Natural Resources
Conservation Service

Ecological site R067AY142WY
Saline Subirrigated (SS)

Last updated: 12/09/2024
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General information

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

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). MLRAs 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 Subirrigated Ecological Site was developed by an earlier version of the Saline Subirrigated ESD (2005, updated 2008). The earlier version of the Saline Subirrigated (named Saline Subirrigated (SS) 12 to 17 inch Precipitation Zone) ESD was based on input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Saline Subirrigated (SS) 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 Saline Subirrigated Ecological Site is a run-on site with visible salts on the soil surface or in the upper soil profile. The water table is within 6 to 36 inches of the surface during some or most of the growing season.

Associated sites

R067AY138WY	**Saline Lowland (SL)** This ecological site is commonly adjacent.
R067AY174WY	**Subirrigated (Sb)** This ecological site is commonly adjacent.
R067AY178WY	**Wetland (WL)** This ecological site is commonly adjacent.

Similar sites

R067AY174WY	**Subirrigated (Sb)** The Subirrigated Ecological Site is not saline and does not have visible salts on the soil surface or in the upper layer of the soil profile.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus*
Herbaceous	(1) *Sporobolus airoides* (2) *Pascopyrum smithii*

Physiographic features

This site typically occurs on the floodplains, flood-plain steps, or drainageways of the river valleys.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Flood-plain step (3) Drainageway
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	1,067–1,981 m
Slope	0–3%
Water table depth	15–91 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) BRIDGEPORT [USC00251145], Bridgeport, NE
- (2) HARRISBURG 12WNW [USC00253605], Harrisburg, NE
- (3) OSHKOSH [USC00256385], Oshkosh, NE
- (4) KIMBALL 2NE [USC00254440], Kimball, NE
- (5) CHUGWATER [USC00481730], Chugwater, WY

- (6) OLD FT LARAMIE [USC00486852], Yoder, WY
- (7) CHEYENNE [USW00024018], Cheyenne, WY
- (8) SCOTTSBLUFF HEILIG AP [USW00024028], Scottsbluff, NE
- (9) PHILLIPS [USC00487200], LaGrange, WY
- (10) WHEATLAND 4 N [USC00489615], Wheatland, WY

Influencing water features

There is a seasonal water table that influences the kinds and amounts of vegetation on this site. The water table in some areas is anthropogenic, caused by seepage from nearby irrigation ditches, canals, and reservoirs. Some soils in this ESD are hydric soils; most map units in this ESD have a 1 to 10 percent hydric minor component associated with them.

Wetland description

Wetland System is Palustrine; Wetland Class is Emergent Wetland

Soil features

The soils on the Saline Subirrigated ecological site are typically very deep, poorly to somewhat poorly drained soils that formed from alluvium. They typically have a moderately slow to moderately rapid permeability class. The available water capacity is low to moderate. The high levels of salts decrease the available water capacity in these soils. The soil moisture regime is typically aquic. The soil temperature regime is mesic.

The surface layer of the soils in this site are typically loam, silt loam, or silty clay loam, but may include fine sandy loam or very fine sandy loam. The surface layer ranges from a depth of 3 to 10 inches thick. The subsoil is typically loam, silt loam, silty clay loam, or very fine sandy loam, but may include strata of sand, fine sandy loam, coarse sand, or fine sand. Rock fragments are typically less than 5 percent, but some soils may have up to 30 percent rock fragments. Soils in this site have carbonates at the surface but may be leached to 10 inches in some soils. These soils are slightly to strongly saline and moderately to very strongly alkaline. The high levels of salinity and alkalinity adversely affect plant species composition and growth. These soils are typically not susceptible to erosion by water and wind due to the wetness of the soil profile by the seasonal water table. However, these areas may have the hazard of wind erosion if these areas are drained and the surface is not protected by vegetation.

Surface soil structure is typically granular, and structure below the surface ranges from subangular blocky and prismatic to massive and single grain. 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: Dobent, Gering, Janise, Jankosh, Lewellen, Lisco, Merden, McGrew, Minatare, and Yockey.

Other soil series that have been correlated to this site include: Bigwin, Fluvaquents, Kirkham, Torrifluvents, Rushcreek, and Wildhorse.

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

Note: Revisions to soil surveys are ongoing. 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) Silt loam (3) Silty clay loam
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	7.62–15.24 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
Electrical conductivity (0-101.6cm)	4–30 mmhos/cm
Sodium adsorption ratio (Depth not specified)	10–50
Soil reaction (1:1 water) (0-101.6cm)	7.9–9.6
Subsurface fragment volume <=3" (Depth not specified)	0–30%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The information in this ESD, including the state-and-transition model diagram (STM), was developed using archaeological 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 and time-controlled grazing strategies, and historical accounts.

The Saline Subirrigated ecological site is characterized by four states: Reference, Sod-bound, Increased *Bare Ground*, and Russian Olive. The Reference State is characterized by warm-season midgrass (alkali sacaton) and cool-season rhizomatous midgrass (western wheatgrass). Secondary grasses include warm-season rhizomatous shortgrasses such as inland saltgrass and alkali cordgrass; and cool-season mid-bunchgrasses such as slender wheatgrass, Canada wildrye, and alkali bluegrass (also known as Sandberg bluegrass). A minor component of grasslikes such as rush, spikerush, and bulrush species; forbs and shrubs, are also present. See the species composition list in this ESD. The Sod-bound State is characterized by saltgrass and remnant alkali sacaton. The Increased *Bare Ground* State is characterized by remnant saltgrass, and by invasive annuals such as burningbush and Russian thistle. In salt-encrusted soils, halogeton becomes prevalent. Other noxious species that may invade include Canada thistle and Russian knapweed . Trees such as Russian olive may invade if a seed source is available.

As this site begins to deteriorate from a combination of frequent and severe grazing during the growing season, grasses such as alkali sacaton, alkali cordgrass, western wheatgrass, and slender wheatgrass decrease in frequency and production. Grasses such as saltgrass increase. Under continued frequent and severe defoliation, alkali sacaton is eventually removed from the plant community. The plant community becomes sod-bound, and all midgrasses may eventually be removed. Over the long-term, this continuous use in combination with high stock densities results in a broken sod, with areas of bare ground developing. Species such as burningbush, Russian thistle, and halogeton invade. As bare ground increases, it allows salts or alkali to build up on the soil surface. Once these events have occurred, it is difficult for native perennial plants to reestablish.

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

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

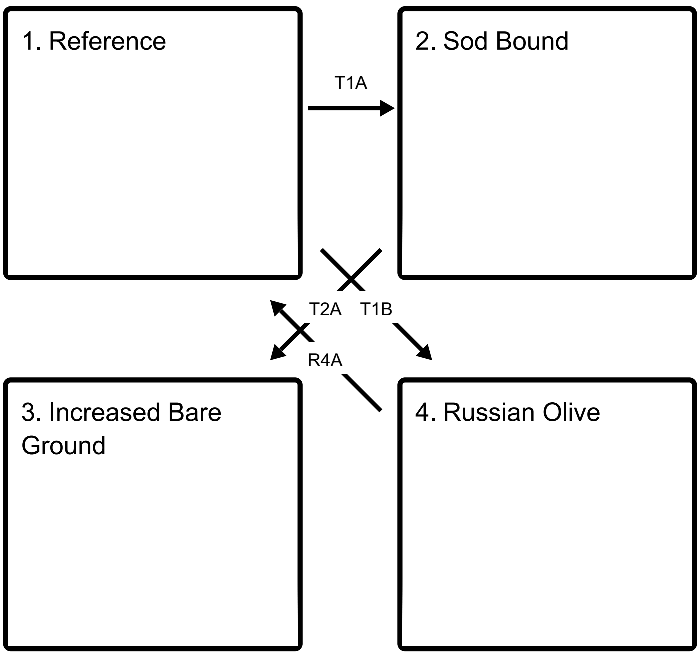
Today, livestock grazing, especially beef cattle has been a major influence on the ecological dynamics of the site. Grazing management, coupled with the effects of annual climatic variations, largely dictates the plant communities for the site.

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

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

State and transition model

Ecosystem states



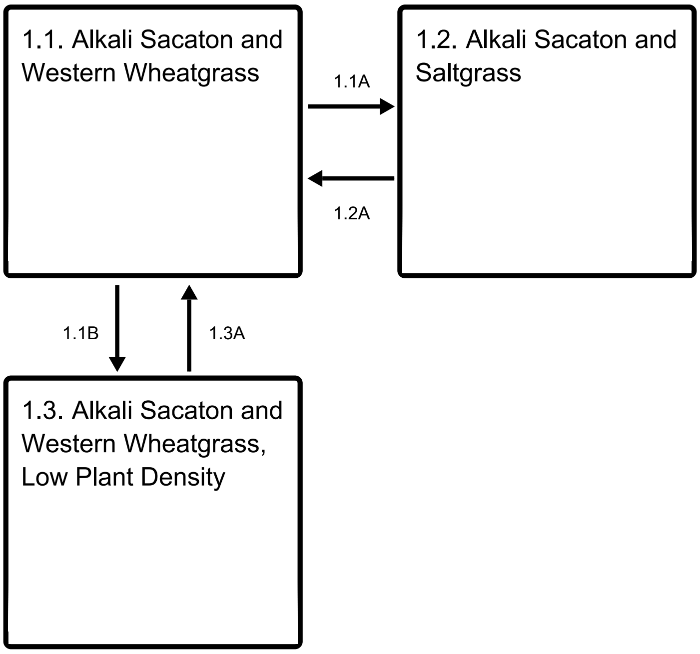
T1A - Excessive grazing. Lack of fire.

T1B - Non-use. Lack of fire.

T2A - Excessive grazing. Lack of fire.

R4A - Prescribed grazing. Brush management. Prescribed fire.

State 1 submodel, plant communities



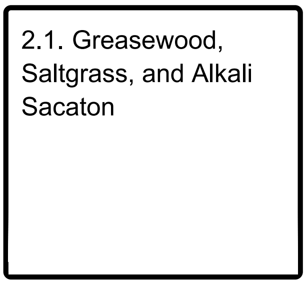
1.1A - Excessive grazing. Lack of fire.

1.1B - Non-use. Lack of fire.

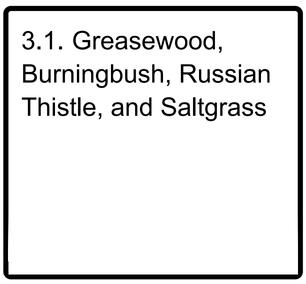
1.2A - Prescribed grazing. Prescribed fire.

1.3A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities

4.1. Russian Olive

State 1
Reference

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

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Alkali Sacaton and Western Wheatgrass

The Reference Plant Community is the interpretive plant community for the Saline Subirrigated 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 about 90 percent grasses and grass-likes, 5 to 10 percent forbs, and 0 to 5 percent woody plants. The major grasses include alkali sacaton, western wheatgrass, and saltgrass. Secondary species include alkali cordgrass; and cool-season mid- bunchgrasses such as slender wheatgrass, Canada wildrye, and alkali bluegrass (also known as Sandberg bluegrass). Other minor grasses include foxtail barley, alkali muhly, Nuttall’s alkaligrass, and little bluestem. A minor component of grasslikes such as mountain rush (also known as Baltic rush), spikerush, and bulrush species; forbs such as horsetail, Pursh seepweed, arrowgrass, and showy milkweed; white sagebrush (also known as cudweed sagewort), Cuman ragweed, milkvetch; and a minor component of shrubs, are also present. In the 12 to 14 inch precipitation zone (PZ), the total annual production (air-dry weight) is about 3,200 pounds per acre during an average year, but ranges from about 2,600 pounds per acre in unfavorable years to about 3,800 pounds per acre in above- average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 3,500 pounds per acre during an average year, but ranges from about 2,850 pounds per acre in unfavorable years to about 4,200 pounds per acre in above-average years. Community dynamics (nutrient and water cycles, and energy flow) are functioning properly. Infiltration rates are moderate, and soil erosion is low. Litter is properly distributed where vegetative cover is continuous. Decadence and natural plant mortality are low. This community is resistant to many disturbances except heavy, continuous grazing, tillage, and development into urban or other uses.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 9. Plant community growth curve (percent production by month). WY1106, 12-14SP Free water sites w/warm - WL, Sb, SS.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	20	30	20	10	0	0	0

Community 1.2
Alkali Sacaton and Saltgrass

Saltgrass has increased in abundance. Most of the palatable plants such as alkali sacaton, western wheatgrass, and slender wheatgrass are present but occur in lesser amounts. Plant diversity is moderate. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 2,100 pounds per acre during an average year, but ranges from about 1,700 pounds per acre in unfavorable years to about 2,500 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 2,300 pounds per acre during an average year, but ranges from about 1,850 pounds per acre in unfavorable years to about 2,750 pounds per acre in above-average years. Total aboveground biomass has been reduced. Reduction of rhizomatous wheatgrasses, nitrogen-fixing forbs, and increased warm-season shortgrasses, 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

- greasewood (*Sarcobatus vermiculatus*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- saltgrass (*Distichlis spicata*), grass

Figure 10. Plant community growth curve (percent production by month). WY1106, 12-14SP Free water sites w/warm - WL, Sb, SS.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	15	20	30	20	10	0	0	0

Community 1.3
Alkali Sacaton and Western Wheatgrass, Low Plant Density

Plant species resemble the Reference community however, frequency and production are reduced. Standing dead canopy may prevent sunlight from reaching plant crowns. Much of the available nutrients are tied up in standing dead plant material and litter. Eventually, litter levels can become high enough to cause decadence and mortality of the stand. Bunchgrasses such as alkali sacaton, slender wheatgrass, and switchgrass typically develop dead centers, and rhizomatous grasses can form small decadent communities due to a lack of impact by grazing animals. The semiarid environment and the absence of animal traffic to break down litter slows nutrient recycling. Water flow patterns and pedestalling can become apparent. Infiltration is reduced and runoff is increased. In advanced states 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 2,900 pounds per acre during an average year, but ranges from about 2,300 pounds per acre in unfavorable years to about 3,500 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production (air-dry weight) is about 3,100 pounds per acre during an average year, but ranges from about 2,500 pounds per acre in unfavorable years to about 3,700 pounds per acre in above-average years. Total annual production can vary substantially.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- alkali sacaton (*Sporobolus airoides*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 11. Plant community growth curve (percent production by month). WY1103, 12-14SP Free water w/o warm - WL, Sb, SS.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	25	15	10	0	0	0

Pathway 1.1A
Community 1.1 to 1.2

Frequent and severe defoliation without adequate recovery between grazing events, and lack of fire shifts this plant community to1.2 Community. Drought accelerates this process. Biotic integrity, water, and nutrient cycles may become impaired as a result of this community pathway.

Pathway 1.1B
Community 1.1 to 1.3

Non-use and lack of fire cause the Reference Plant Community to shift to the 1.3

Community. Plant decadence and standing dead plant material impede energy flow. Initially, excess litter increases. Eventually, native plant density begins to decrease and annuals and introduced species begin to invade. Water and nutrient cycles are impaired as a result of this community pathway.

Pathway 1.2A
Community 1.2 to 1.1

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

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

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

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Sod Bound

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. This is a very stable state, resistant to change due to the high tolerance of saltgrass 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 bunch and rhizomatous grasses, forbs, and shrubs, reduces the biodiversity productivity of this site.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- saltgrass (*Distichlis spicata*), grass
- alkali sacaton (*Sporobolus airoides*), grass

Community 2.1
Greasewood, Saltgrass, and Alkali Sacaton

The mid-grasses and palatable forbs have been eliminated. The dominant species is saltgrass, with remnant stands of alkali sacaton. The saltgrass has developed into a sod-bound condition occurring in localized colonies exhibiting a mosaic appearance. Annual weeds such as burningbush and Russian thistle have invaded. The plant community lacks diversity and is resistant to change. Evaporation has increased, resulting in salts on the soil surface. Halogeton begins to invade in salt-affected areas. Energy flow, water cycle, and mineral cycle have been negatively affected. Litter levels are very low and unevenly distributed. In the 12 to 14 inch precipitation zone, the total annual production (air-dry weight) is about 1,800 pounds per acre during an average year, but ranges from about 1,600 pounds per acre in unfavorable years to about 2,000 pounds per acre in above-average years. In the 15 to 17 inch precipitation zone, the total annual production (air-dry weight) is about 1,900 pounds per acre during an average year, but ranges from about 1,700 pounds per acre in unfavorable years to about 2,100 pounds per acre in above-average years.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- saltgrass (*Distichlis spicata*), grass
- alkali sacaton (*Sporobolus airoides*), grass

Figure 12. Plant community growth curve (percent production by month). WY1103, 12-14SP Free water w/o warm - WL, Sb, SS.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	25	15	10	0	0	0

State 3
Increased Bare Ground

An ecological threshold has been crossed. The Increased *Bare Ground* State denotes changes in infiltration, runoff, aggregate stability, and species composition. The changes in water movement and the plant community affect changes in hydrologic functionality, biotic integrity, and soil and site stability. Infiltration, runoff, and soil erosion vary depending upon the vegetation present. Erosion and loss of organic matter and carbon reserves are concerns. Desertification is advanced.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- saltgrass (*Distichlis spicata*), grass
- burningbush (*Bassia scoparia*), other herbaceous

- Russian thistle (*Salsola*), other herbaceous
- saltlover (*Halogeton*), other herbaceous

Community 3.1
Greasewood, Burningbush, Russian Thistle, and Saltgrass

The plant composition is made up introduced annuals, noxious weeds, and remnant grasses such as inland saltgrass that are very tolerant to frequent and severe defoliation. Annual invasive forbs include burningbush, Russian thistle, and halogeton. Noxious weeds, such as Russian knapweed and Canada thistle may invade. Halogeton becomes the dominant invasive species where bare ground and salt crusts have increased. Forage palatability for livestock is low. The total annual production (air-dry weight) is about 650 to 800 pounds per acre during an average year but may be as low as 500 pounds per acre in unfavorable years, to 950 lbs. per acre in favorable years. NOTE: This plant community is highly variable, in both species composition and production. Where halogeton is dominant, the plant community may be rendered useless for livestock grazing. Average annual production should be determined on site. This plant community is very resistant to change because of the lack of native species, the increase of salt-affected soils, and the amount of invasive species present. The changes in water movement and the plant community affect changes in hydrologic functionality, biotic integrity, and soil and site stability. Litter levels are extremely low due to reduced production. Runoff and evaporation are high because of soil crusting and the lack of cover.

Dominant plant species

- greasewood (*Sarcobatus vermiculatus*), shrub
- saltgrass (*Distichlis spicata*), grass
- burningbush (*Bassia scoparia*), other herbaceous
- Russian thistle (*Salsola*), other herbaceous
- saltlover (*Halogeton*), other herbaceous

Figure 13. Plant community growth curve (percent production by month). WY1103, 12-14SP Free water w/o warm - WL, Sb, SS.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	25	15	10	0	0	0

State 4
Russian Olive

The Russian Olive State develops with the introduction of a seed source. An ecological threshold has been crossed. The Russian Olive State denotes changes in infiltration, runoff, aggregate stability, and species composition. The changes in water movement and the plant community affect changes in hydrologic functionality, biotic integrity, and soil and site stability. Infiltration, runoff, and soil erosion vary depending upon the vegetation present. Erosion and loss of organic matter and carbon reserves are concerns.

Dominant plant species

- Russian olive (*Elaeagnus angustifolia*), tree

Community 4.1
Russian Olive

This plant community develops with the introduction of seed source by wildlife, water, or wind. It is most commonly found along major drainageways. The lack of fire or haying (if mechanically harvested), allows trees to become established. Eventually, dense populations of Russian olive may prohibit livestock from utilizing existing forage. In the 12 to 14 inch PZ, the total annual production (air-dry weight) is about 2,600 pounds per acre during an average year, but ranges from about 2,100 pounds per acre in unfavorable years to about 3,100 pounds per acre in above-average years. In the 15 to 17 inch PZ, the total annual production is about 2,800 pounds per acre during an average year, but ranges from about 2,200 pounds per acre in unfavorable years to about 3,400 pounds per acre in above-average years.

Dominant plant species

- Russian olive (*Elaeagnus angustifolia*), tree

Figure 14. Plant community growth curve (percent production by month). WY1103, 12-14SP Free water w/o warm - WL, Sb, SS.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	25	15	10	0	0	0

Transition T1A
State 1 to 2

Frequent and severe defoliation and lack of fire shift the Reference State to the Sod-bound State. Biotic integrity and hydrologic function are impaired as a result of this transition.

Transition T1B
State 1 to 4

In the presence of a seed source, non-use and lack of fire shift this state to the Russian Olive State. Biotic integrity and hydrologic function are impaired as a result of this transition.

Transition T2A

State 2 to 3

Long-term frequent and severe defoliation and lack of fire cause a shift across an ecological threshold to the Increased *Bare Ground* State. Erosion and loss of organic matter along with invasion of introduced plants and noxious weeds are resource concerns.

Restoration pathway R4A
State 4 to 1

Very long-term prescribed grazing, mechanical and chemical brush management of Russian olive, and prescribed fire move this plant community toward the Reference State. Brush management alone will not restore this site and is only supplemental to prescribed grazing for this restoration pathway. This transition, however, could require a long period of time, depending upon the amount of salt accumulation on the soil surface.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**12-14 Warm Season Mid and Tall Grasses**			420–673	
	alkali sacaton	SPAI	*Sporobolus airoides*	420–673	–
	switchgrass	PAVI2	*Panicum virgatum*	0–84	–
	alkali cordgrass	SPGR	*Spartina gracilis*	0–84	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	0–84	–
2	**12-14 Rhizomatous Wheatgrass**			252–336	
	western wheatgrass	PASM	*Pascopyrum smithii*	252–336	–
3	**12-14 Other Cool Season Grasses**			84–336	
	Canada wildrye	ELCA4	*Elymus canadensis*	0–84	–
	sedge	CAREX	*Carex*	0–84	–
	slender	ELTR7	*Elymus trachycaulus*	0–84	–

	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–84	
	bluegrass	POA	*Poa*	0–84	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–84	–
4	**12-14 Short Grasses**			168–336	
	saltgrass	DISP	*Distichlis spicata*	168–252	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–196	–
	muhly	MUHLE	*Muhlenbergia*	0–196	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–84	–
7	**15-17 Warm Season Mid and Tall Grasses**			1569–2746	
	alkali sacaton	SPAI	*Sporobolus airoides*	1373–1765	–
	alkali cordgrass	SPGR	*Spartina gracilis*	196–404	–
	switchgrass	PAVI2	*Panicum virgatum*	0–196	–
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	0–196	–
	little bluestem	SCSC	*Schizachyrium scoparium*	0–196	–
8	**15-17 Wheatgrass**			392–981	
	western wheatgrass	PASM	*Pascopyrum smithii*	392–588	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0–392	–
9	**15-17 Other Cool Season Grasses**			196–588	
	plains bluegrass	POAR3	*Poa arida*	196–588	–
	Sandberg bluegrass	POSE	*Poa secunda*	196–588	–
	bluegrass	POA	*Poa*	0–196	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–196	–
	foxtail barley	HOJU	*Hordeum jubatum*	0–196	–
	Grass, perennial	2GP	*Grass, perennial*	0–196	–
10	**15-17 Short Grasses**			392–588	
	saltgrass	DISP	*Distichlis spicata*	392–588	–
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–196	–
	muhly	MUHLE	*Muhlenbergia*	0–196	–
11	**15-17 Grasslikes**			196–392	

11	**15-17 Grasslikes**			196–392	
	sedge	CAREX	*Carex*	196–392	–
	spikerush	ELEOC	*Eleocharis*	0–196	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	0–196	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	0–196	–
	rush	JUNCU	*Juncus*	0–196	–
	bulrush	SCIRP	*Scirpus*	0–196	–
Forb					
5	**12-14 Forbs**			179–359	
	Forb, perennial	2FP	*Forb, perennial*	17–84	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–72	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–72	–
	milkvetch	ASTRA	*Astragalus*	0–72	–
	horsetail	EQUIS	*Equisetum*	0–72	–
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–72	–
	arrowgrass	TRIGL	*Triglochin*	0–72	–
	scarlet beeblossom	OESU3	*Oenothera suffrutescens*	0–34	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–34	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–34	–
12	**15-17 Forbs**			196–392	
	showy milkweed	ASSP	*Asclepias speciosa*	0–78	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	0–78	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–78	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–78	–
	milkvetch	ASTRA	*Astragalus*	0–78	–
	horsetail	EQUIS	*Equisetum*	0–78	–
	Pursh	SUCA2	*Suaeda calceoliformis*	0–78	–

	seepweed				
	arrowgrass	TRIGL	*Triglochin*	0–78	–
	Carelessweed	CYXA2	*Cyclachaena xanthiifolia*	0–78	–
	Forb, perennial	2FP	*Forb, perennial*	0–78	–
Shrub/Vine					
6	**12-14 Shrubs**			34–336	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	17–336	–
	silver buffaloberry	SHAR	*Shepherdia argentea*	0–84	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	17–84	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–84	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–34	–
13	**15-17 Shrubs**			28–196	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–196	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0–196	–

Animal community

Wildlife Interpretations:

Reference Plant Community— Alkali Sacaton, Western Wheatgrass, and Saltgrass:
Common bird species expected in the Reference Plant Community include Cassin’s sparrow, chestnut-collared longspur, lark bunting, western meadowlark, and ferruginous and Swainson’s hawk. White- and black-tailed jackrabbit, badger, pronghorn, coyote, plains pocket gopher, and several species of mice are mammals that commonly use this plant community.

1.2 Community—Alkali Sacaton, Decreased Midgrasses, and Increased 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 of these animals.

1.3 Community—Excessive Litter, Decadent Plants, and Standing Dead Canopy:
This community has reduced habitat value for most wildlife species found in the Reference Plant Community.

2.1 Community—Saltgrass and Remnant Alkali Sacaton:
Horned lark, McCown’s longspur, killdeer, and long-billed curlew use these plant communities. Jackrabbit, thirteen-lined ground squirrel, and cottontail rabbit are frequent

users of this community. This community may still 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 of these animals.

3.1 Community—Burningbush, Russian Thistle, and Halogeton:
This community has low habitat value for most wildlife species.

4.1 Community—This community has low habitat value for most wildlife species.

Grazing Interpretations:

The following table is a guide to stocking rates for the plant communities described in the Saline Subirrigated 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, with or without a calf, 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 – (3200) (.88)
3,200 lbs. per acre X 25% Harvest Efficiency = 800 lbs. forage demand for one month.
Then, 800 lbs. per acre/912 demand per AUM =.88

Plant Community (PC) Production (lbs.ac) and Stocking Rate (AUM/Acre) 12-14” PZ:
Reference PC - (3200) (0.88)
1.2 PC - (2100) (0.58)
2.1 PC - (1800) (0.49)
4.1 PC – (2600) (.71)

15-17” PZ
Reference PC - (3500) (0.96)
1.2 PC - (2300) (0.63)
2.1 PC - (1900) (0.52)
4.1 PC (2800) (.77)

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

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C. Infiltration ranges from moderate to rapid. Runoff potential for this site varies from moderate to high depending upon soil hydrologic group and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where shortgrasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential for reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information).

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

None noted.

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 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

Inventory Data References

Date Source: NRI
Number of Records: 3
Sample Period: 2009-2012
States: NE, WY
Counties: Garden, Goshen

Date Source: 417s
Number of Records: 7
Sample Period: 1972-1982
States: NE
Counties: Morrill

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

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

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

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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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:** None. Water flow patterns are not expected on this site.

3. **Number and height of erosional pedestals or terracettes:** None. Erosional pedestals and terracettes are not expected on this site. Alkali sacaton tends to have a hummocky growth form that may appear pedestalled.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is expected to be 10% or less, occurring in small areas less than 3 inches (7.6 cm) and scattered throughout the site.

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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:** None. Wind-scoured and/or depositional areas are not present on the site.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter should fall in place. Slight amount of movement of fine litter from water is possible, but not normal. Litter movement from wind is not expected.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil aggregate stability ratings typically 5 to 6, normally 6. Surface organic matter adheres to the soil surface. Soil surface peds will typically retain structure indefinitely when dipped in distilled water.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface layer ranges from 3 to 10 inches (7.6-25.4 cm) thick. Soil color ranges from light brownish gray, gray to dark grayish brown (values of 4 to 6) dry and black to dark gray (values of 2 to 4) moist.

   Soil surface structure is typically granular. These soils are slightly to strongly saline and moderately to very strongly alkaline which adversely impacts plant species composition and growth.

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

tufted perennial cool season grasses) with fine and coarse roots positively influences infiltration. The expected composition of the plant community is approximately 90 percent perennial grasses and grass-likes, 5-10 percent forbs, and 0 to 5 percent shrubs.

In the 12-14 inch precipitation zone, the grass and grass-like component is made up of warm-season, tall, bunch grasses (10-30%); cool-season, rhizomatous grasses (7-10%); warm-season, short grasses (5-10%); cool-season, bunch grasses (3-10%); warm-season, tall, rhizomatous grasses (0-5%); grass-likes (0-2%).

In the 15-17 inch precipitation zone, the grass and grass-like component is made up of warm-season, tall, bunch grasses (35-45%); cool-season, rhizomatous grasses (10-15%); warm-season, short grasses (10-15%); cool-season, bunch grasses (5-15%); warm-season, tall, rhizomatous grasses (5-15%); grass-likes (5-10%).

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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. Some surface crusting of salts may be present due to fluctuation of water table.

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

Dominant: 12-14” PZ: Community 1.1:
1. Native, C4, tall, bunch grasses – 320-600 #/ac (10-30%), 1 species minimum

15-17” PZ: Community 1.1:
Native, C4, tall, bunch grasses – 1225-1575 #/ac (35-45%), 1 species minimum

Sub-dominant: 15-17” PZ: Community 1.1:
2. Native, C3, rhizomatous grasses – 350-525 #/ac (10-15%), 1 species minimum
3. Native, C4, short grasses – 350-525 #/ac (10-15%), 1 species minimum
4. Native, C4, tall, rhizomatous grasses – 175-525 (5-15%), 1 species minimum
5. Native, C3, bunch grasses – 175-525 (5-15%), 1 species minimum

Other: 12-14” PZ: Community 1.1
2. Native, C3, rhizomatous grasses – 225-320 #/ac (7-10%)
3. Native, C4, short grasses – 160-320 #/ac (5-10%)
4. .Native, Perennial and Annual Forbs – 160-320 #/ac (5-10%)

5. Native, C3, bunch grasses – 96 -320 (3-10%)
6. Shrubs, vines, cacti – 32-320 #/ac (1-10%)
7. Native, C4, tall, rhizomatous grasses – 0-160 (0-5%)
8. Grass-likes – 0-64 #/ac (0-2%)

15-17” PZ: Community 1.1
6. Grass-likes – 175-350 #/ac (5-10%)
7. Native, Perennial and Annual Forbs – 175-350 #/ac (5-10%)
8. Shrubs, vines, cacti – 35-175 #/ac (1-5%)

Additional: 12-14” PZ: Community 1.1
12a. Relative Dominance:
Community 1.1: Native, C4, tall, bunch grasses > Native, C3, rhizomatous grasses > Native, C4, short grasses = Native, Perennial and Annual Forbs > Native, C3, bunch grasses > Shrubs, vines, cacti > Native, C4, tall, rhizomatous grasses > 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: 8

12d. Species number in Dominant and Sub-dominant F/S Groups: 1

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

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

12c. Number of F/S Groups: 8

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.

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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 50 to 80 percent. Litter depths range from 0.25 to 0.50 inch (0.65-1.3 cm). Foxtail barley and/or Kentucky bluegrass excessive litter may negatively impact the functionality of this site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** In the 12-14 inch precipitation zone, annual production ranges from 2,600 to 3,800 pounds per acres on an air dry basis. Average annual production is 3,200 pounds per acre under normal precipitation and weather conditions.

    In the 15-17 inch precipitation zone, annual production ranges from 2,850 to 4,200 pounds per acres on an air dry basis. Average annual production is 3,500 pounds per acre under normal precipitation and weather conditions.

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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:** Russian thistle, kochia, halogeton, Russian knapweed, Canada thistle, Russian olive, and others as they become known. Under certain management strategies, foxtail barley can increase significantly on this site and become invasive, especially in the western portions of the MLRA.

    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.