Grama, Threadleaf Sedge with Remnant Mid-grasses:
The reduction in taller grasses in this community results in decreased use by lark buntings and western meadowlarks. Use by long-billed curlew increases, provided there is standing water within ¼ mile. Killdeer, horned larks, and McCown’s longspurs also make significant use of this community. Pronghorn may forage in this community.

2.1 Community - Blue Grama, Threadleaf Sedge:

This community provides limited foraging for antelope and other grazers. Ground-nesting birds favoring sparse vegetation may use this community. Long-billed curlews use this community if standing water is present within ¼ mile. Generally, this is not a target vegetative community for wildlife habitat management.

1.3 Community - Low Plant Density, Increased Litter, and Standing Dead Canopy:

This community has low habitat value for most wildlife species. Horned larks may nest in this community.

3.1 Community - Threadleaf Sedge, Annuals, Cheatgrass, And *Bare Ground*:

Sparse vegetation and greater amounts of bare ground provide suitable habitat for prairie dogs, horned larks and McCown's longspurs. However, a lack of complex vegetation structure and residual cover makes this community poor habitat in general for most ground-nesting birds and big game species.

Grazing Interpretations:

The following table is a guide to stocking rates for the plant communities described in the Shallow 12-17 inch PZ site. These are conservative estimates for initial planning. On-site conditions will vary, and stocking rates should be adjusted based on range inventories, animal kind/class, forage availability (adjusted for slope, distance to water), and the type of grazing system (number of pastures, planned moves, etc.), all of which is determined in the conservation planning process.

The following stocking rates are based on the total annual forage production in a normal year multiplied by 25 percent harvest efficiency of preferred and desirable forage species, divided by 912 pounds of ingested air-dry vegetation for an animal unit per month (Natl. Range and Pasture Handbook, 1997). An animal unit month (AUM) is defined as the amount of forage required by one mature cow, for one month.

Example:

Plant Community (PC) Production (total lbs. /acre in a normal year) and Stocking Rate (AUMs/acre) are listed below: Example: Reference PC – (900) (.25)

900 lbs. per acre X 25% Harvest Efficiency = 225 lbs. forage demand for one month.
225 lbs. per acre/912 demand per AUM =.25 AUM's/ac

Plant Community (PC) Production (lbs.ac), and Stocking Rate (AUM/Acre)

12-14 Inch PZ:

Reference PC - (900) (.25)
1.2 PC - (700) (.19)
2.1 PC - (550) (.15)

15-17 Inch PZ

Reference PC – (1100) (.30)

1.2 PC – (850) (0.23)
2.1 PC – (650) (.18)

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide year-long forage under prescribed grazing for cattle, sheep, horses, and other herbivores. During the dormant period, livestock may need supplementation based on reliable forage analysis.

An on-site inventory is required prior to developing a grazing plan.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in Hydrologic Group D. Infiltration ranges from moderately slow to moderate. Runoff potential for this site varies from low to moderate depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. 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 (USDA–NRCS, 1972–2012) for runoff quantities and hydrologic curves).

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. 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 to 2 percent of the soil surface.

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 aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

Site Development & Testing Plan

General Data (MLRA and Revision Notes, Hierarchical Classification, Ecological Site Concept, Physiographic, Climate, and Water Features, and Soils Data):

Updated. All “Required” items complete to Provisional level.

Soils narrative and table updated to show combined Shallow Loamy (SwLy)/Shallow Sandy (SwSy) sites, and to increase the calcium carbonate equivalent and pH to reflect “limy” soils.

Community Phase Data (Ecological Dynamics, STM, Transition & Recovery Pathways, Reference Plant Community, Species Composition List, Annual Production Table):

Updated. All “Required” items complete to Provisional “+” level.

Annual Production Table is from the “Previously Approved” ESD (2008).

The 2008 Shallow Loamy and Shallow Sandy species composition lists were combined.
Note: Used Lowest and Highest values in low and high range (Annual Production lbs./acre table by species), to capture the range of variability between both sites.
Addition of new species to update species list will be done at the next Approved level.

The Annual Production Table and Species Composition List will be reviewed for future updates at Approved level.

Each Alternative State/Community:

Complete to Provisional level.

Supporting Information (Site Interpretations, Assoc. & Similar Sites, Inventory Data References, Agency/State Correlation, References):

Updated. All “Required” items complete to Provisional level.

Livestock Interpretations: Plant community names updated. (Provisional “+”).
Stocking Rate table is from the “Previously Approved” ESD (2008). Discussion needed to clarify which forage balance formula was used in the “legacy”. Also, whether “Take-half/leave-half” or Harvest Efficiency forage balance method is preferred in future update.

Wildlife Interpretations: Plant community names updated (Provisional “+”). Narrative is from “Previously Approved” ESD (2008). Hydrology, Recreational Uses, Wood Products, Other Products, and Plant Preferences table, are carried over from previously “Approved” ESD (2008).

Existing NRI or 417 Inventory Data References updated. More field data collection is needed to support this site concept.

Reference Sheet:
Rangeland Health Reference Sheet carried over from previously “Approved” ESD (2008).
It will be updated at the next “Approved” level.

“Future work, as described in a project plan, to validate the information in this provisional ecological site description is needed. This will include field activities to collect low and medium intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.” (NI 430_306 ESI and ESD, April, 2015)

Inventory data references

Date Source: NRI
Number of Records: 14
Sample Period: 2004-2013
States: NE, WY
Counties: Morrill, Scotts Bluff (NE);
Goshen, Laramie, Niobrara, Platte (WY)

Date Source: 417s
Number of Records: 15
Sample Period: 1968-1983
States: NE, WY, CO
Counties: Cheyenne, Kimball, Morrill, Scotts Bluff, Sioux (NE):
Laramie (WY);
Weld (CO)

Information presented here has been derived from data collection on private and federal lands using:
• Double Sampling (clipped 2 of 5 plots)*
• Rangeland Health (Pellant et al., 2005)
• Soil Stability (Pellant et al., 2005)
• Line Point Intercept : Foliar canopy, basal cover (Forb, Graminoid, Shrub, subshrub, Lichen, Moss, Rock fragments, bare ground, % Litter) (Herrick et al., 2005)
• Soil pedon descriptions collected on site (Schoeneberger et al., 2012)

*NRCS double-sampling method, CO NRCS Similarity Index Worksheet 528(1).
Additional reconnaissance data collection using numerous ocular estimates and other inventory data; NRCS clipping data for USDA program support; Field observations from experienced range trained personnel. Specific data information is contained in individual landowner/user case files and other files located in county NRCS field offices.

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For manuscripts of archived soil surveys, see: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

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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.

Author(s)/participant(s)	Dave Cook, Kristin Dickinson, George Gamblin, John Hartung, Andy Steinert, Nadine Bishop

Contact for lead author	
Date	11/16/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills mayl occur on slopes steeper than 15 percent becoming more evident as slopes increase.

2. **Presence of water flow patterns:** None expected on level to gently sloping terrain. Water flow patterns will be present on slope exceeding 15 percent increasing as slopes increase. Debris dams will be present in association with the waterflow patterns.

3. **Number and height of erosional pedestals or terracettes:** Pedestalled plants and terracettes are not expected on gentle slopes but will occur on slopes steeper than 15 percent becoming more evident as slopes increase.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically 15 to 20 percent, and patches less than 2 to 3 inches (5.1-7.6 cm) in diameter, increasing to 20 to 25 percent during multi-year drought.

5. **Number of gullies and erosion associated with gullies:** None. Gullies should not be present on this site.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None are expected on gentle slopes but may occur on slopes steeper than 15 percent, on ridges, and on sandier soils.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of fine litter from water is possible, but not normal. On slopes greater than 15 percent, litter movement is expected with distances increasing as slopes increase, especially following high precipitation events.

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 on soils with loamy surface textures and 3 to 4 on soils with sandy surface textures. Surface organic matter adheres to the soil surface.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface layer ranges 4 to 8 inches (10.2-20.3 cm) thick. Soil surface structure is fine to medium granular. Soil colors

range from grayish brown, brown, yellowish brown to light brownish gray (values of 5 to 6) when dry and very dark greyish brown, dark grayish brown, dark yellowish brown to dark brown (values of 3 to 5) moist.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The functional/structural groups provide a combination of rooting depths and structure which positively influences infiltration. Combination of shallow and deep rooted species (mid & tall rhizomatous and tufted perennial cool season grasses) with fine and coarse roots positively influences infiltration.

    The expected composition of the plant community is 75 to 80 percent perennial grasses and grass-likes, 10 to 15 percent forbs, and 0 to 5 percent woody plants.

    In the 12-14” PZ, the grass and grass-like component is made up of cool-season, bunch grasses (15-35%); warm-season tall and mid-grasses (15-35%); cool-season, rhizomatous grasses (15-25%), warm-season short grasses (15-20%); and grass-likes (5-15%).

    In the 15-17” PZ, the grass and grass-like component is made up of warm-season tall and mid-grasses (15-35%); cool-season, bunch grasses (10-35%); cool-season, rhizomatous grasses (15-25%), warm-season short grasses (15-20%); and grass-likes (5-15%).

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

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

    Dominant: 12-14" PZ - Community 1.1
    1. Native, C3, bunch grasses – 135-315 #/ac (15-35%), 2 species minimum
    2. Native, C4, tall and mid-grasses – 135-315 #/ac (15-35%), 1 species minimum

    15-17" PZ - Community 1.1
    1. Native, C3, bunch grasses – 110-385 #/ac (10-35%), 2 species minimum
    2. Native, C4, tall and mid-grasses – 165-385 #/ac (15-35%), 1 species minimum

    Sub-dominant: 12-14" PZ - Community 1.1
    3. Native, C3, rhizomatous grasses – 135-225 (15-25%), 1 species minimum
    4. Native, C4, short grasses – 135-180 #/ac (15-20%), 1 species minimum
    5. Grass-likes – 45-135 #/ac (5-15%), 1 species minimum

    15-17" PZ - Community 1.1
    3. Native, C3, rhizomatous grasses – 165-275 (15-25%), 1 species minimum
    4. Native, C4, short grasses – 165-220 #/ac (15-20%), 1 species minimum
    5. Grass-likes – 55-165 #/ac (5-15%), 1 species minimum

    Other: Minor:
    12-14" PZ - Community 1.1
    6. Native, Perennial and Annual Forbs – 45-90 #/ac (5-10%)
    7. Shrubs, Vines, Cacti – 0-45 #/ac: (0-5%)

    15-17" PZ - Community 1.1

6. Native, Perennial and Annual Forbs – 55-110 #/ac (5-10%)
7. Shrubs, Vines, Cacti – 0-55 #/ac: (0-5%)

Additional: 12- 14" PZ Community 1.1
12a. Relative Dominance: Native, C3 bunch grasses = Native, C4, tall and mid-grasses > Native, C3, rhizomatous grasses > Native, C4, short grasses > Grass-likes > Native, Perennial and Annual Forbs > Shrubs, cacti, vines.

12b. F/S Groups not expected for the site: Introduced annual grasses, perennial introduced and naturalized grasses, trees.

12c. Number of F/S Groups: 7

12d. Species number in Dominant and Sub-dominant F/S Groups: 6

15- 17" PZ Community 1.1
12a. Relative Dominance: Native, C3 bunch grasses = Native, C4, tall and mid-grasses > Native, C3, rhizomatous grasses > Native, C4, short grasses > Grass-likes > Native, Perennial and Annual Forbs > Shrubs, cacti, vines.

12b. F/S Groups not expected for the site: Introduced annual grasses, perennial introduced and naturalized grasses, trees.

12c. Number of F/S Groups: 7

12d. Species number in Dominant and Sub-dominant F/S Groups: 6

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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 with less than 3 percent mortality and shrubs have few dead stems.

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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 40 to 60 percent. Litter depth is expected to be approximately 0.25 inch (0.65 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** In the 12-14” precipitation zone, annual production ranges from 600-1200 pounds per acres (air dry basis). Average annual production is 900pounds per acre under normal precipitation and weather conditions.

    In the15-17” Precipitation Zone, annual production ranges from 750-1500 pounds per acre (air dry basis). Average annual production is 1,100 pounds per acre under normal precipitation and weather conditions.

    No significant reduction is expected the growing season following wildfire.

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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:** Annual bromes fringed sagewort, broom snakeweed, and others as they become known.

See:
Colorado Department of Agriculture Invasive Species Website:
https://www.colorado.gov/pacific/agconservation/noxious-weed-species
Wyoming Weed and Pest Council Website: https://wyoweed.org/
Nebraska Invasive Species website: https://neinvasives.com/plants.

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