USDA Natural Resources
Conservation Service

Ecological site R067AY144WY
Saline Upland (SU)

Last updated: 9/07/2023
Accessed: 05/19/2024

General information

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

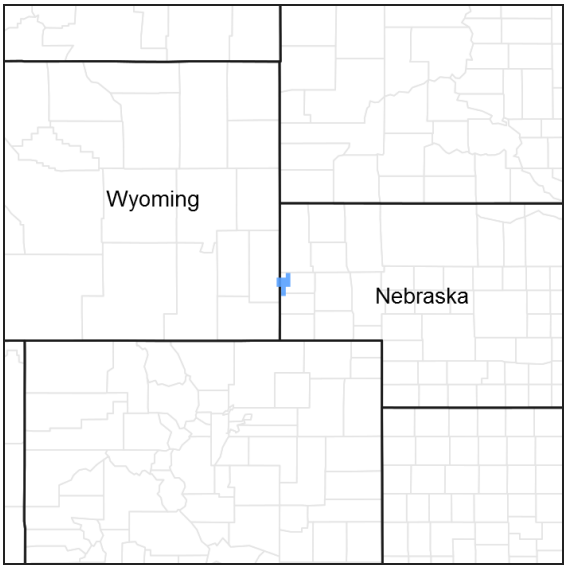


Figure 1. Mapped extent

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

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 Saline Upland 12-17 inch PZ ecological site was developed by an earlier version of the Saline Upland (SU) 12-17 inch Precipitation Zone ESD (2005, updated 2008). The earlier version of the Saline Upland (SU) 12-17 inch Precipitation Zone ESD was based on input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Saline Upland (SU) Range Site Description (1988). 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 Saline Upland Ecological Site is a run-off site that has visible salts on the soil surface or the upper profile. The soil is over 20 inches deep.

Associated sites

R067AY138WY	**Saline Lowland (SL)** This ecological site is commonly adjacent.

Similar sites

R067AY138WY	**Saline Lowland (SL)** The Saline Lowland Ecological Site is a run-on site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex canescens*
Herbaceous	(1) *Pascopyrum smithii* (2) *Bouteloua gracilis*

Physiographic features

This site occurs on nearly level fans or terraces in the basin of the Goshen Hole area in Wyoming and the far western Panhandle of Nebraska.

Table 2. Representative physiographic features

Landforms	(1) Fan (2) Terrace
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,189–1,402 m
Slope	0–3%
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) HARRISBURG 12WNW [USC00253605], Harrisburg, NE
- (2) KIMBALL 2NE [USC00254440], Kimball, NE
- (3) OSHKOSH [USC00256385], Oshkosh, NE
- (4) OLD FT LARAMIE [USC00486852], Yoder, WY
- (5) PHILLIPS [USC00487200], LaGrange, WY
- (6) WHEATLAND 4 N [USC00489615], Wheatland, WY
- (7) CHUGWATER [USC00481730], Chugwater, WY
- (8) SCOTTSBLUFF HEILIG AP [USW00024028], Scottsbluff, NE
- (9) BRIDGEPORT [USC00251145], Bridgeport, NE
- (10) CHEYENNE [USW00024018], Cheyenne, WY

Influencing water features

There are no water features associated with this ecological site.

Soil features

The soils on this site are typically very deep but may include shallow. They are well drained soils that formed from alluvium; shallow soils formed from residuum derived from shale. They typically have a slow to moderately slow permeability class. The high sodium and clayey subsoil restrict water movement in these soils. The available water capacity is typically low, but ranges from very low to moderate. The high levels of sodium and salts decrease the available water capacity in these soils. 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 loam, clay loam, or clay, but may include silty clay loam or silty clay. The surface layer ranges from a depth of 1 to 8 inches thick. The subsoil is typically clay, clay loam, silty clay loam, or silty clay. Soils in this site typically have carbonates at the surface; but a few soils may be leached to varying depths. These soils are strongly sodic, strongly saline, and very strongly alkaline. The high levels of sodium and salinity adversely affects plant species composition and growth. These soils are susceptible to erosion by water and wind. The potential for water erosion accelerates with increasing slope.

Surface soil structure is granular or platy, and structure below the surface is columnar, but may include prismatic and/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: Keyner.

Other soil series that have been correlated to this site include: Orella and Slickspots.

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.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loam (2) Clay loam (3) Clay
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–21.34 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	13–30
Soil reaction (1:1 water) (0-101.6cm)	7.4–10
Subsurface fragment volume <=3" (0-101.6cm)	0%
Subsurface fragment volume >3" (0-101.6cm)	0%

Ecological dynamics

The information in this ESD, including the state-and-transition model diagram (STM), 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 Saline Upland Ecological Site is characterized by three states: Reference, Sod-bound, and Increased *Bare Ground*. The Reference State is characterized by cool-season mid rhizomatous grass (western wheatgrass), warm-season mid bunchgrass (alkali sacaton), cool-season mid bunchgrasses (Needle and Thread), and warm-season shortgrass (blue grama). Other grasses and grass-likes include buffalograss, Indian ricegrass, saltgrass, and threadleaf sedge. A minor component of forbs such as scarlet globemallow and silverscale saltbush; and shrubs such as fourwing saltbush and Gardner's saltbush are also present. The Sod-bound State is characterized by warm-season shortgrass (blue grama, buffalograss, and saltgrass), and shrubs (broom snakeweed). The Increased *Bare Ground* State is characterized by early-successional warm-season shortgrass (scratchgrass and Fendler threeawn), forbs (curlycup gumweed and annuals), and shrubs (broom snakeweed).

As the Saline Upland Ecological Site begins to deteriorate from a combination of frequent and severe grazing during the growing season, bunchgrasses such as alkali sacaton and rhizomatous wheatgrasses begin to decrease in both frequency and production. Grasses such as blue grama, buffalograss, and inland saltgrass increase. Forbs and shrubs such as curlycup gumweed and broom snakeweed also increase. If continued, the plant community becomes sod-bound, and all midgrasses may 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 and bare ground.

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).

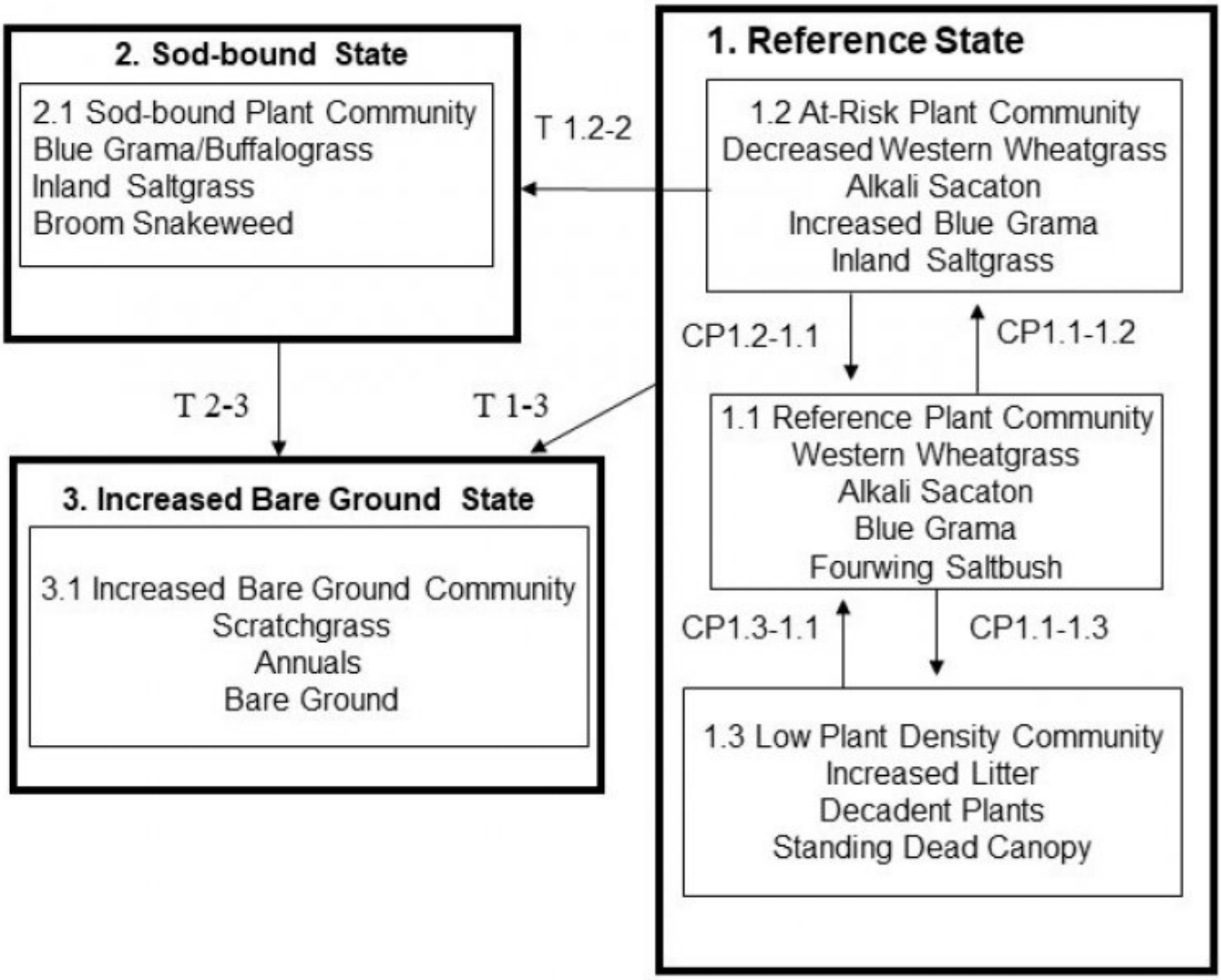
Today, livestock grazing, especially beef cattle has been a major influence on the ecological dynamics of the site. Grazing management, coupled with the effects of annual climatic variations, largely dictates the plant communities for the site.

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

Saline Upland 12-17" PZ



CP- Community Pathway
T-Transition
CP 1.1-1.2 Continuous grazing and/or frequent defoliation without adequate recovery, extended drought
CP 1.1-1.3 Non-use, no fire
CP 1.2-1.1 Prescribed grazing with adequate recovery and proper stocking, drought followed by normal precipitation
CP 1.3-1.1 Prescribed grazing with adequate recovery, fire
T 1.2-2 – Continuous grazing and/or frequent defoliation without adequate recovery
T 1-3 – Long-term heavy continuous grazing and/or excessive defoliation
T 2-3 Long-term continuous grazing with over-stocking and/or excessive defoliation

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

- fourwing saltbush (*Atriplex canescens*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 1.1
Pascopyrum smithii-Bouteloua gracilis (western wheatgrass-blue grama).

This is the interpretive plant community for the Saline Upland 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. The Reference plant community can be found on areas where grazed plants receive adequate periods of recovery during the growing season. The potential vegetation is about 85 percent grasses and grass-likes, 5 percent forbs and 10 percent woody plants. The major grasses include western wheatgrass, blue grama, and alkali sacaton . Secondary and minor grasses include buffalograss, Indian ricegrass, saltgrass, and threadleaf sedge. Forbs include scarlet globemallow, silverscale saltbush, textile onion, curlycup gumweed, and rush skeletonplant. Shrubs such as fourwing saltbush, Gardner’s saltbush, broom snakeweed, plains pricklypear, and winterfat also occur. Plant diversity is high. In the 12 to 14 inch Precipitation Zone (PZ), the total annual production (air-dry weight) is about 700 pounds per acre during an average year, but ranges from about 500 pounds per acre in unfavorable years to about 1, 000 pounds per acre in above-average years. Note: The extent of the Saline Upland ecological site occurs in the 14-16 inch PZ in southern Goshen County, WY and into Scotts Bluff County, NE. 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. Decadence and natural plant mortality are low. This community is resistant to many disturbances except continuous grazing, tillage, or development into urban or other uses.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- blue grama (*Bouteloua gracilis*), grass

Figure 9. 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

Community 1.2
Bouteloua gracilis-Pascopyrum smithii (blue grama-western wheatgrass).

Grazing-tolerant species such as blue grama, buffalograss, and saltgrass have noticeably increased. Needle and thread may initially increase or decrease depending upon the season of grazing use. Alkali Sacaton is nearly absent. Silverscale saltbush and other palatable forbs are present in reduced amounts. Forbs such as scarlet globemallow and curlycup gumweed have increased. Palatable shrubs such as fourwing saltbush and Gardner’s saltbush have been reduced, and shrubs such as broom snakeweed have increased. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 500 pounds per acre during an average year, but ranges from about 350 pounds per acre in unfavorable years to about 725 pounds per acre in above-average years. Total aboveground biomass has been reduced. Reduction of rhizomatous wheatgrasses, nitrogen-fixing forbs, and increased warm-season short-grasses have begun to alter the biotic integrity of this community. Water and nutrient cycles may be impaired. Nearly all plant species typically found in the Reference Plant Community are present and

will respond to changes in grazing management.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- blue grama (*Bouteloua gracilis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 10. 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

Community 1.3
Pascopyrum smithii-Bouteloua gracilis (western wheatgrass-blue grama) 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 become high enough to cause decadence and mortality of the stand. Bunchgrasses typically develop dead centers and rhizomatous grasses 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 semi-arid environment and the absence of animal traffic to break down litter slow nutrient recycling. Water flow patterns and pedestalling become apparent. Infiltration is reduced and runoff is increased. In advanced stages of non-use or lack of fire, bare areas increase causing an erosion concern. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 600 pounds per acre during an average year, but ranges from about 400 pounds per acre in unfavorable years to about 800 pounds per acre in above-average years.

Dominant plant species

- fourwing saltbush (*Atriplex canescens*), shrub
- western wheatgrass (*Pascopyrum smithii*), grass
- blue grama (*Bouteloua gracilis*), 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

Heavy, continuous grazing and lack of fire shift this plant community to the 1.2 Community. Drought accelerates this process. Biotic integrity and 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 toward the Low Plant Density Plant Community. Plant decadence and standing dead plant material impede energy flow. Initially, excess litter increases. Eventually, native plant density begins to decrease and annuals and introduced species begin to invade. Water and nutrient cycles will be impaired as a result of this community pathway.

Pathway 1.2A

Community 1.2 to 1.1

Grazing that allows for adequate recovery between grazing events, proper stocking rates, and prescribed fire shift this Community 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 time frame with the return of these disturbances.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Sod-bound State

An ecological threshold has been crossed and 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. The loss of functional/structural groups such as cool-season mid-grasses reduces the biodiversity and productivity of this site. This is a very stable state, resistant to change due to the high tolerance of blue grama and buffalograss to grazing, the development of a shallow root system (aka root pan), and subsequent changes in hydrology and nutrient cycling. The loss of other functional/structural groups such as cool-season and warm-season bunch and cool-season rhizomatous grasses, forbs, and shrubs reduces the biodiversity productivity of this site.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Community 2.1
Bouteloua gracilis-Bouteloua dactyloides (blue grama-buffalograss).

The mid-grasses and palatable forbs and shrubs have been eliminated. The dominant species are blue grama, buffalograss, and saltgrass. These species have developed into a sod-bound condition occurring in localized colonies exhibiting a mosaic appearance. Fendler threeawn has increased. Forbs such as scarlet globemallow, wild onion, curlycup gumweed, and skeletonplant remain. Shrubs that continue to increase are broom snakeweed. Plant diversity is very low. Energy flow and the water and mineral cycles have been negatively affected. Litter levels are very low and unevenly distributed. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 500 pounds per acre during an average year, but ranges from about 350 pounds per acre in unfavorable years to about 650 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

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- blue grama (*Bouteloua gracilis*), grass
- buffalograss (*Bouteloua dactyloides*), 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
Increased Bare Ground State

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.An ecological threshold has been crossed. Erosion and loss of organic matter and carbon reserves are concerns.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- scratchgrass (*Muhlenbergia asperifolia*), grass
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- burningbush (*Bassia scoparia*), other herbaceous
- Russian thistle (*Salsola*), other herbaceous

Community 3.1
Gutierrezia sarothrae/Bassia scoparia-Salsola/Muhlenbergia asperifolia-Aristida purpurea (broom snakeweed/burningbush-Russian thistle/scratchgrass-Fendler threeawn).

The plant composition of this state is primarily annuals with a few species of perennial forbs and grasses that are very tolerant to frequent and severe defoliation. The dominant grasses include scratchgrass and Fendler threeawn. Western wheatgrass has been reduced, but still persists in the plant community. Annuals such as Russian thistle and burningbush have invaded. Broom snakeweed is persistent. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 300 pounds per acre during an average year, but ranges from about 250 pounds per acre in unfavorable years to about 400 pounds per acre in above-average years.

Dominant plant species

- broom snakeweed (*Gutierrezia sarothrae*), shrub
- scratchgrass (*Muhlenbergia asperifolia*), grass
- Fendler threeawn (*Aristida purpurea var. longiseta*), grass
- burningbush (*Bassia scoparia*), other herbaceous
- Russian thistle (*Salsola*), 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

Transition T1A
State 1 to 2

Continuous, heavy grazing and lack of fire shifts this state across an ecological threshold to the Sod-bound State. Biotic integrity and hydrologic function are impaired as a result of this transition.

Transition T1B
State 1 to 3

Long-term heavy, continuous grazing, and lack of fire shifts this state across an ecological threshold to the Increased *Bare Ground* State. Erosion and loss of organic matter and carbon reserves are concerns. Non-native

exotic plants are likely to invade.

Transition T2A
State 2 to 3

Long-term, heavy, continuous grazing 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.

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	**Cool-season Midgrass**			0–157	
	needle and thread	HECO26	*Hesperostipa comata*	39–118	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–39	–
	green needlegrass	NAVI4	*Nassella viridula*	0–39	–
2	**Cool-season Rhizomatous**			275–392	
	western wheatgrass	PASM	*Pascopyrum smithii*	275–392	–
3	**Warm-season**			157–314	
	blue grama	BOGR2	*Bouteloua gracilis*	78–196	–
	alkali sacaton	SPAI	*Sporobolus airoides*	39–118	–
	saltgrass	DISP	*Distichlis spicata*	0–39	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–39	–
4	**Grasslike**			0–78	
	threadleaf sedge	CAFI	*Carex filifolia*	0–78	–
	sedge	CAREX	*Carex*	0–39	–
5	**Grass**			0–39	
	Grass, perennial	2GP	*Grass, perennial*	0–39	–
Forb					
6	**Forbs**			0–39	
	Forb, perennial	2FP	*Forb, perennial*	0–39	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–39	–
	textile onion	ALTE	*Allium textile*	0–16	–
	silverscale saltbush	ATAR2	*Atriplex argentea*	0–16	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–16	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–16	–
Shrub/Vine					
7	**Shrub**			39–78	
	fourwing saltbush	ATCA2	*Atriplex canescens*	8–78	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–16	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–16	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–16	–
	Gardner's saltbush	ATGA	*Atriplex gardneri*	0–16	–

Animal community

Wildlife Interpretations:

Reference Plant Community – Western Wheatgrass, Alkali Sacaton, Blue Grama, and Fourwing Saltbush: The predominance of grasses with a shrub component in this plant community favor grazers and mixed-feeders such as bison, elk, and antelope.

1.2 Community – Decreased Western Wheatgrass, Decreased Alkali Sacaton, Increased Blue Grama and Inland Saltgrass: This plant community may be
useful for the same large grazers that would use the Reference Plant Community.
However, the plant community composition is less diverse, and thus less apt to meet
the seasonal needs for wildlife.

1.3 Community – Increased Litter, Decadent Plants, and Standing Dead Canopy: This community has limited habitat value for most wildlife species.

2.1 Community: Blue Grama/Buffalograss, Inland Saltgrass, and Broom Snakeweed: This community provides limited foraging for antelope and other grazers.
3.1 Community – Scratchgrass, Annuals, and *Bare Ground*: This plant community exhibits a low level of plant species diversity due to the accumulation of salts in the soil. In most cases it is not a desirable plant community to select as a wildlife habitat management objective.

Grazing Interpretations:

The following table is a guide to stocking rates for the plant communities described in the Saline Upland 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 and 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.

Plant Community (PC) Production (total lbs./acre in a normal year) and Stocking Rate (AUMs/acre) are listed below:
Example: Reference PC – (700) (.19)
700 lbs. per acre X 25% Harvest Efficiency = 175 lbs. forage demand for one month. Then, 175 lbs. per acre/912 demand per AUM =.19

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

Reference PC - (700) (0.19)
1.2 PC - (500) (0.14)
2.1 PC - (300) (0.08)

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 development of a grazing plan.

Hydrological functions

Water and salinity are the principal factors 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 slow to moderate.

Runoff potential for this site varies from moderate to high depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (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 may be present. Cryptogamic crusts are present, but only cover 1-2 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.

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 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: Stocking Rate table updated.

Wildlife Interpretations: Plant community names updated. 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 is very limited. 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

NRI: references to Natural Resource Inventory data
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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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, Nadine Bishop
Contact for lead author	
Date	11/19/2020
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.

2. **Presence of water flow patterns:** Typically, none. Water flow patterns are not expected on this site; if present they are barely observable.

3. **Number and height of erosional pedestals or terracettes:** Essentially non-existent

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 40 to 50 percent, with patches less than 2 feet (0.61 meter) across.

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. Wind-scoured and/or depositional areas are not present on the site.

7. **Amount of litter movement (describe size and distance expected to travel):** Small size litter classes will generally move short (less than 6 inches or 15.2 cm) distances, some medium size-class litter will move very short distances. Litter debris dams are occasionally present.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability class will be variable; under plant canopy soil stability class ratings will be 4 or greater. In interspaces, where salinity is higher, ratings will be 3 or lower. As bare ground increases and community moves toward plant community phase 3.1, soil stability ratings will average 3 across the site.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface layer ranges 1 to 8 inches (2.5-20.3 cm) thick. Soil colors range from dark grayish brown to light grayish brown (values of 4 to 6) when dry and very dark grayish brown to dark grayish brown (values of 3 to 4) when moist. Soil surface structure is granular or platy. These soils are strongly sodic, strongly saline and very strongly alkaline.

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 about 85 percent perennial grasses and grass-likes, 5 percent forbs, and 10 percent shrubs. The grass and grass-like component is made up of cool-season, rhizomatous grasses (35-50%); warm-season, mid-and short grasses (10-30%); cool-season, bunch grasses (5-20%); warm-season, tall, bunch grasses (5-15%); grass-likes (0-5%).

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. The soils will have a natural platy structure near the soil surface which could be mistaken for a compaction layer.

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: 1. Native, C3, rhizomatous grasses – 245-350 #/ac (35-50%), 1 species minimum

    Sub-dominant: 2. Native, C4, mid- and short grasses – 70-210 (10-30%), 1 species minimum
    3. Native, C3, bunch grasses – 35-140 #/ac (5-20%), 1 species minimum
    4. Native, C4, tall, bunch grasses – 35-105 #/ac (5-15%), 1 species minimum

    Other: Minor Groups:
    5. Shrubs, vines, cacti – 35-70 #/ac (5-10%)
    6. Native, Perennial and Annual Forbs – 0-35 #/ac (0-5%)
    7. Grass-likes – 0-35 #/ac (0-5%)

    Additional: 12a. Relative Dominance:
    Community 1.1: Native, C3, rhizomatous grasses > Native, C4, mid- and short grasses > Native, C3, bunch grasses > Native, C4, tall, bunch grasses > Shrubs, Cacti, Vine > Native, Annual or Perennial 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: 4

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 some dead stems.

14. **Average percent litter cover (%) and depth (in):** Average litter cover is 10 to 15 percent. Litter depth is expected to be 0.1 to 0.5 inches (0.25-1.25 cm).

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production ranges from 500 to 1,000 pounds per acres on an air dry basis. Average annual production is 700 pounds per acre under normal precipitation and weather conditions.

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, scratchgrass, Russian thistle, kochia, broom snakeweed, Fendler's threeawn, 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.
