USDA Natural Resources Conservation Service

Ecological site R067AY102WY
Choppy Sands (CS)

Last updated: 12/10/2024
Accessed: 05/14/2025

General information

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

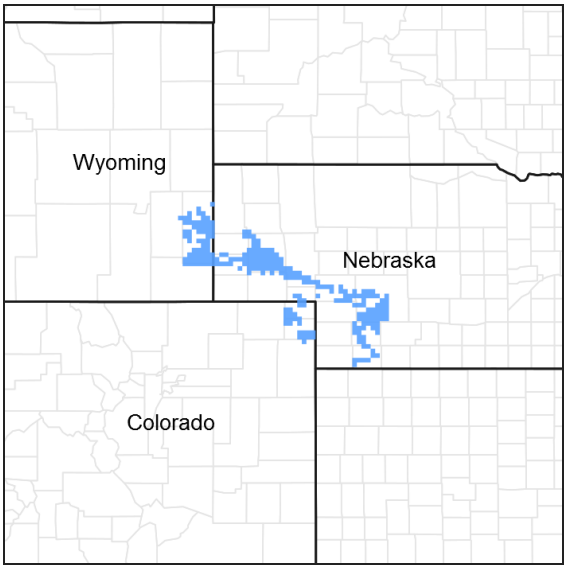


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 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 Choppy Sands (CS) Ecological Site Description was developed from an earlier version of the Choppy Sands (CS) 12-17" Precipitation Zone ESD (2005, updated 2008). The earlier version was based on input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Sands (Sa) Range Site Description (1988) and earlier (1970).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 Choppy Sands Ecological Site is a run-off site with sandy soil textures on slopes greater than 24 percent. The soils are not saline or alkaline and do not have coarse gravel fragments. Catsteps or terracettes, and blowouts are common.

Associated sites

R067AY146WY	**Sands (Sa)** This ecological site is commonly adjacent.

Similar sites

R067AY146WY	**Sands (Sa)** The Sands Ecological Sites has slopes of less than 24 percent and lacks catsteps or terracettes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia filifolia* (2) *Prunus pumila var. besseyi*
Herbaceous	(1) *Calamovilfa longifolia* (2) *Andropogon hallii*

Physiographic features

This site occurs on stabilized to active dunes in dune fields. There are many narrow crests, terracettes or catsteps, and blowouts associated with this site.

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Hill
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	975–1,676 m
Slope	24–60%
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

Climate stations used

- (1) KIMBALL 2NE [USC00254440], Kimball, NE
- (2) OSHKOSH [USC00256385], Oshkosh, NE
- (3) BRIDGEPORT [USC00251145], Bridgeport, NE
- (4) CHEYENNE [USW00024018], Cheyenne, WY
- (5) HARRISBURG 12WNW [USC00253605], Harrisburg, NE
- (6) CHUGWATER [USC00481730], Chugwater, WY
- (7) OLD FT LARAMIE [USC00486852], Yoder, WY
- (8) PHILLIPS [USC00487200], LaGrange, WY
- (9) WHEATLAND 4 N [USC00489615], Wheatland, WY
- (10) SCOTTSBLUFF HEILIG AP [USW00024028], Scottsbluff, NE

Influencing water features

There are no water features of the ecological site or adjacent wetland or riparian regimes that influence the vegetation or management of the site.

Soil features

The soils on this site are very deep, excessively drained, and formed from eolian sands. They have a very rapid to rapid permeability class. The available water capacity is very low to low. The soil moisture regime is ustic aridic. The soil temperature regime is mesic.

The surface layer of the soils are fine sand but may include loamy fine sand or sand. The surface layer ranges from a depth of 3 to 10 inches thick. The subsoil consists of fine sand or sand but may include loamy fine sand or loamy sand. Soils in this site that are leached of free carbonates to a depth of 40 inches or more correspond to the Valent series; soils that have carbonates at the surface or within 40 inches of the surface correspond to the Dwyer series. These soils are very susceptible to erosion by wind if not covered. Blowouts are common where the surface has been disturbed or is void of vegetation. The potential for water erosion accelerates with increasing slope.

Major soil series correlated to this ecological site: Dwyer and Valent.

The attributes listed in the following table 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.

Table 4. Representative soil features

Parent material	(1) Eolian sands
Surface texture	(1) Fine sand (2) Loamy fine sand (3) Sand
Drainage class	Excessively drained
Permeability class	Rapid to very rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.81–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Choppy Sands Ecological Site is characterized by three states; Reference, Sandhill Muhly, and Eroded. The Reference State is characterized by warm-season tall bunchgrass (sand bluestem), warm-season tall rhizomatous grass (prairie sandreed), and warm and cool-season mid- bunchgrasses (needle and thread and little bluestem, respectively). Secondary are warm-season mid- bunchgrasses (switchgrass, sand lovegrass), and cool-season bunch midgrasses (Indian ricegrass and prairie Junegrass). Other grasses and grass-likes include blowout grass, sandhill muhly, sand dropseed, hairy grama, and threadleaf sedge. A minor component of forbs and shrubs are also present. The Sandhill Muhly State is characterized by warm-season shortgrass (sandhill muhly and hairy grama), grass-likes (threadleaf sedge), and shrubs (sand sagebrush and soapweed yucca). The Eroded State is characterized by annual forbs and grasses (burningbush, Russian thistle, cuman ragweed, and sandbur) and active blowouts. Once the soil is re-stabilized, blowout grass, lemon scurfpea, and annual sunflowers colonize the site, followed by other early pioneer species.

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

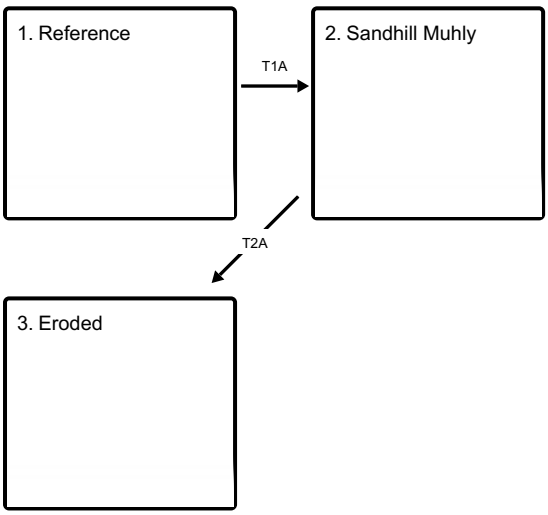
Recurrent drought has historically impacted the vegetation of this region. Changes in species composition and production vary depending upon the duration and severity of the drought cycle, and on prior grazing management.

The Choppy Sands Ecological Site developed with occasional fire as part of the ecological processes. Historic fire frequency (pre-industrial), is estimated at 10 to12 years (Guyette, 2012), randomly distributed, and started by lightning at various times throughout the growing season. It is thought that 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.

As this site begins to deteriorate from a combination of frequent and severe grazing during the growing season without adequate recovery periods, bunchgrasses such as sand bluestem, prairie sandreed, switchgrass, and needle and thread decrease in both frequency and production. Prairie sandreed may persist in remnant amounts protected by remaining shrubs. Key shrubs such as western sandcherry and prairie rose decrease in frequency and production. Purple prairie clover and other highly palatable forbs decrease. Sand sagebrush continues to increase with an understory of grasses such as sandhill muhly, hairy grama, and threadleaf sedge. Under continued frequent and severe defoliation with no rest periods, mid-grasses will eventually be removed from the plant community. Over the long-term, this continuous use in combination with high stock densities results in bare ground and active blowouts. As this condition persists, erosion becomes so severe that all soil development is lost.

State and transition model

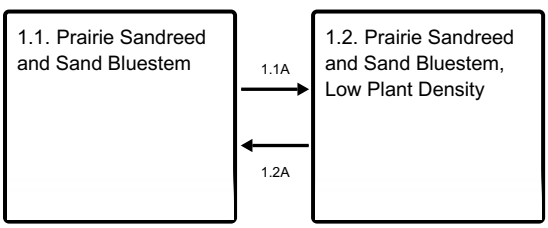
Ecosystem states



T1A - Excessive grazing. Non-use. Lack of fire. Drought.

T2A - Excessive grazing. Lack of fire. Drought.

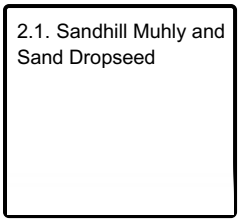
State 1 submodel, plant communities



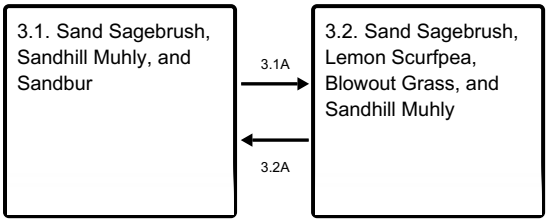
1.1A - Non-use. Lack of fire.

1.2A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 3 submodel, plant communities



3.1A - Prescribed grazing.

3.2A - Excessive grazing.

State 1
Reference

The Reference state is characterized by two 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

- sand sagebrush (*Artemisia filifolia*), shrub
- western sandcherry (*Prunus pumila var. besseyi*), shrub
- prairie sandreed (*Calamovilfa longifolia*), grass
- sand bluestem (*Andropogon hallii*), grass

Community 1.1
Prairie Sandreed and Sand Bluestem

Figure 8. Choppy Sands, 12-17" PZ, Goshen County, WY

This is the interpretive plant community for Choppy Sands Ecological Site. 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 75 to 90 percent grasses and grass-likes, 5 to 10 percent forbs and 5 to15 percent woody plants. Principle grasses are prairie sandreed, sand bluestem, little bluestem, and needle and thread. Secondary grasses are switchgrass, lovegrass, Indian ricegrass, and prairie Junegrass. Minor grasses and grasslikes that may occur include blowout grass, sandhill muhly, sand

dropseed, blue grama, hairy grama, and threadleaf sedge. A variety of forbs such as dotted blazing star (also known as dotted gayfeather), bush morningglory, scarlet globemallow, painted milkvetch, lemon scurfpea, prairie spiderwort, purple prairie clover, veiny dock, prairie coneflower, and penstemon species are also present. Half-shrubs such as silver- and sand sagebrush, and prairie rose; and shrubs such as western sandcherry also occur. Plant diversity is high. Community dynamics (nutrient cycle 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. Decadence and natural plant mortality is low. This community is resistant to many disturbances except heavy, continuous grazing, tillage, and development into urban or other uses.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- western sandcherry (*Prunus pumila var. besseyi*), shrub
- prairie sandreed (*Calamovilfa longifolia*), grass
- sand bluestem (*Andropogon hallii*), 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.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	35	30	5	5	0	0	0

Community 1.2
Prairie Sandreed and Sand Bluestem, Low Plant Density

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 typically develop dead centers and rhizomatous grasses can form small decadent communities due to a lack of impact by grazing animals. Much of the available nutrients are tied up in standing dead plant material and increased amounts of litter. The semiarid environment and the absence of animal traffic to break down litter will slow nutrient cycling. Compared to the Reference Plant Community, weedy species, cool-season grasses, and sedges have increased. Rodent activity has resulted in an increase in soil disturbance. Dominant grasses include prairie sandreed, needle and thread, and sand bluestem. Other species include sand dropseed and threadleaf sedge. Dominant forbs include annual sunflower and bractless blazingstar (also known as mentzelia). Dominant shrubs include pricklypear, sageworts, and sand sagebrush. Invasive grasses such as cheatgrass or field brome, tend to encroach under these conditions. Water flow patterns and pedestalling can become apparent. Infiltration is reduced and runoff is increased. In advanced stages of non-use or lack of fire, bare areas will increase causing an erosion concern. Plant diversity is moderate to high. This plant community is not resistant to change. The introduction of grazing or fire quickly changes the plant community. It is somewhat more vulnerable to severe disturbance than the Reference Plant Community. Soil erosion is accelerated because of increased bare ground. Water flow patterns and pedestaling are obvious. Infiltration is reduced and runoff is increased.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- western sandcherry (*Prunus pumila var. besseyi*), shrub
- prairie sandreed (*Calamovilfa longifolia*), grass
- sand bluestem (*Andropogon hallii*), 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.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	25	40	15	5	10	0	0	0

Pathway 1.1A

Community 1.1 to 1.2

Non-use and lack of fire causes the Reference Plant Community to shift toward Community 1.2. Plant decadence and standing dead plant material impede energy flow. Initially, litter increases to excess . Eventually, native plant density begins to decrease and introduced species may begin to invade. Water and nutrient cycles are impaired.

Pathway 1.2A
Community 1.2 to 1.1

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

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Sandhill Muhly

The Reference state has been driven beyond the limits of ecosystem resilience. An ecological threshold has been crossed to the Sandhill Muhly state. Short, drought-tolerant grasses and shrubs dominate the plant community. Occasional mid-grasses may be found within the canopy of the shrubs where it is protected from grazing. Understory plants may be negatively affected by shrubs, which reduce the availability of light, soil moisture, and soil nutrients. A significant amount of production and diversity has been lost when compared to the Reference state. Significant biotic and soil changes have negatively impacted energy flow, and nutrient and hydrologic cycles.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- sandhill muhly (*Muhlenbergia pungens*), grass
- sand dropseed (*Sporobolus cryptandrus*), grass

Community 2.1
Sandhill Muhly and Sand Dropseed

The dominant grasses are sandhill muhly, sand dropseed, and hairy grama. Other perennial grasses and grasslikes include blowout grass and threadleaf sedge. Prairie sandreed and needle and thread are limited to areas protected from grazing. Significant forbs include cuman ragweed (also known as western ragweed), green sagewort, lemon scurfpea, annual sunflower, and bractless blazingstar (mentzelia). Significant shrubs include sand sagebrush, yucca, and pricklypear cactus. The midgrasses and palatable forbs have been significantly reduced or eliminated. Plant diversity is very low. Energy flow, water cycle, and mineral cycle have been negatively affected. Litter levels are very low and unevenly distributed. This plant community is extremely resistant to change. Soil erosion by wind is increased; infiltration is reduced, and surface runoff is increased because of the lack of surface plant litter. Evaporation is also increased.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- sandhill muhly (*Muhlenbergia pungens*), grass
- sand dropseed (*Sporobolus cryptandrus*), 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.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	35	30	5	5	0	0	0

State 3
Eroded

This condition is not stable. It consists of bare areas that are continually eroded by wind. Evapo-transpiration rates are high due to bare ground, lack of litter, and extremely low plant density. Soil development is poor. Dry conditions and open winters tend to increase the likelihood of blowout formation. An ecological threshold has been crossed. Erosion and loss of organic matter are resource concerns.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- sandhill muhly (*Muhlenbergia pungens*), grass
- sandbur (*Cenchrus*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 3.1
Sand Sagebrush, Sandhill Muhly, and Sandbur

Compared to the community 1.1, sandhill muhly, blowout grass, and sandbur have increased due to their drought tolerance. All other grasses are absent. Lemon scurfpea and cuman ragweed are increasing. There is an overstory of sand sagebrush. Annual grasses and forbs include cheatgrass, field brome, burningbush, Russian thistle, sunflower, pigweed, and sixweeks fescue are increasing or invading. Soil erosion hazard has increased due to the increase of bare ground. Runoff is typically high and infiltration is low. All ecological functions are impaired. Species diversity has substantially decreased. Production varies with density and vigor of sand sagebrush.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub
- sandhill muhly (*Muhlenbergia pungens*), grass
- sandbur (*Cenchrus*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

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.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	35	30	5	5	0	0	0

Community 3.2
Sand Sagebrush, Lemon Scurfpea, Blowout Grass, and Sandhill Muhly

This plant community occurs as community 3.1 becomes re-vegetated. Plant composition consists of an overstory of sand sagebrush, annuals, and drought tolerant perennial forbs and grasses. The dominant grasses are blowout grass and sandhill muhly. Annual grasses such as sandbur and stinkgrass have increased. The dominant forbs include lemon scurfpea, Rocky Mountain beeplant, and annual sunflower. Prairie sandreed, hairy grama and Arkansas rose become more evident. Compared to the Reference Plant Community, all perennial plants have been greatly reduced with only remnants of the most drought tolerant species present. Plant diversity is very low. Wind erosion continues to be a concern.

Dominant plant species

- sand sagebrush (*Artemisia filifolia*), shrub

- blowout grass (*Redfieldia flexuosa*), grass
- sandhill muhly (*Muhlenbergia pungens*), grass
- lemon scurfpea (*Psoralidium lanceolatum*), other herbaceous
- common sunflower (*Helianthus annuus*), other herbaceous

Figure 14. 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.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	35	30	5	5	0	0	0

Pathway 3.1A
Community 3.1 to 3.2

Prescribed grazing with adequate recovery periods between grazing events shifts this plant community to the 3.2 Community.

Conservation practices

Prescribed Grazing

Pathway 3.2A
Community 3.2 to 3.1

Continuous, heavy grazing without adequate recovery periods between grazing events shifts this plant community back to the 3.1 Community. Wind erosion is a concern and blowouts can form as a result of this community pathway.

Transition T1A
State 1 to 2

Continuous, heavy grazing without adequate recovery periods between grazing events, or non-use and lack of fire shift this this state across an ecological threshold to the Sandhill Muhly State.

Transition T2A
State 2 to 3

Long-term, heavy, continuous grazing without adequate recovery periods, lack of fire, and drought causes a shift across an ecological threshold to the Eroded State. Constraints to recovery include changes in aggregate stability, nutrient availability, plant cover, hydrologic function, severe soil erosion, and loss of organic matter. Accelerated wind erosion can cause the formation of blowouts.

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	**Tall Warm-season 12-14**			370–740	
	prairie sandreed	CALO	*Calamovilfa longifolia*	308–555	–
	sand bluestem	ANHA	*Andropogon hallii*	62–370	–
	switchgrass	PAVI2	*Panicum virgatum*	0–123	–
2	**Mid- Warm-season 12-14**			62–247	
	little bluestem	SCSC	*Schizachyrium scoparium*	123–185	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–123	

	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–123	–
3	**Cool-season 12-14**			62–185	
	needle and thread	HECO26	*Hesperostipa comata*	62–185	–
4	**12-14**			185–247	
	Grass, perennial	2GP	*Grass, perennial*	0–62	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–62	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–62	–
	sedge	CAREX	*Carex*	0–62	–
	rosette grass	DICHA2	*Dichanthelium*	0–62	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–62	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–62	–
	blowout grass	REFL	*Redfieldia flexuosa*	0–62	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–62	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–62	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–62	–
7	**Tall Warm-season 15-17**			437–874	
	prairie sandreed	CALO	*Calamovilfa longifolia*	364–656	–
	sand bluestem	ANHA	*Andropogon hallii*	73–437	–
	switchgrass	PAVI2	*Panicum virgatum*	0–146	–
8	**Mid- Warm-season 15-17**			73–291	
	little bluestem	SCSC	*Schizachyrium scoparium*	146–219	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	0–146	–
9	**Cool-season 15-17"**			73–219	
	needle and thread	HECO26	*Hesperostipa comata*	73–219	–
10	**15-17"**			219–291	
	Grass, perennial	2GP	*Grass, perennial*	0–73	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–73	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–73	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–73	–
	sedge	CAREX	*Carex*	0–73	–
	rosette grass	DICHA2	*Dichanthelium*	0–73	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–73	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–73	–
	thin paspalum	PASE5	*Paspalum setaceum*	0–73	–
	blowout grass	REFL	*Redfieldia flexuosa*	0–73	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–73	–
Forb					
5	**12-14"**			62–123	
	Forb, perennial	2FP	*Forb, perennial*	0–62	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–25	–
	field sagewort	ARCA12	*Artemisia campestris*	0–25	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–25	–
	false boneset	BREU	*Brickellia eupatorioides*	0–25	–
	prairie clover	DALEA	*Dalea*	0–25	–

	silky prairie clover	DAVI	*Dalea villosa*	0–25	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	0–25	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–25	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–25	–
	Chalk Hill hymenopappus	HYTE2	*Hymenopappus tenuifolius*	0–25	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–25	–
	flaxflowered ipomopsis	IPLO2	*Ipomopsis longiflora*	0–25	–
	manystem pea	LAPO2	*Lathyrus polymorphus*	0–25	–
	dotted blazing star	LIPU	*Liatris punctata*	0–25	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–25	–
	bractless blazingstar	MENU	*Mentzelia nuda*	0–25	–
	evening primrose	OENOT	*Oenothera*	0–25	–
	beardtongue	PENST	*Penstemon*	0–25	–
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	0–25	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–25	–
	veiny dock	RUVE2	*Rumex venosus*	0–25	–
	spiderwort	TRADE	*Tradescantia*	0–25	–
	ironweed	VERNO	*Vernonia*	0–25	–
11	**15-17"**			73–146	
	Forb, perennial	2FP	*Forb, perennial*	0–73	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–73	–
	field sagewort	ARCA12	*Artemisia campestris*	0–73	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–73	–
	false boneset	BREU	*Brickellia eupatorioides*	0–73	–
	prairie clover	DALEA	*Dalea*	0–73	–
	silky prairie clover	DAVI	*Dalea villosa*	0–73	–
	rubber rabbitbrush	ERNAN4	*Ericameria nauseosa ssp. nauseosa var. nana*	0–73	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0–73	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–73	–
	Chalk Hill hymenopappus	HYTE2	*Hymenopappus tenuifolius*	0–73	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0–73	–
	flaxflowered ipomopsis	IPLO2	*Ipomopsis longiflora*	0–73	–
	manystem pea	LAPO2	*Lathyrus polymorphus*	0–73	–
	dotted blazing star	LIPU	*Liatris punctata*	0–73	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–73	–
	bractless blazingstar	MENU	*Mentzelia nuda*	0–73	–
	evening primrose	OENOT	*Oenothera*	0–73	–
	beardtongue	PENST	*Penstemon*	0–73	–
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	0–73	–

	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–73	–
	veiny dock	RUVE2	*Rumex venosus*	0–73	–
	spiderwort	TRADE	*Tradescantia*	0–73	–
	ironweed	VERNO	*Vernonia*	0–73	–
Shrub/Vine					
6	**12-14"**			62–185	
	sand sagebrush	ARFI2	*Artemisia filifolia*	0–62	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–62	–
	soapweed yucca	YUGL	*Yucca glauca*	0–62	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–25	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–25	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–25	–
	prairie rose	ROAR3	*Rosa arkansana*	0–25	–
12	**15-17"**			73–219	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–73	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	0–73	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0–73	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–73	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0–73	–
	prairie rose	ROAR3	*Rosa arkansana*	0–73	–
	soapweed yucca	YUGL	*Yucca glauca*	0–73	–

Animal community

Wildlife Interpretations:

Reference Plant Community - Prairie Sandreed, Sand Bluestem, Little Bluestem, and Needle and Thread:

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 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 will utilize this community for nesting and foraging.

1.2 Community – Increased Litter, Decadent Plants, and Standing Dead Canopy:

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

2.1 Community – Sandhill Muhly and Sand Sagebrush:

This community provides limited foraging for pronghorn and other grazers. Ground-nesting birds that favor sparse vegetation may use this community. Long-billed curlews use this community if standing water is present within one-quarter mile.

3.1 Community - Annual Grasses and Forbs, Sand Sagebrush, Increased Bare Ground, and Blowouts:

This community has low habitat value for most wildlife species. Horned larks may nest in this community. When Rocky Mountain beeplant is present, mourning doves use this plant community in the fall.

3.2 Community – Blowout Grass, Sandhill Muhly, Lemon Scurfpea, Annual Grasses and Forbs:

This community has low habitat value for most wildlife species. Horned larks may nest in this community. When Rocky Mountain beeplant is present, mourning doves use this plant community in the fall.

Hydrological functions

Water is the principal factor limiting forage production on this ecological site. This ecological site is dominated by soils in hydrologic group A. Infiltration ranges from moderately high to high and runoff potential ranges from moderately low to low. Water transmission through group A soils is greater than 0.30 inch per hour. Runoff is expected to occur only during the most intense storms (refer to Part 360, NRCS National Engineering Handbook (USDA–NRCS, 1972–2012) for runoff quantities and hydrologic curves).

The ecological site should show slight to no evidence of rills or gullies. Water flow paths, if any, are broken, irregular in appearance or discontinuous. Wind-scoured areas are inherent to this site and some soil movement may be noticeable on various landscape positions. Overall, the soil surface should be stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration. These soils are susceptible to wind erosion where vegetative cover is inadequate.

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other recreational 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.

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).

Growth Curves are from the “Previously Approved” ESD (2008).

The Annual Production Table, Species Composition List, and Growth Curves 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.
Wildlife Interpretations: Plant community names updated. Narrative is from “Previously Approved” ESD (2008).

Wildlife species will need to be updated at the next Approved level.

Livestock Interpretations: Plant community names and stocking rates updated.

Hydrology, Recreational Uses, Wood Products, and Other Products carried over from "Previously Approved" ESD (2008).

Plant Preferences tabled removed. Will be released as a technical guide notice by NRCS NE and WY state offices in the future.

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

Data Source: NRI, 417
Number of Records: 2
Sample Period 2009, 1985
Counties: Goshen

Information presented here has been derived from data collection on private and federal lands using:
• Double Sampling (clipped 2 of 5 plots)*
• Rangeland Health**
• Soil Stability**
• Line Point Intercept : Foliar canopy, basal cover (forb, graminoid, shrub, subshrub, lichen, moss, rock fragments, bare ground, percentage of litter)***
• Soil pedon descriptions collected on site****
*NRCS 528-Prescribed Grazing Standard job sheets.
**Interpreting Indicators of Rangeland Health, Version 4, 2005
***Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems, Volume II, 2005
****Field Book for Describing and Sampling Soils, Version 3, 2012
NRI- Natural Resource Inventory data
SCS-RANGE-417 Production & Composition Record for Native Grazing Lands
Additional reconnaissance data collection using numerous ocular estimates and other inventory data; NRCS clipping data for USDA program support; and field observations from experienced range trained personnel.

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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	11/23/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Typically, none. Water flow patterns may occur during extreme precipitation events and will be less than 12 (30.5 cm) inches long, less than 6 inches (15.2 cm) wide, discontinuous, and usually found between catsteps.

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3. **Number and height of erosional pedestals or terracettes:** Bunch grasses may be slightly pedestalled (less than 0.5 inch or 1.25 cm) with no exposed roots; occurrence of pedestalled plants will be rare and would typically occur on north and west aspects of slopes and where bunchgrasses are more common. Drought or wildfire can contribute to increased incidences pedestalled plants.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground typically less than 25 to 30 percent. Occasional small blowouts may occur immediately adjacent to areas receiving repeated disturbance, but areas should not be connected.

   Multi-year drought and/or wildfire can increase bare ground to 40 percent for up to two years following the disturbance.

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Occasional small blowouts may occur immediately adjacent to areas receiving repeated disturbance, such as increased animal activity (e.g. rodent burrow, animal trailing). Wind-scoured areas are typically less than 10 feet (3 meters) wide and occupy less than 5 percent of the site.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall into place. Fine litter movement is expected to be less than 12 inches (30 cm). Coarse litter is not expected to move.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site has low organic matter in the surface horizon and the structure is single grain sand. Soil aggregate stability will be difficult to measure on these soils. Soil stability ratings of less than 2 are expected.

   Surface erosion by water rarely occurs due to rapid infiltration, but surface is susceptible to erosion when vegetative cover is reduced due to multi-year drought, wildfire, or multi-year heavy grazing.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soils have little organic matter in the A-horizon which ranges from 2 to 6 inches (5-15.25 cm) deep. Soil colors are grayish brown to pale brown (values of 5 to 6) when dry and dark grayish brown (value of 4) when moist. Structure can be single grain to fine granular parting to single grain in the A-horizon.

---

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 90 percent perennial grasses and grass-likes, 5 to 10 percent forbs, and 5 to 15 percent shrubs.

    In the 12-14” PZ, the perennial grass and grass-like component is made up of tall, warm-season, rhizomatous grasses (30-60 percent); cool-season bunch grasses (5-20 percent); mid, warm season grasses (10-20 percent), short, warm-season grasses (5-15 percent; and grass-likes (0-5 percent).

    In the 15-17” PZ, the perennial grass and grass-like component is made up of tall, warm-season, rhizomatous grasses (30-60 percent); cool-season bunch grasses (5-20 percent); mid, warm season grasses (10-20 percent), short, warm-season grasses (5-10 percent); and grass-likes (0-5 percent).

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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 is not expected on this site.

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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. Dominant F/S Group: Native, C4, tall, rhizomatous grasses – 330-660 #/ac (30-60%): 2 species minimum

15-17" PZ: Community 1.1:
1. Dominant F/S Group: Native, C4, tall, rhizomatous grasses – 390-780 #/ac (30-60%): 2 species minimum

Sub-dominant: 12-14" PZ: Community 1.1:
2. Subdominant F/S Group: Native, C4, mid-grasses – 110-220 #/ac (10-20%), 1 species minimum
3. Subdominant F/S Group: Native, C3, bunch grasses – 55-220 #/ac (5-20%), 1 species minimum
4. Subdominant F/S Group: Native, C4, short grasses 55-165 #/ac (5-15%), 1 species minimum
5. Subdominant F/S Group: Shrubs, cacti, vines – 55-165 #/ac (5-15%), 1 species

15-17" PZ: Community 1.1:
2. Subdominant F/S Group: Native, C4, mid-grasses – 130-260 #/ac (10-20%), 1 species minimum
3. Subdominant F/S Group: Native, C3, bunch grasses– 65-260 #/ac (5-20%), 1 species minimum
4. Subdominant F/S Group: Shrubs, cacti, vines – 65-195 #/ac (5-15%), 1 species minimum

Other: 12-14" PZ: Community 1.1:
6. Minor F/S Group: Native, Perennial and Annual Forbs – 55-110 #/ac (5-10%)
7. Minor F/S Group: Grass-likes – 0-55 #/ac: 0-55 #/ac (0-5%)

15-17" PZ: Community 1.1:
5. Minor F/S Group: Native, C4, short grasses – 65-130 #/ac (5-10%)
6. Minor F/S Group: Native, Perennial and Annual Forbs – 65-130 #/ac (5-10%)
7. Minor F/S Group: Grass-likes – 0-65 #/ac: (0-5%)

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

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:
Community 1.1: Native, C4, tall, rhizomatous grasses >> Native, C4, Mid-grasses > Native, C3, bunch grasses > Shrubs, cacti, vines > Native, C4, short grasses = Native, Perennial and Annual Forbs > Grass-likes.

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: 5

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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. The exception is the potential of up to 10 percent mortality in the 15-17" PZ and up to 15 percent mortality in the 12-14" PZ of mid and short, warm-season bunch grasses during multi-year drought cycles.

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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 0.25 to 0.50 inch (0.65-1.3 cm). Litter cover during and following drought will be reduced.

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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 700 to 1,500 pounds per acres (air dry basis) Average annual production is 1,100 pounds per acre under normal precipitation and weather conditions.

    In the15-17" Precipitation Zone, annual production ranges from 750 to 1,750 pounds per acre (air dry basis). Average annual production is 1,300 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:** The invasive species most likely to be encountered on the site include annual bromes (cheatgrass and Japanese/field), Russian thistle, sand sagebrush (at levels exceeding that in the reference state), small soapweed, 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.
