USDA Natural Resources Conservation Service

Ecological site R058BY162WY
Shallow Loamy (SwLy) 10-14” PZ

Last updated: 12/10/2024
Accessed: 05/21/2025

General information

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

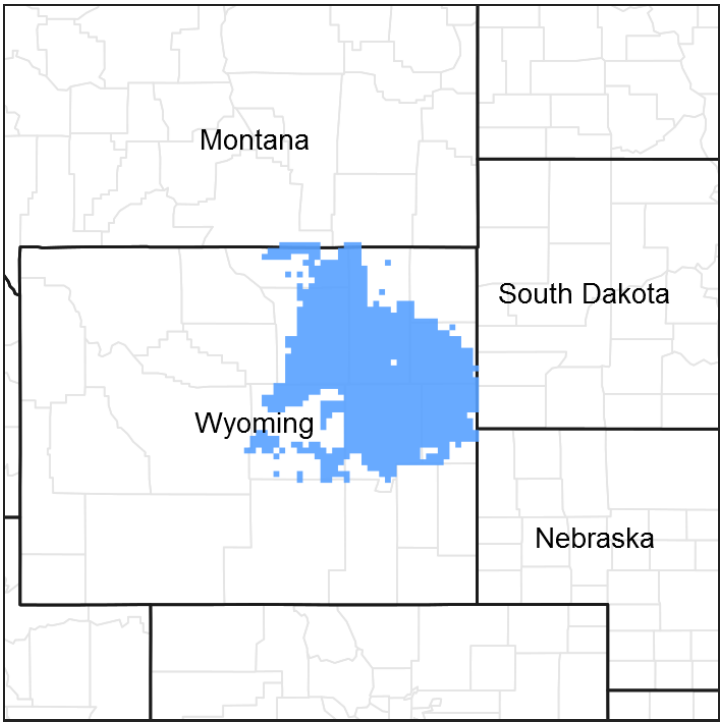


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 058B–Northern Rolling High Plains, Southern Part

MLRA 58B is located in northeastern Wyoming (95 percent) and extreme southeastern Montana (5 percent). It is comprised of sedimentary plains, scoria hills, and river valleys.

The major rivers include the Powder, Tongue, Belle Fourche, Cheyenne, and North Platte. Tributaries include the Little Powder River, Little Missouri River, Clear Creek, Crazy Woman Creek, and others. This MLRA is traversed by Interstates 25 and 90, and U.S. Highways 14 and 16. The extent of MLRA 58B covers approximately 12.3 million acres. Major land uses include rangeland (approximately 93 percent), cropland, pasture, and hayland (approximately 2 percent), and forest, urban, and miscellaneous uses (approximately 5 percent). Cities include Buffalo, Casper, Sheridan, and Gillette, WY. Land ownership is mostly private. Federal lands include the Thunder Basin National Grassland (U.S. Forest Service) and lands administered by the Bureau of Land Management. Areas of interest in MLRA 58B in Wyoming include Fort Phil Kearny State Historic Site, Glendo State Park, and Lake DeSmet. The elevations in MLRA 58B increase gradually from north to south and range from approximately 2,900 to 5,900 feet. A few buttes are higher than 6,800 feet. The average annual precipitation in this area ranges from 10 to 17 inches per year. Precipitation occurs mostly during the growing season, often during rapidly developing thunderstorms. Mean annual air temperature is 46 degrees Fahrenheit. Summer temperatures may exceed 100 degrees Fahrenheit. Winter temperatures may drop to below zero. Snowfall averages 45 inches per year, but varies from 25 to over 70 inches in some locales.

Classification relationships

USDA Natural Resources Conservation Service (NRCS):
Land Resource Region—G Western Great Plains Range and Irrigation; Major Land Resource Area (MLRA)—58B Northern Rolling High Plains, Southern Part (USDA, 2006)

Relationship to Other Classifications:

USDA Forest Service (FS) Classification Hierarchy:

Province—331 Great Plains-Palouse Dry Steppe; Section—331G-Powder River Basin; Subsections—331Gb Montana Shale Plains, 331Ge Powder River Basin, 331Gf South Powder River Basin-Scoria Hills (Cleland et al, 1997)

Environmental Protection Agency (EPA) Classification Hierarchy:

Level III Ecoregion—43 Northwestern Great Plains; Level IV Ecoregion—43p Scoria Hills, 43q Mesic-Dissected Plains, 43w Powder River Basin (EPA, 2013)
https://www.epa.gov/eco-research/ecoregions

Ecological site concept

The Shallow Loamy 10-14" PZ occurs on nearly level to steeply sloping hills and ridges, on sedimentary plains or uplands. Primary production is from cool-season midgrasses (bunch and rhizomatous), warm-season midgrasses (bunch), and secondary warm-season shortgrasses. There is also lesser component of forbs and shrubs. Site is shallow (less

than 20 inches) to a restrictive or root limiting layer.

Associated sites

R058BY158WY	**Shallow Clayey (SwCy) 10-14” PZ** Shallow Clayey 10-14 has birdfoot sagebrush. Located on adjacent formations or in common with Shallow Loamy.
R058BY122WY	**Loamy (Ly) 10-14” PZ** The Loamy 10-14, has deeper soils and higher production, occurs below the Shallow Loamy on the landform.

Similar sites

R058BY262WY	**Shallow Loamy (SwLy) 15-17” PZ** Shallow Loamy 15-17” P.Z. has higher production. Site is generally higher in the landscape, as transition towards the foothills.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pascopyrum smithii* (2) *Pseudoroegneria spicata*

Physiographic features

This site occurs on nearly level to steeply sloping hills and ridges, on sedimentary plains or uplands. This site occurs on all aspects. Aspect is not a significant factor.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Runoff class	Low to high
Flooding frequency	None
Ponding frequency	None
Elevation	3,500–6,800 ft
Slope	0–60%
Water table depth	80 in
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation ranges from 10 to 17 inches per year across MLRA 58B. There are two precipitation zones (PZ). The 10 to 14 inch precipitation zone is predominant across the MLRA, including portions of Sheridan, Johnson, and Natrona Counties; portions of Campbell and Converse Counties; and smaller portions of Weston and Niobrara Counties. The 15 to 17 inch precipitation zone occurs in northern and eastern portions of the MLRA, including portions of Sheridan, Campbell, and western Crook Counties. Wide fluctuations in precipitation may occur from year to year, and occasional periods of extended drought (longer than one year in duration) can be expected. Two-thirds of the annual precipitation occurs during the growing season from May through September. Mean Annual Air Temperature (MAAT) is 46 degrees Fahrenheit. 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 ranching operations during late winter and spring. High-intensity afternoon thunderstorms may occur during the summer. Annual wind speeds average about 5 mph. Daytime winds are generally stronger than nighttime winds. Occasional strong storms may bring brief periods of high winds with gusts of more than 75 mph. The average length of the freeze-free period (28 degrees Fahrenheit) is 125 days and generally occurs from May 16 to September 19. The average frost-free period (32 degrees Fahrenheit) is 101 days and generally occurs from June 1 to September 9.

The growth of native cool-season plants begins in late April to early May with peak growth occurring in mid to late June. Native warm-season plants begin growth in late May to early June and continue into August. Regrowth of cool-season plants occurs in September in most years, depending upon moisture.

Note: The climate described here is based on historic climate station data and is averaged to provide an overview of the annual precipitation, temperatures, and growing season. Future climate is beyond the scope of this document. However, research to determine the effects of elevated CO2 and heating on mixed-grass prairie ecosystems, and how it may relate to future plant communities, is ongoing.

For detailed information, or to find a specific climate station, visit the Western Regional Climate Center (WRCC) website: Western Regional Climate Center, Historical Data, Western U.S. Climate summaries, NOAA Coop Stations, Wyoming (Note: Montana climate stations are also listed under the Wyoming link).
https://wrcc.dri.edu/summary/Climsmwy.html

Wind speed averages can be found at the WRCC home page, under the Specialty Climate tab: https://wrcc.dri.edu/

The following tables represent area-wide climate data for the 10 to 14 inch precipitation zone:

Table 3. Representative climatic features

Frost-free period (characteristic range)	92-103 days
Freeze-free period (characteristic range)	121-128 days
Precipitation total (characteristic range)	12-13 in
Frost-free period (actual range)	86-107 days
Freeze-free period (actual range)	116-129 days
Precipitation total (actual range)	10-14 in
Frost-free period (average)	101 days
Freeze-free period (average)	125 days
Precipitation total (average)	13 in

Climate stations used

- (1) SHERIDAN CO AP [USW00024029], Sheridan, WY
- (2) CASPER NATRONA CO AP [USW00024089], Casper, WY
- (3) DULL CTR 1SE [USC00482725], Douglas, WY
- (4) KAYCEE [USC00485055], Kaycee, WY
- (5) MIDWEST [USC00486195], Midwest, WY
- (6) WESTON 1 E [USC00489580], Weston, WY
- (7) BUFFALO [USC00481165], Buffalo, WY
- (8) WRIGHT 12W [USC00489805], Gillette, WY
- (9) GLENROCK 5 ESE [USC00483950], Glenrock, WY

Influencing water features

This upland ecological site is not influenced by a water table or run in from adjacent sites. Due to the semi-arid climate in which it occurs, the water budget is normally contained within the soil pedon. Soil moisture is recharged by spring rains, but it rarely exceeds field capacity in the upper 20 inches before being depleted by evapotranspiration. During intense precipitation events, precipitation rates frequently exceed infiltration rates and the site delivers moisture to downslope sites through surface runoff. Moisture loss through evapotranspiration exceeds precipitation for a majority of the growing season. Soil moisture is the primary limiting factor for vegetative production on this ecological site.

Wetland description

N/A

Soil features

The soils on this site are well drained, shallow to bedrock and formed in residuum and slope alluvium weathered from sedimentary rock. They typically have a moderate to moderately rapid permeability class. The available water capacity is typically very low to low. As fineness of texture increases, there is a general increase in available moisture storage from sands to loams and silt loams. The surface layer of the soils in this site are typically clay loam or loam but may include silt loam or very fine sandy loam. The surface layer ranges from a depth of 1 to 6 inches thick. The subsoil is typically clay loam or loam. Soils in this site typically have carbonates at the surface; but some soils may be leached as deep as 2 to 10 inches. Soils formed in material derived from porcelanite (scoria) are inconsistently calcareous. These soils are susceptible to erosion by water and wind. The potential for water erosion accelerates with increasing slope. The soil moisture regime is typically ustic aridic. The soil temperature regime is mesic.

Major soil series correlated to this ecological site include: Shingle and Worf.

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

Table 4. Representative soil features

Parent material	(1) Residuum–sedimentary rock (2) Slope alluvium–sedimentary rock (3) Colluvium
Surface texture	(1) Clay loam (2) Loam (3) Silt loam (4) Very fine sandy loam
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	10–20 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–20%
Available water capacity (Depth not specified)	1.6–5.6 in
Calcium carbonate equivalent (Depth not specified)	0–10%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–5
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4

Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

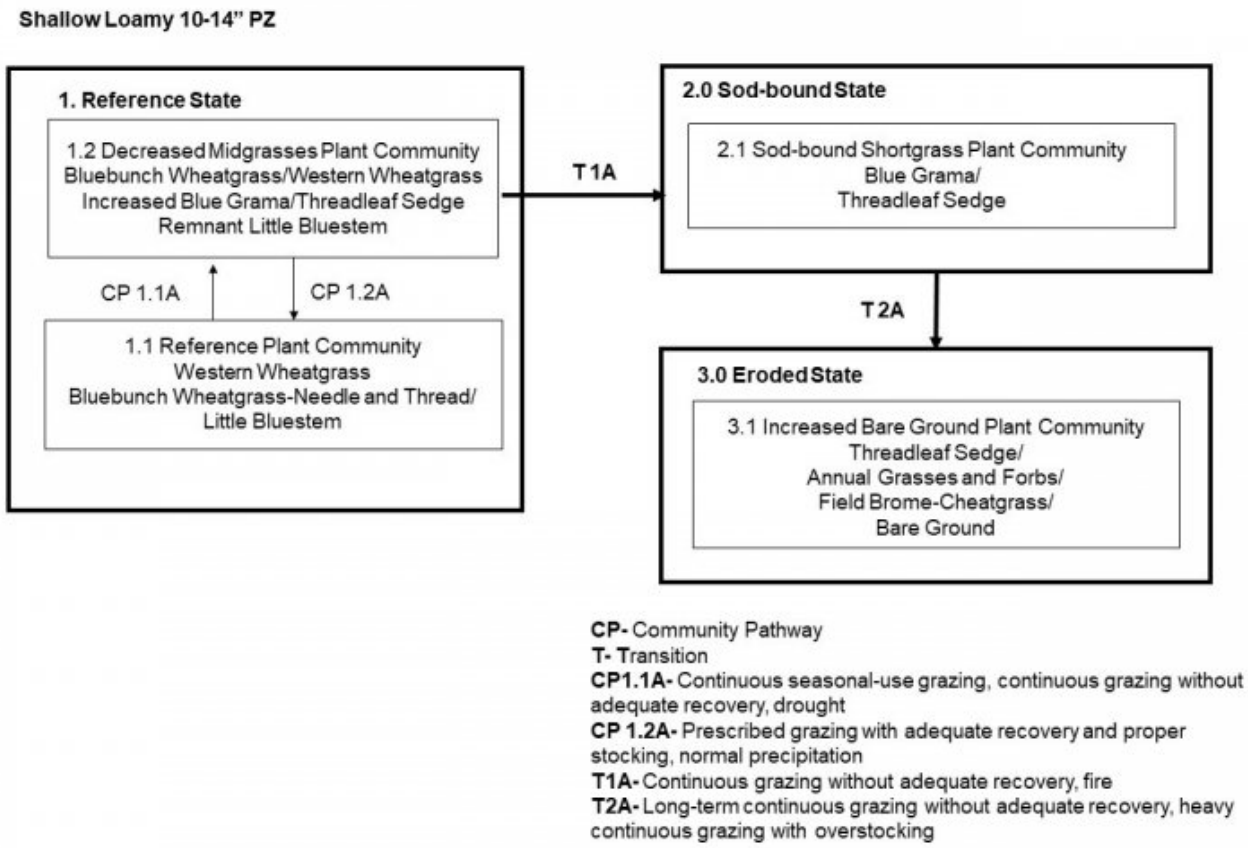
The Reference state is the plant community in which interpretations are primarily based and is used as a reference in order to understand the original potential of the site. The Reference state evolved under the combined influences of climatic conditions, periodic fire activity, grazing by large herbivores, and impacts from small mammals and insects. Changes may occur to the Reference state due to management actions such as continuous season-long or year-long grazing, increased stocking rates, climatic conditions such as drought, and natural events such as fires. The Reference state is characterized by cool-season rhizomatous midgrasses, cool-season bunch midgrasses, warm-season bunch midgrass, and warm-season shortgrass. Forbs (dotted blazing star, scarlet globemallow, buckwheat species, and phlox), and shrubs (skunkbush sumac and Wyoming big sagebrush) are also present. Trees such as Rocky Mountain juniper occasionally occur in minor amounts. The Reference state is not necessarily the management goal, as other vegetative states may be considered desired plant communities as long as critical resource concerns are met.

The Sod Bound state is characterized by warm-season shortgrass (blue grama) and grass-likes (threadleaf sedge). The Eroded State is characterized by annual grasses (sixweeks fescue), Fendler threeawn, forbs (curlycup gumweed, hairy false goldenaster, and annuals), shrubs (prairie sagewort, snakeweed, yucca, and pricklypear) and bare ground. Invasives include cool-season annual bromes such as field brome (also known as Japanese brome), and cheatgrass. The degree of grazing has a significant impact on the ecological dynamics of the site.

As this site begins to shift from a combination of excessive grazing, or frequent and severe defoliation during the growing season, bunchgrasses such as needle and thread will decrease in both frequency and production. Grasses and grass-likes such as blue grama, threadleaf sedge, and sixweeks fescue will increase. Forbs and shrubs such as hairy false goldenaster, tansyaster, broom snakeweed, and prairie sagewort (also known as fringed sagewort), will also increase. If continued, the plant community will become sod-bound, and all midgrasses can eventually be removed from the plant community. Over the long-term, this continuous use in combination with high stocking rates, will result in bare ground developing and shrubs such as pricklypear, broom snakeweed; and annual forbs such as wooly plantain, field cottonrose, and pepperweed increasing or invading. Other invasives include field brome (also known as Japanese brome) and cheatgrass.

There are various transitional stages which may occur on this ecological site. The information presented is representative of a dynamic set of plant communities that illustrate the complex interaction of several ecological processes.

State and transition model



State 1
Reference

The Reference state is characterized by two distinct plant communities. The plant communities, and various successional stages between them, represent the natural range of variability within the Reference state.

Dominant plant species

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 1.1
Wyoming Big Sagebrush, Bluebunch Wheatgrass, and Western

Wheatgrass

This is the interpretive plant community for this site. It is well adapted to the Northern Great Plains climate. This community developed with grazing by large herbivores and is suited to grazing by domestic livestock. Historically, fires likely were patchy and randomly distributed. This plant community can be found on areas where grazed plants receive adequate periods of recovery during the growing season. The potential vegetation is about 75 percent grasses and grass-likes, 15 percent forbs, and 10 percent woody plants. The plant community is predominately cool-season midgrasses, with a smaller component of warm-season mid- and shortgrasses. The major grasses and grass-likes include western- and thickspike wheatgrass, bluebunch wheatgrass, and needle and thread. Secondary and minor grasses and grass-likes include little bluestem, prairie Junegrass, threadleaf sedge, Cusick's bluegrass, green needlegrass, blue- and hairy grama, purple threeawn, and plains muhly. A variety of forbs include American vetch, white- and purple prairieclover, breadroot scurfpea, and prairie coneflower. Other forbs include scarlet globemallow, sulphur-flower buckwheat, and spiny phlox. Primary subshrubs and shrubs are prairie sagewort (also known as fringed sagebrush), winterfat, big sagebrush, rubber rabbitbrush, and skunkbush sumac. (see the Species Composition List for additional information.) Plant diversity is high. In the Shallow Loamy 10 to 14" Precipitation Zone (PZ) ecological site, the total annual production (air-dry weight) is about 900 pounds per acre during an average year, but it can range from about 450 pounds per acre in unfavorable years to about 1,200 pounds per acre in above-average years. Defoliation levels should be determined as part of a grazing management plan based on objectives. 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. Plant decadence and natural mortality are low. This community is resistant to many disturbances except excessive grazing, or development into urban or other uses.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	677	1254	1830
Shrub/Vine	69	130	190
Forb	45	83	120
Total	**791**	**1467**	**2140**

Figure 9. Plant community growth curve (percent production by month). WY1401, 10-14NP upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	10	30	35	10	5	5	5	0	0

Community 1.2

Wyoming Big Sagebrush, Bluebunch Wheatgrass, and Blue Grama

This plant community developed with excessive grazing without adequate recovery during the growing season. Grazing-tolerant species such as blue grama and threadleaf sedge have noticeably increased. Midgrasses such as needle and thread may initially increase or decrease depending on the season of grazing use. Palatable forbs such as white and purple prairieclover, American vetch, and penstemon are present in reduced amounts. Hairy false goldenaster, slimflower scurfpea, scarlet globemallow, prairie sagewort (fringed sagewort), and broom snakeweed have increased. Natural disturbances such as drought and/or fire can contribute to this shift. In the Shallow Loamy 10 to 14“ PZ ecological site, the total annual production (air-dry weight) is about 700 pounds per acre during an average year, but it can range from about 450 pounds per acre in unfavorable years to about 1,000 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 community 1.1 are present and will respond to changes in grazing management.

Figure 10. Plant community growth curve (percent production by month). WY1401, 10-14NP upland sites.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	10	30	35	10	5	5	5	0	0

Pathway 1.1A
Community 1.1 to 1.2

Excessive grazing without adequate recovery between grazing events, drought, or fire can shift this plant community toward the community 1.2. Over a period of years, plant species less tolerant to frequent and severe defoliation will begin to decrease, and those more tolerant will begin to increase. Excessive grazing from year-to-year will result in a reduction or loss of cool-season species. Biotic integrity and water and nutrient cycles may become impaired because of this community pathway.

Pathway 1.2A
Community 1.2 to 1.1

Grazing that allows for adequate recovery between grazing events, and proper stocking rates, will shift community 1.2 back toward community 1.1. Natural disturbances such as return to normal precipitation will contribute to this shift.

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 the 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, reduces the biodiversity and productivity of this site.

Dominant plant species

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- blue grama (*Bouteloua gracilis*), grass
- threadleaf sedge (*Carex filifolia*), grass

Community 2.1
Wyoming Big Sagebrush, Plains Pricklypear, Blue Grama, and Threadleaf Sedge

This plant community develops under long-term frequent and severe defoliation. This typically occurs when the community has been excessively grazed with heavy stocking rates, throughout the growing season over a period of many years. The midgrasses and palatable forbs have been eliminated. The dominant species are blue grama and threadleaf sedge. These species have developed into a sod-bound condition occurring in localized colonies exhibiting a mosaic appearance. Perennial threeawn species such as purple threeawn have increased. Forbs such as scarlet globemallow, wild onion, death camas, and slimflower scurfpea remain. Forbs and shrubs that continue to increase are Cuman ragweed (western ragweed), hairy false goldenaster, prairie sagewort (fringed sagewort), and pricklypear. Plant diversity is low. Energy flow, water cycle and mineral cycle have been negatively affected. Litter levels are very low and unevenly distributed. In the 10 to 14“ PZ, the total annual production (air-dry weight) is about 600 pounds per acre during an average year, but it can range from about 400 pounds per acre in unfavorable years to about 800 pounds per acre in above-average years. This plant community is extremely resistant to change. Many plant species are missing a seed source is not readily available.

Figure 11. Plant community growth curve (percent production by month). WY5803, Northern Rolling High Plains, Southern Part, cool-season/warm-season co-dominant. Cool-season/warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	10	20	28	21	10	5	3		

State 3
Eroded

The Eroded state develops with long-term excessive grazing or frequent and severe defoliation, without adequate recovery between grazing events, heavy, excessive grazing with overstocking. An ecological threshold has been crossed. Soil erosion and loss of organic matter or carbon reserves are resource concerns.

Dominant plant species

- Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), shrub
- plains pricklypear (*Opuntia polyacantha*), shrub
- Fendler's threeawn (*Aristida purpurea var. fendleriana*), grass
- cheatgrass (*Bromus tectorum*), grass

Community 3.1
Wyoming Big Sagebrush, Plains Pricklypear, Purple Threeawn, and Cheatgrass

This plant community occurs where the rangeland is grazed year-round, at high stock densities. Physical impact such as trampling, soil compaction, and trailing typically contribute to this transition. The plant composition is made of annuals with a few species of perennial forbs and grasses that are very tolerant to frequent and severe defoliation. Grasses include purple threeawn. Annuals such as sixweeks fescue, Russian thistle, and kochia have increased or invaded. The dominant forbs include hairy false goldenaster, curlycup gumweed, field cottonrose, and woolly plantain. Green sagewort, broom snakeweed, and pricklypear are increasing. Annual bromes such as field brome (also known as Japanese brome), and cheatgrass invade. In the 10 to 14“ PZ, the total annual production (air-dry weight) is about 400 pounds per acre during an average year, but it can range from about 150 pounds per acre in unfavorable years to about 550 pounds per acre in above-average years. Annual production is highly variable and should be determined on-site. Soil erosion hazard has increased due to the increase of bare ground. Runoff typically is high and infiltration is low. All ecological functions are impaired. Desertification is advanced.

Figure 12. Plant community growth curve (percent production by month). WY5803, Northern Rolling High Plains, Southern Part, cool-season/warm-season co-dominant. Cool-season/warm-season co-dominant.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		3	10	20	28	21	10	5	3		

Transition T1A
State 1 to 2

Excessive grazing without adequate recovery between grazing events or frequent and severe defoliation, will shift this plant community across an ecological threshold toward the Sod Bound state. Biotic integrity and hydrologic function will be impaired because of this

transition.

Transition T2A
State 2 to 3

Long-term excessive grazing or frequent and severe defoliation without adequate recovery between grazing events, or heavy, excessive grazing with overstocking, will cause a shift across an ecological threshold to the Eroded state. Non-native annual bromes begin to invade in this transition.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Cool-Season Rhizomatous**			68–180	
	western wheatgrass	PASM	*Pascopyrum smithii*	68–180	5–15
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	68–180	5–15
2	**Cool-Season Midgrasses/Grass-likes**			361–960	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	225–600	10–50
	needle and thread	HECO26	*Hesperostipa comata*	45–120	1–10
	threadleaf sedge	CAFI	*Carex filifolia*	45–120	1–10
	Cusick's bluegrass	POCU3	*Poa cusickii*	23–60	1–5
	green needlegrass	NAVI4	*Nassella viridula*	23–60	1–5
3	**Warm-Season Bunch Midgrass**			45–120	
	little bluestem	SCSC	*Schizachyrium scoparium*	45–120	–
4	**Warm-Season Shortgrass**			90–240	
	blue grama	BOGR2	*Bouteloua gracilis*	45–120	1–10
	hairy grama	BOHI2	*Bouteloua hirsuta*	45–120	1–10
5	**Miscellaneous**			113–330	
	sideoats grama	BOCU	*Bouteloua curtipendula*	23–60	1–5
	plains reedgrass	CAMO	*Calamagrostis montanensis*	23–60	1–5
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	23–60	1–5
	needleleaf sedge	CADU6	*Carex duriuscula*	23–60	1–5

	Grass, perennial	2GP	*Grass, perennial*	23–60	1–5
	purple threeawn	ARPU9	*Aristida purpurea*	23–60	1–5
	prairie Junegrass	KOMA	*Koeleria macrantha*	23–60	1–5
	Sandberg bluegrass	POSE	*Poa secunda*	23–60	1–5
	plains muhly	MUCU3	*Muhlenbergia cuspidata*	23–60	1–5
Forb					
6	**Forbs**			45–120	
	desertparsley	LOMAT	*Lomatium*	23–60	1–5
	large Indian breadroot	PEES	*Pediomelum esculentum*	23–60	1–5
	American vetch	VIAM	*Vicia americana*	23–60	1–5
	bluebells	MERTE	*Mertensia*	23–60	1–5
	milkvetch	ASTRA	*Astragalus*	23–60	1–5
	textile onion	ALTE	*Allium textile*	23–60	1–5
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	23–60	1–5
	Forb, perennial	2FP	*Forb, perennial*	23–60	1–5
	stemless mock goldenweed	STAC	*Stenotus acaulis*	23–60	1–5
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	23–60	1–5
	purple prairie clover	DAPU5	*Dalea purpurea*	23–60	1–5
	white prairie clover	DACA7	*Dalea candida*	23–60	1–5
	upright prairie coneflower	RACO3	*Ratibida columnifera*	23–60	1–5
	aster	ASTER	*Aster*	23–60	1–5
	scarlet beeblossom	GACO5	*Gaura coccinea*	23–60	1–5
	rosy pussytoes	ANRO2	*Antennaria rosea*	23–60	1–5
	common yarrow	ACMI2	*Achillea millefolium*	23–60	1–5
Shrub/Vine					
7	**Shrubs**			56–165	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	23–60	1–5
	prairie sagewort	ARFR4	*Artemisia frigida*	23–60	1–5
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	23–60	1–5

	winterfat	KRLA2	*Krascheninnikovia lanata*	23–60	1–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	23–60	1–5
	Subshrub (<.5m)	2SUBS	*Subshrub (<.5m)*	23–60	1–5
Tree					
8	**Tree**			13–25	
	ponderosa pine	PIPO	*Pinus ponderosa*	13–25	1–5
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	13–25	1–5

Animal community

Animal Community – Wildlife Interpretations Wildlife Interpretations (from 2001 ESD; will be revised in future updates)

Rhizomatous wheatgrass/ Green needlegrass (Reference): The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. When found adjacent to sagebrush dominated states, this plant community may provide brood-rearing and foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland-obligate small mammals would occur here.

Heavy Sagebrush: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15 percent protein and 40 to 60 percent digestibility during that time. This community can provide nesting and brood rearing habitat for sage grouse.

Mixed Sagebrush/Grass: The combination of an overstory of sagebrush and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of sagebrush tends to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer’s sparrows’ nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20 to 30 percent cover range.

Blue Grama Sod: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Mixed Sagebrush/Grass Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management.

Animal Community – Grazing Interpretations (updated in 2019 Provisional revision)

The following table is a guide to stocking rates for the plant communities described in the Shallow Loamy 10-14" PZ ecological 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 and 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 is defined as the amount of forage required by one livestock animal, with or without one calf, for one month, and is shortened to AUM.

Plant Community (PC) Production (total lbs./acre in a normal year) and Stocking Rate (AUM/acre) are listed below:

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

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

Reference Plant Community 450-1200 .2
Heavy Sagebrush 450-900 .17
Mixed Sagebrush/Grass 450-1000 .17
Blue Grama Sod 400-800 .1

Increased Bare Ground PC (*) (*)

* Highly variable stocking rates must be determined on site.

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.

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 moderate to moderately rapid. Runoff potential for this site varies from moderate to high depending on soil hydrologic group and ground cover. In many cases,

areas with greater than 75 percent ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information).

Slight to none, typically on steeper slopes (greater than 15%) and discontinuous. Active gullies should be restricted to areas of concentrated water flow patterns on steeper slopes. Water flow patterns should be barely distinguishable if at all present. Pedestalled plants and terracettes are not expected on gentle slopes but will occur on slopes steeper than 15% becoming more evident as slopes increase. Fine litter will generally move short distances (less than 6 inches), some coarse litter will move very short distances (less than 3 inches). Litter debris dams are occasionally present. 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 opportunities for upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

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 (2001).

The Annual Production Table and Species Composition List will be reviewed for future updates at the 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: Narrative is from “Previously Approved” ESD (2001). 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 (2001).

Existing NRI 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 (2005). 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 has been collected on private and federal lands by the following methods:
• Double Sampling (Determining Vegetation Production and Stocking Rates, WY-ECS-1)
• Rangeland Health (Interpreting Indicators of Rangeland Health, Version 4, 2005)
• Soil Stability (Interpreting Indicators of Rangeland Health, Version 4, 2005)
• Line Point Intercept (Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems, Volume II, 2005)
• Soil Pedon Descriptions (Field Book for Describing and Sampling Soils, Version 3, 2012)
• SCS-RANGE-417 (Production & Composition Record for Native Grazing Lands)

National Resources Inventory (NRI)
Number of Records: 57
Sample Period: 2005-2017
Counties: Campbell, Crook, Converse, Johnson, Natrona, Niobrara, Sheridan, Weston

Additional data collection includes ESI data collection in conjunction with Soil Surveys conducted within MLRA 58B; ocular estimates; rangeland vegetative clipping for NRCS program support; field observations from experienced rangeland personnel

Data collection for this ecological site was done in conjunction with the progressive soil surveys within MLRA 58B Northern Rolling High Plains (Southern Part)

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

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Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	04/01/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be present.

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2. **Presence of water flow patterns:** Barely observable.

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

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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 40-60% occurring in small areas throughout site.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should be restricted to areas of concentrated water flow
patterns on steeper slopes.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Small scoured sites may be observed.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is little to none based on topography and water flow patterns.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Plant cover and litter is at 50% or greater of soil surface and maintains soil surface
integrity. Soil Stability class is anticipated to be 4 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use Soil Series description for depth and color of A-horizon.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Grass canopy and basal cover should reduce raindrop impact and slow overland flow providing increased time for infiltration to occur. Infiltration is moderate.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer or soil surface crusting should be present.

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: Mid stature Cool Season Grasses > Short Grasses/Grasslikes Mid
    Stature Warm Season Grasses Shrubs Forbs

    Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Very Low

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14. **Average percent litter cover (%) and depth (in):** Average litter cover is 15-25% with depths of 0.25 to 0.5 inches

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 900 lbs./ac

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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:** Blue grama, Threadleaf sedge, Prickly Pear, Broom Snakeweed, and Species found on Noxious Weed List.

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17. **Perennial plant reproductive capability:** All species are capable of reproducing.
