USDA Natural Resources Conservation Service

Ecological site R067AY124WY
Loamy Lowland (LyL)

Last updated: 9/07/2023
Accessed: 05/18/2024

General information

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

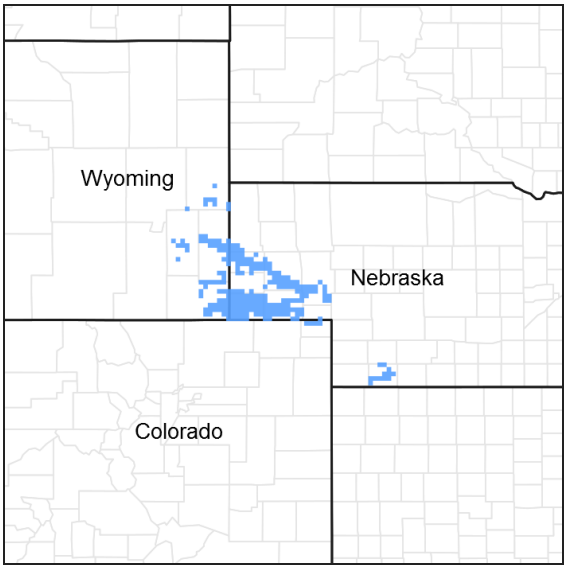


Figure 1. Mapped extent

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 Loamy Lowland (LyL) 12-17 inch Precipitation Zone (PZ) Ecological Site was developed by an earlier version of the Loamy Lowland (LyL) ESD (2005, updated 2008). The earlier version of the Loamy Lowland (LyL) 12-17 inch Precipitation Zone ESD was based on input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Loamy Lowland (LyL) 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 Loamy Lowland Ecological Siteis a run-on site that is not alkaline or saline. The water table is deeper than 36 inches and has soil surface textures of loam or silt loam, and occasionally very fine sandy loam.

Associated sites

R067AY122WY	**Loamy (Ly)** This ecological site is commonly adjacent.

Similar sites

R067AY152WY	**Sandy Lowland (SyL)** The Sandy Lowland Ecological Site surface soil textures are loamy fine sand, loamy sand, or fine sandy loam, and may include sand.

Table 1. Dominant plant species

Tree	(1) *Populus deltoides ssp. monilifera* (2) *Fraxinus pennsylvanica*
Shrub	(1) *Rosa woodsii* (2) *Symphoricarpos occidentalis*
Herbaceous	(1) *Pascopyrum smithii* (2) *Hesperostipa comata*

Physiographic features

This site typically occurs on the floodplains, drainageways, or floodplain-steps of the river valleys; but may also occur on low stream terraces that have very rare to no flooding.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Drainageway (3) Flood-plain step
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None

Elevation	914–1,676 m
Slope	0–3%
Ponding depth	0 cm
Water table depth	203–610 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)	85-114 days
Freeze-free period (characteristic range)	119-135 days
Precipitation total (characteristic range)	406-432 mm
Frost-free period (actual range)	84-119 days
Freeze-free period (actual range)	116-136 days
Precipitation total (actual range)	356-432 mm
Frost-free period (average)	100 days
Freeze-free period (average)	127 days
Precipitation total (average)	406 mm

Climate stations used

- (1) BRIDGEPORT 18WSW [USC00251149], Bayard, NE
- (2) HARRISBURG 12WNW [USC00253605], Harrisburg, NE
- (3) KIMBALL 2NE [USC00254440], Kimball, NE
- (4) OSHKOSH [USC00256385], Oshkosh, NE
- (5) CHUGWATER [USC00481730], Chugwater, WY
- (6) OLD FT LARAMIE [USC00486852], Yoder, WY
- (7) PHILLIPS [USC00487200], LaGrange, WY
- (8) WHEATLAND 4 N [USC00489615], Wheatland, WY
- (9) CHEYENNE [USW00024018], Cheyenne, WY
- (10) SCOTTSBLUFF HEILIG AP [USW00024028], Scottsbluff, NE

Influencing water features

There are no water features associated with the ecological site.

Soil features

The soils on this site are typically very deep, well drained soils that formed from alluvium. They typically have a moderately rapid to moderately slow permeability class. The available water capacity is moderate to high. 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 or silt loam but may include very fine sandy loam. The surface layer ranges from a depth of 4 to 20 inches thick. The subsoil is typically loam, but may include silt loam, very fine sandy loam, or stratified layers of varying textures. Soils in this site typically have carbonates at the surface; but some soils may be leached to 10 inches. These soils are very susceptible to erosion by water and wind if not covered. The potential for erosion increases where vegetative cover is inadequate. Channel cutting, deposition, and removals may occur adjacent to rivers or streams.

Surface soil structure is typically granular, and structure below the surface is subangular blocky or prismatic; some subsoil horizons may have massive structure. 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: Cheyenne, Craft, Haverson, McCook, and Tripp.

Other soil series that have been correlated to this site include: Haverson variant.

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.

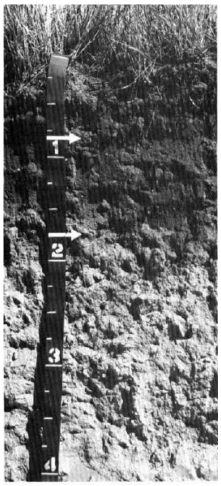


Figure 8. Soil Profile Image—Tripp very fine sandy loam, Morrill County, NE. The depth is in feet.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loam (2) Silt loam (3) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well 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 (0-101.6cm)	15.24–30.48 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (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 Loamy Lowland ecological site is characterized by three states: Reference, Sod-bound, and Increased *Bare Ground*. The Reference State is characterized by cool-season mid- rhizomatous grasses (western wheatgrass), cool-season mid bunchgrass (needle and thread,), warm-season shortgrass (blue grama) and warm-season tall bunchgrass (big bluestem). Secondary grasses include green needlegrass, little bluestem, thickspike wheatgrass, and switchgrass. A minor component of forbs and shrubs (Woods rose, western snowberry, and silver sage*) are also present, with an overstory of plains cottonwood and other trees.The Sod-bound State is characterized by warm-season shortgrass (blue grama), stoloniferous grass (buffalograss), and grasslikes (threadleaf sedge). The Increased *Bare Ground* State is characterized by remnant blue grama, buffalograss, and threadleaf sedge. Warm-season bunchgrass (Fendler threeawn), annual grass (sixweeks fescue), and forbs such as hairy false goldenaster and curlycup gumweed. Shrubs such as broom snakeweed, and pricklypear have increased. Annual invasive species include burningbush, Russian thistle, and cheatgrass. Perennial invasive species include Kentucky bluegrass and smooth brome. Other noxious weeds that may invade include Canada thistle, houndstongue, whitetop, and bindweed. Introduced trees such as Russian olive and tamarisk may invade and eventually dominate the site.
*WY

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).

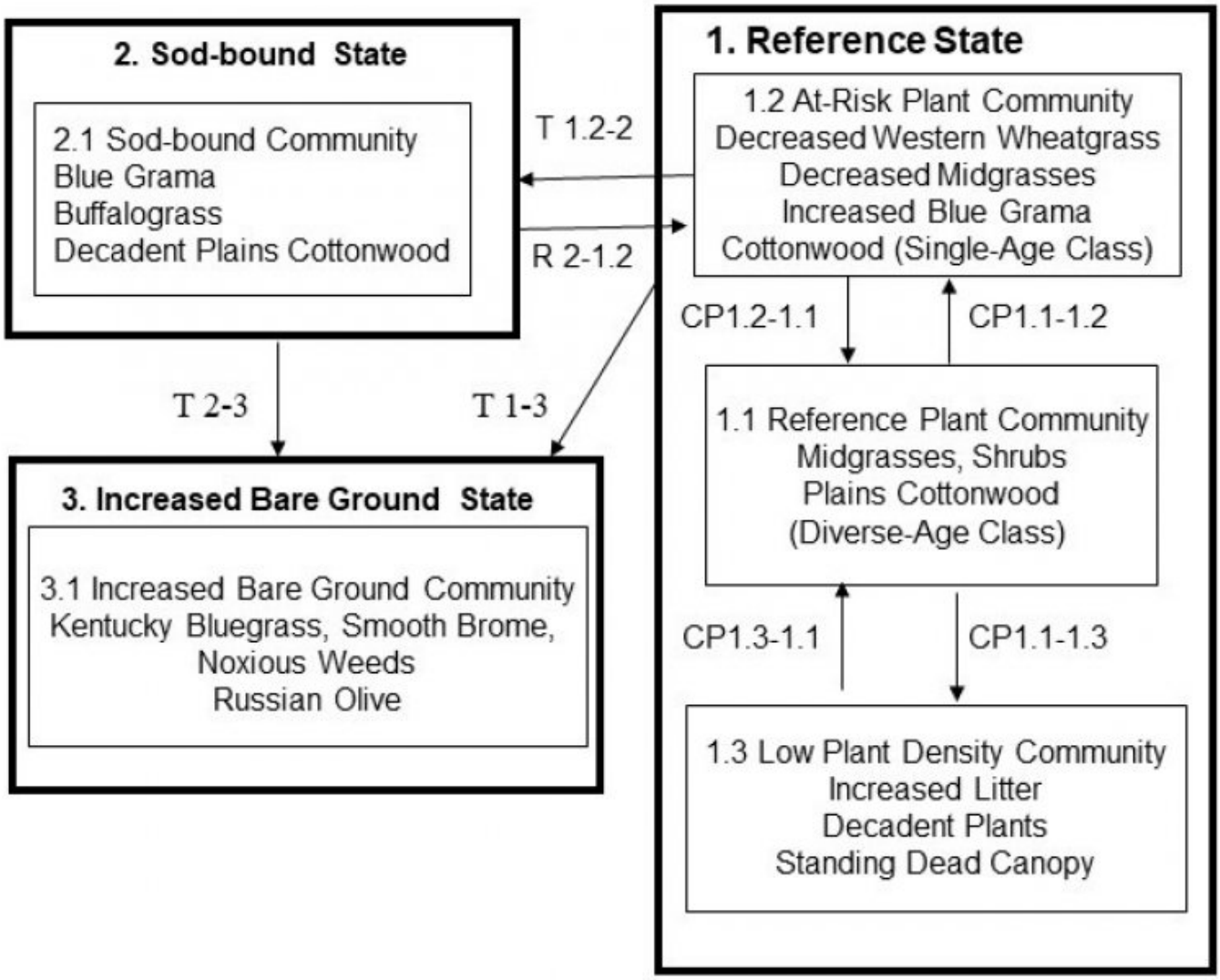
Today, livestock grazing, especially beef cattle has been a major influence on the ecological dynamics of the site. Grazing management, coupled with the effects of annual climatic variations, largely dictates the plant communities for the site.

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

Loamy Lowland 12-17" PZ



CP- Community Pathway, **T**-Transition **R**-Restoration
CP1.1-1.2 Continuous grazing and/or frequent defoliation without adequate recovery, extended drought
CP1.2-1.1 Prescribed grazing with adequate recovery and proper stocking, drought followed by normal precipitation
CP1.1-1.3 Non-use, no fire
CP 1.3-1.1 Prescribed grazing with adequate recovery, fire
T1.2-2 – Continuous grazing and/or frequent defoliation without adequate recovery
R 2-1.2 Very **l**ong-term prescribed grazing with adequate recovery, flooding
T1-3 – Long-term heavy continuous grazing, and/or excessive defoliation
T2-3 Long-term continuous grazing with over-stocking, and/or excessive defoliation

Figure 9. Loamy_Lowland_S&T_Diagram_6-13-18

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

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- rose (*Rosa*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- needle and thread (*Hesperostipa comata ssp. comata*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Community 1.1
Populus deltoides-Fraxinus pennsylvanica/Hesperostipa comata-Pascopyrum smithii (plains cottonwood-green ash/needle and thread-western wheatgrass).

This is the interpretive plant community for the Loamy Lowland 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 65 to 85 percent grasses and grass-likes, 5 to10 percent forbs, and 5 to10 percent woody plants. Trees can make up 5 to15 percent of the total annual production, and approximately 10 to 30 percent canopy. The major grasses include western wheatgrass, needle and thread, blue grama, green needlegrass, and little- and big bluestem. Various species of shrubs and trees typically occur due to the water table within reach of the woody plants. These can include shrubs such as Woods' rose, western snowberry, silver sagebrush (in Wyoming), a diverse age class of plains cottonwood, and other trees including boxelder, and green ash. In addition, numerous other species of grasses can occur, along with a wide variety of forbs including prairie coneflower, scarlet globemallow, and American vetch. Because of the landscape position and micro-climate produced by the overstory of trees, plant diversity is very high. The total annual production (air-dry weight) is about 2,500 pounds per acre during an average year, but ranges from about 2,000 pounds per acre in unfavorable years to about 3,000 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 or development into urban or other uses.

Dominant plant species

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- rose (*Rosa*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- needle and thread (*Hesperostipa comata*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 11. Plant community growth curve (percent production by month). WY1105, 12-14SP Extra water w/warm - LL, Ov, CyO, SL. 12-14" Precipitation Zone, Southern Plains (SP), with warm-season (grasses); sites which receive additional water (run-on position, from adjacent sites)..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	30	15	5	0	0	0

Community 1.2
Populus deltoides-Fraxinus pennsylvanica/Hesperostipa comata-Bouteloua gracilis (plains cottonwood-green ash/needle and thread-blue grama).

Western wheatgrass, green needlegrass, and big bluestem have been reduced and may be missing from the plant community. Grazing-tolerant species such as blue grama buffalograss, and threadleaf sedge have increased. Prairie clover species, American vetch, and other palatable forbs such as dotted gayfeather and penstemon are present in reduced amounts. Hairy false goldenaster, scarlet globemallow, Cuman ragweed, and plains pricklypear have increased. Palatable shrubs and trees are heavily browsed, often having a hedged appearance. New tree seedlings are reduced or absent The total annual production (air-dry weight) is about 1,750 pounds per acre during an average year, but ranges from about 1,400 pounds per acre in unfavorable years to about 2,100 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. The reduction of palatable shrubs and seedling trees further exacerbate this trend. 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

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- rose (*Rosa*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- needle and thread (*Hesperostipa comata*), grass
- blue grama (*Bouteloua gracilis*), grass

Figure 12. Plant community growth curve (percent production by month). WY1102, 12-14SP Extra water w/o warm - LL, Ov, CyO, SL. 12-14" Precipitation Zone, Southern Plains (SP), without warm-season (grasses); sites which receive additional water (run-on position), from adjacent sites..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	25	30	20	15	5	0	0	0

Community 1.3
Populus deltoides-Fraxinus pennsylvanica/Hesperostipa comata-Pascopyrum smithii (plains cottonwood-green ash/needle and thread-western wheatgrass) Low Plant Density Community.

This plant community developed under years of non-use and lack of fire. Plant species resemble the Reference Plant Community however, frequency and production is reduced. Eventually, litter levels can 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 semiarid environment and the absence of animal traffic to break down litter slows nutrient recycling. Cool-season grasses and pricklypear have typically increased. Blue grama is reduced. Noxious weeds such as Canada- and musk thistle, and leafy spurge, may invade if a seed source is readily available. Invasive grasses such as cheatgrass and smooth brome, tend to encroach under these conditions. 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. The total annual production (air-dry weight) can vary from 100 to 1,500 pounds per acre depending on weather conditions and the plants that are present. The introduction of grazing or fire quickly changes the plant community. It is more vulnerable to severe disturbance than the Reference Plant Community. Soil erosion accelerates if bare ground increases. Infiltration is reduced and runoff is increased.

Dominant plant species

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree

- rose (*Rosa*), shrub
- western snowberry (*Symphoricarpos occidentalis*), shrub
- needle and thread (*Hesperostipa comata*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 13. 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

Frequent and severe defoliation and lack of fire shifts this plant community toward the 1.2 Community. Drought accelerates this process. A single-age class of cottonwood develops. 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 toward the Low Plant Density 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 may begin to invade.

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 back toward the Reference Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

The return of grazing with adequate recovery periods and normal fire frequency shift this plant community toward 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. 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 (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, and the loss of cottonwood seedling recruitment reduces the biodiversity and productivity of this site.

Dominant plant species

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- boxelder (*Acer negundo*), tree
- rose (*Rosa*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass

Community 2.1
Populus deltoides Fraxinus pennsylvanica/Bouteloua gracilis-Carex filifolia (plains cottonwood-green ash/blue grama-threadleaf sedge).

The mid- and tallgrasses and palatable forbs have been eliminated. The dominant species are blue grama, threadleaf sedge, and buffalograss. These species have developed into a sod-bound condition occurring in localized colonies exhibiting a mosaic appearance. Fendler threeawn has increased. Forbs and shrubs that continue to increase are Cuman ragweed (also known as western ragweed), hairy false goldenaster, scarlet globemallow, pricklypear, and green and fringed sagewort. Kentucky bluegrass and smooth brome can invade, become dominant, and contribute to the sod-bound condition. No new tree seedlings occur. Only those that have reached “escape height” (out of reach of the browsers) remain, creating a single-age class that will become decadent and begin to die off. Plant diversity is very low. Energy flow and water cycle and mineral cycles have been negatively affected. Litter levels are very low and unevenly distributed. The total annual production (air-dry weight) is about 1,250 pounds per acre during an average year, but ranges from about 900 pounds per acre in unfavorable years to about 1,400 pounds per acre in above average years. This is a very stable state, resistant to change due to the high tolerance of blue grama, threadleaf sedge, 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 reduces the biodiversity productivity of this site.

Dominant plant species

- plains cottonwood (*Populus deltoides ssp. monilifera*), tree
- green ash (*Fraxinus pennsylvanica*), tree
- rose (*Rosa*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Figure 14. Plant community growth curve (percent production by month). WY1105, 12-14SP Extra water w/warm - LL, Ov, CyO, SL. 12-14" Precipitation Zone, Southern Plains (SP), with warm-season (grasses); sites which receive additional water (run-on position, from adjacent sites)..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	30	15	5	0	0	0

State 3
Increased Bare Ground State

Litter levels are extremely low due to reduced production. 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 on the vegetation present. An ecological threshold has been crossed and erosion and loss of organic matter and carbon reserves are resource concerns.

Dominant plant species

- Russian olive (*Elaeagnus angustifolia*), tree
- plains pricklypear (*Opuntia polyacantha*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- Kentucky bluegrass (*Poa pratensis*), grass
- smooth brome (*Bromus inermis*), grass

Community 3.1
Elaeagnus angustifolia/Bromus inermis-Poa pratensis (Russian olive/smooth bromegrass-Kentucky bluegrass).

The plant composition is made up introduced grasses, annuals, noxious weeds, and a few species of native forbs and grasses that are very tolerant to frequent and severe defoliation. The site may also be invaded by introduced trees. The dominant grasses typically include Kentucky bluegrass, smooth brome, Fendler threeawn, blue grama, buffalograss, and threadleaf sedge. Annual grasses such as cheatgrass and sixweeks fescue have increased or invaded. The dominant perennial forbs include curlycup gumweed and hairy false goldenaster. Major shrubs include broom snakeweed, pricklypear, and green sagewort. Noxious weeds, such as whitetop, Canada- and musk thistle, and hound's tongue may have invaded the site. Introduced trees, such as Russian olive and tamarisk may invade and eventually dominate the site. This plant community is highly variable in both species composition and production. This plant community is very resistant to change because of the lack of native species and the amount of introduced plants and weeds present. Smooth brome and Kentucky bluegrass can eventually dominate the site due to their rhizomatous growth form and their resistance to heavy grazing. Once this occurs, it is nearly impossible to change the plant composition in a reasonable management timeframe.

Dominant plant species

- Russian olive (*Elaeagnus angustifolia*), tree
- plains pricklypear (*Opuntia polyacantha*), shrub
- broom snakeweed (*Gutierrezia sarothrae*), shrub
- smooth brome (*Bromus inermis*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

Figure 15. Plant community growth curve (percent production by month). WY1105, 12-14SP Extra water w/warm - LL, Ov, CyO, SL. 12-14" Precipitation Zone, Southern Plains (SP), with warm-season (grasses); sites which receive additional water (run-on position, from adjacent sites)..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	30	15	5	0	0	0

Transition T1A
State 1 to 2

Frequent and severe defoliation without adequate recovery periods between grazing events and lack of fire shift this plant community across an ecological threshold toward 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 without adequate recovery periods and lack of fire shift this plant community across an ecological threshold to the Increased *Bare Ground* State. Erosion and loss of organic matter and carbon reserves are resource concerns. Non-native exotic plants are likely to invade.

Restoration pathway R2A
State 2 to 1

Flooding followed by very long-term prescribed grazing moves this state to the Reference State. A timely flood event can result in germination of cottonwood seeds. Cottonwood regeneration is feasible if grazing and degree of browsing is closely monitored and controlled. It could take generations to reestablish the mid and tallgrasses, forbs,

and shrubs, depending on the availability of a seed source. Pasture planting may be an option to return this site to a productive condition in a shorter management timeframe.

Conservation practices

Prescribed Grazing

Transition T2A
State 2 to 3

Long-term frequent and severe defoliation without adequate recovery between grazing events 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.

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**			701–841	
	needle and thread	HECO26	*Hesperostipa comata*	560–701	–
	green needlegrass	NAVI4	*Nassella viridula*	140–280	–
2	**12**			701–841	
	western wheatgrass	PASM	*Pascopyrum smithii*	701–841	–
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	140–280	–
3	**12**			280–420	
	blue grama	BOGR2	*Bouteloua gracilis*	280–420	–
4	**12**			280–420	
	big bluestem	ANGE	*Andropogon gerardii*	140–280	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	140–280	–
5	**12**			420–560	
	Graminoid (grass or grass-like)	2GRAM	*Graminoid (grass or grass-like)*	0–140	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–140	–
	threeawn	ARIST	*Aristida*	0–140	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–140	–
	threadleaf sedge	CAFI	*Carex filifolia*	0–140	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0–140	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–140	–
Forb					
6	**12**			140–280	
	Forb, perennial	2FP	*Forb, perennial*	0–140	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–140	–
	prairie sagewort	ARFR4	*Artemisia frigida*	0–140	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–140	–
	milkvetch	ASTRA	*Astragalus*	0–140	–

	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–140	–
	beardtongue	PENST	*Penstemon*	0–140	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	0–140	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–140	–
	American vetch	VIAM	*Vicia americana*	0–140	–
Shrub/Vine					
7	**12**			140–280	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–140	–
	silver sagebrush	ARCA13	*Artemisia cana*	0–140	–
	rose	ROSA5	*Rosa*	0–140	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–140	–
Tree					
8	**12**			140–420	
	plains cottonwood	PODEM	*Populus deltoides ssp. monilifera*	140–420	–
	boxelder	ACNE2	*Acer negundo*	140–420	–
	green ash	FRPE	*Fraxinus pennsylvanica*	140–420	–

Animal community

Animal Community – Wildlife Interpretations
Reference Plant Community— Midgrasses, Shrubs, Plains Cottonwood (Diverse-Age Class):
The predominance of grasses plus high forb diversity in this community favors large grazers. Trees and shrubs provide suitable thermal and escape cover for mule deer. White-tailed and black-tailed jackrabbit, badger, and coyote commonly use this community. This community also provides habitat for a wide array of smaller mammals, so diverse prey populations are available for raptors such as ferruginous and Swainson's hawks. Birds such as western kingbird, western meadowlark, lark bunting, and grasshopper sparrow utilize this community for nesting and foraging. The overstory of large cottonwoods provides habitat for a variety of birds ranging from raptors to neo-tropical migrants.

1.2 Community— Decreased Western Wheatgrass, Decreased Midgrasses, Increased Blue Grama, Cottonwood (Single-Age Class):
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. The overstory of large cottonwoods provides habitat for a variety of birds ranging from raptors to neotropical migrants.

1.3 Community - Low Plant Density, Increased Litter, Standing Dead Canopy:
This community has reduced habitat value for most wildlife species found in the Reference Plant Community.

2.1 Community - Blue Grama and Decadent Plains Cottonwood:
This plant 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. The overstory of large cottonwoods still provides some habitat for a variety of birds ranging from raptors to neo-tropical migrants.

3.1 Community - Kentucky Bluegrass, Smooth Brome, Noxious weeds, Russian Olive:
This community has low habitat value for most wildlife species.

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

conservation planning process.

The following stocking rates are based on the total annual forage production in a normal year multiplied by 25 percent harvest efficiency of preferred and desirable forage species, divided by 912 pounds of ingested air-dry vegetation for an animal unit per month (Natl. Range and Pasture Handbook, 1997). An animal unit month (AUM) is defined as the amount of forage required by one mature cow, and a calf up to six months, 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 – (2500) (.69)
1,800 lbs. per acre X 25% Harvest Efficiency = 625 lbs. forage demand for one month. Then, 625 lbs. per acre/912 demand per AUM =.69
Plant Community (PC) Production (lbs.ac), and Stocking Rate (AUM/Acre)
Reference PC - (2500) (0.69)
1.2 PC - (1750) (0.48)
2.1 PC - (1250) (0.34)

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 is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderately slow to rapid. Runoff potential for this site varies from low to moderate depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where 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 such as bluebunch wheatgrass. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1 to 2 percent of the soil surface.

Recreational uses

This site provides hunting, hiking, photography, bird watching, and other opportunities. The wide varieties of plants that bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

Limited value for campfire and fireplace wood.

Other products

Site Development & Testing Plan

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

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

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

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

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

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

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

Each Alternative State/Community:

Complete to Provisional level.

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

Updated all “Required” items complete to Provisional level.
Wildlife Interpretations: Plant community names updated. Narrative is from “Previously Approved” ESD (2008). Wildlife species will need to be updated at the next Approved level.

Livestock Interpretations: Plant community names and stocking rates updated.

Hydrology, Recreational Uses, Wood Products, and Other Products carried over from previously “Approved” ESD (2008).

Plant Preferences tabled removed. Will be released as a technical guide notice by 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

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.

Date Source: NRI
Number of Records: 2
Sample Period: 2008-2011
States: NE, WY
Counties: Morrill, Platte

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To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

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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Contact for lead author	
Date	11/18/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Typically, none, or barely visible. Evidence of water flow may be present after high overland flow events or flooding from adjacent streams, but vegetation normally remains intact.

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3. **Number and height of erosional pedestals or terracettes:** Typically, none.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is typically less than 10 percent with patch size of 2 to 3 inches (5.1 to 7.6 cm) or less, 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 of small and medium size classes will move after above average to high rainfall events. Litter does not travel far, typically being trapped in small bunches by the extensive vegetative cover. Litter movement may be fairly excessive after major runoff or flooding events. Small woody debris may move up to 6 inches (15.25 cm). Fine litter may move up to 12 inches (30.5 cm). Numerous debris dams or vegetative barriers may be present.

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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 should typically be 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 4 to 20 inches (10.2-30.5 cm) thick. Soil colors range from dark brown, dark grayish brown, grayish brown, to pale brown (values of 3 to 6) when dry and very dark brown, dark grayish brown, dark brown, to very dark grayish brown (values of 2 to 4) when moist. Soil surface structure is typically granular.

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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 65 to 80 percent perennial grasses and grass-likes, 5 to 10 percent forbs, 5 to 15 percent shrubs, and 5 to 15 percent trees.
    The grass and grass-like component is made up of cool-season, rhizomatous grasses (25-30%), cool-season, bunch grasses (25-35%); warm-season tall and mid-grasses (10-20%); warm-season, short grasses (10-15%); and grass-likes (0-5%).

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

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

    Dominant: 1. Native, C3, bunch grasses – 625-875 #/ac (25-35%), 2 species minimum
    2. Native, C3, rhizomatous grasses – 625-750 (25-30%), 2 species minimum

    Sub-dominant: 3. Native, C4, tall and mid-grasses – 250-500 #/ac (10-20%), 3 species minimum
    4. Native, C4, short grasses – 250-375 #/ac (10-15%), 1 species minimum
    5. Native Trees – 125-375 #/ac (5-15%), 3 species minimum

    Other: 6. MInor: Native, Perennial and Annual Forbs – 125-250 #/ac (5-10%)
    7. Minor: Shrubs, Vines, Cacti – 125-250 #/ac (5-10%)
    8. Minor: Grass-likes – 0-125 #/ac (0-5%)

Additional: 12a. Relative Dominance:
Community 1.1: Native, C3 bunch grasses > Native, C3, rhizomatous grasses > Native, C4, tall and mid-grasses > Native, C4, short grasses > Trees > Native, Annual or Perennial Forbs > Shrubs, Cacti, Vines > Grass-likes

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

12c. Number of F/S Groups: 8

12d. Species number in Dominant and Sub-dominant F/S Groups: 11

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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 65 to 80 percent. Litter depth is expected to be 0.25 to 0.50 inch (0.65-1.3 cm).

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production ranges from 2,000 pounds per acre during unfavorable years to 3,000 pounds per acre in above average years on an air dry basis. Average annual production is 2,500 pounds per acre under normal precipitation and weather conditions.

    No significant reduction is expected the growing season following wildfire.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Curlycup gumweed, hairy false goldenaster, pricklypear, green sagewort, whitetop, Canada thistle, musk thistle, hound’s tongue, Russian olive, saltcedar (tamarisk) 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.
