USDA Natural Resources Conservation Service

Ecological site EX049X01X202
Loamy Foothill Palmer Divide

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General information

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

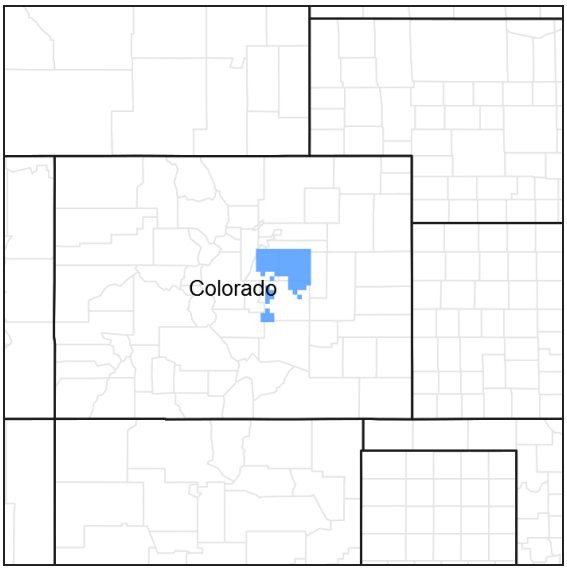


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 049X–Southern Rocky Mountain Foothills

Major Land Resource Area (MLRA) 49 comprises approximately 11,130 square miles running north to south, from south-central Wyoming (27 percent), the length of the Front Range of Colorado (58 percent), and into north-central New Mexico (15 percent). Almost half of this area occurs in the Southern Rocky Mountains and Wyoming Basin provinces in the Rocky Mountain system. The remainder is in the Colorado Pediment, Raton, and High Plains Section of the Great Plains Province of the Interior Plains. The northern part consists of the Laramie Mountains. The central and southern parts generally are bounded on the east by the Great Plains and on the west by the Southern Rocky Mountains (excerpts from USDA Ag. Handbook 296). Average elevation ranges from 5,000 to 8,000 feet. Annual precipitation can range from 10-35 inches.

Land Resource Unit (LRU) 49C (shaded area of location map) is a transition zone between the mountains and plains and describes the central Colorado foothills of the Front Range including the Palmer Divide. It includes the cities of Highlands Ranch, Castle Rock, and Kiowa in Douglas and Elbert counties. The Black Forest/Palmer Divide area is central, while Cheyenne Mountain State Park at Colorado Springs is the southernmost extent in El Paso County. It is characterized by Gambel Oak and Ponderosa Pine with ponderosa increasing at higher elevations. The ponderosa grades into grasslands on the drier eastern fringes as it transitions into the plains. This area was historically used for ranching,some farming, timbering, mining and quarry activities. The area had an influx of people during the Colorado gold rush of 1859. Because of its proximity to Denver and Colorado Springs, many of the original ranches and small towns have been converted to subdivisions, small acreage land holdings and suburbs.

Some cities such as Castle Rock have zoned "open space" for recreation.

Ecological site concept

The 49C Loamy Foothill was drafted from the existing Loamy Foothill Range Site (49BY202CO, November 1989). The concept was expanded upon based on soil temperature and moisture regimes, climate, and geology. This site occurs on fans, fan remnants and swales on loamy to fine loamy soils derived from alluvium. It is a Western wheatgrass-Blue grama-Winterfat-Fourwing Saltbush community. It occurs in the Gambel Oak, Ponderosa, and Grassland areas of the LRU area.

Associated sites

R049XY036CO	**Overflow** The existing Range Site "Overflow" # 36 (1983), which includes MLRA 49B, 67, and 72. A draft Foothill Overflow Ecological Site to be developed for MLRA 49 in the future.

Similar sites

EX049X01X208	**Clayey Foothill Palmer Divide**

Table 1. Dominant plant species

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

Legacy ID

R049XC202CO

Physiographic features

Landform: fans, fan remnants, hills, hillslopes, and valley sides.

Figure 2. MLRA 49C-Front Range Foothills of Central Colorado

Table 2. Representative physiographic features

Landforms	(1) Fan (2) Hill (3) Valley side
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	1,615–2,256 m
Slope	0–20%
Ponding depth	0 cm
Water table depth	152 cm
Aspect	Aspect is not a significant factor

Climatic features

The average annual precipitation is 14-19 inches per year, but can vary from 11 to 22 inches depending upon the year and location within the LRU. Approximately 60 to 75 percent of the annual precipitation occurs during the growing season from late-April to late-September. The Rocky Mountains to the west intercept much of the precipitation from Pacific storms during the winter. Snowfall can vary from 39 inches to 75 inches, depending upon elevation and location. Snowfall averages 63 inches annually across the LRU. Wind speeds average 10 miles per hour annually. Daytime winds are generally stronger than nighttime, and occasional strong storms may bring brief periods of high winds with gusts to more than 60 miles per hour.

The average length of the freeze-free period is 142 days, but varies from 111 to 172 days in 5 out of 10 years. The average date of first freeze (28 degrees or below) in the fall is September 22, and the average last freeze in the spring is May 17. July is the hottest month and January is the coldest. Summer temperatures are moderate, with average highs in the low 80s and occasionally reaching the mid 90s.

Summer nights are comfortably cool, with lows averaging in the 50s. Higher elevations can receive a dusting of snow in early September. Severe cold is normally of short duration. Summer humidity is low and evaporation is high.

Cool season plants generally begin growth from April 1 to April 15. Native warm season plants typically begin growth about May 1 to May 15. Cool season plants generally continue to grow through the summer and fall, in comparison to the warmer and drier eastern plains where cool season plants exhibit summer dormancy.

Table 3. Representative climatic features

Frost-free period (average)	141 days
Freeze-free period (average)	172 days
Precipitation total (average)	559 mm

Influencing water features

None.

Soil features

The soils of this site are typically very deep but may also include moderately deep soils. Typically, they are well drained and are moderately slow or moderately permeable. Loamy alluvium and residuum modified by local wind deposits from sedimentary sandstone, siltstone and shale, is how these soils formed. They occur on fans, fan remnants and valley sides. The available water capacity is typically high for the very deep soils and low to moderate for the moderately deep soils. The soil surface layer ranges from 3 to 16 inches thick and is typically loam or silt loam. The pH of these soils ranges from neutral to moderately alkaline. The soil moisture regime is typically aridic

ustic or ustic with some ustic aridic in the drier areas in the eastern part of the LRU. The soil temperature regime is mesic.

The Reference State should show slight to no evidence of rills, wind scoured areas or pedestaled plants. Water flow paths are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. The soil surface is stable and intact. Sub-surface soil layers are non-restrictive to water movement and root penetration. Major soil series correlated to this ecological site include: Buick, Cushman, Fondis, Rednun, Sampson.

Other soil series that are correlated to this site, but may be re-correlated in the future include: Ascalon, Baca, Colby, Connerton, Lavate, Nunn, Renohill, Satanta, Weld, Wiley

Table 4. Representative soil features

Parent material	(1) Alluvium–shale (2) Residuum–siltstone (3) Eolian deposits–sandstone
Surface texture	(1) Loam (2) Silt loam (3) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	51–203 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–22.86 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed with occasional fires being part of the ecological processes. It is believed that fires were historically infrequent, randomly distributed, and started by lightning at various times throughout the growing season. Early human inhabitants were also likely to start fires for various reasons (deliberately or accidentally). Both of these types of fire events likely impacted the site by leaving mosaic vegetation patterns. The impact of fire over the past 50 years has been relatively insignificant due to wildfire suppression and the lack of acceptance of prescribed fire as a management tool. However, prolonged drought, coupled with fire suppression has increased the frequency and intensity of periodic wildfires in the area. Lack of grazing and lack of fire initially causes increased herbaceous litter.

Deterioration of this site, due to continuous grazing without adequate recovery periods following each grazing occurrence and/or overstocking, will cause blue grama to increase and eventually form a sod. Cool season grasses such as green needlegrass and western wheatgrass will decrease. Warm season grasses such as big bluestem, key shrubs such as fourwing saltbush and winterfat, and palatable forbs such as American vetch will also decrease. Red threeawn, annuals and bare ground increase under heavy continuous grazing. Decadence of bunchgrasses, such as needle and thread and Indian ricegrass, and lower vigor vegetation is expected. This also allows invasive species like diffuse knapweed, spotted knapweed, cheatgrass, toadflax and other similar vegetation to establish. Prescribed grazing with adequate recovery periods following each grazing event and proper stocking rates will maintain the palatable plants.

Drought and/or early killing frost cycles have historically impacted the vegetation. Changes in species composition will vary depending upon the duration and severity of the drought and/or frost cycle.

Some of this ecological site has been tilled and used for crop production. Today, much of this site is urban/suburban residence and small acreage development. Residential development leads to fire suppression. The Reference Plant Community (as described in the State and Transition Diagram below) has been determined by study of rangeland relic areas, areas protected from excessive disturbance, seasonal use pastures, short duration/time controlled grazing and historical accounts.

The following diagram illustrates the common plant communities that can occur on the site and the pathways (arrows) among communities. Bold lines surrounding each plant community or communities represent ecological thresholds and a plant community state. Community phase pathways in the reference state represent shifts in the plant community within the natural range of variability. Transition and Restoration pathways represent the plant community crossing an ecological threshold between states. The ecological processes are discussed in more detail in the plant community descriptions following the diagram.

State and transition model

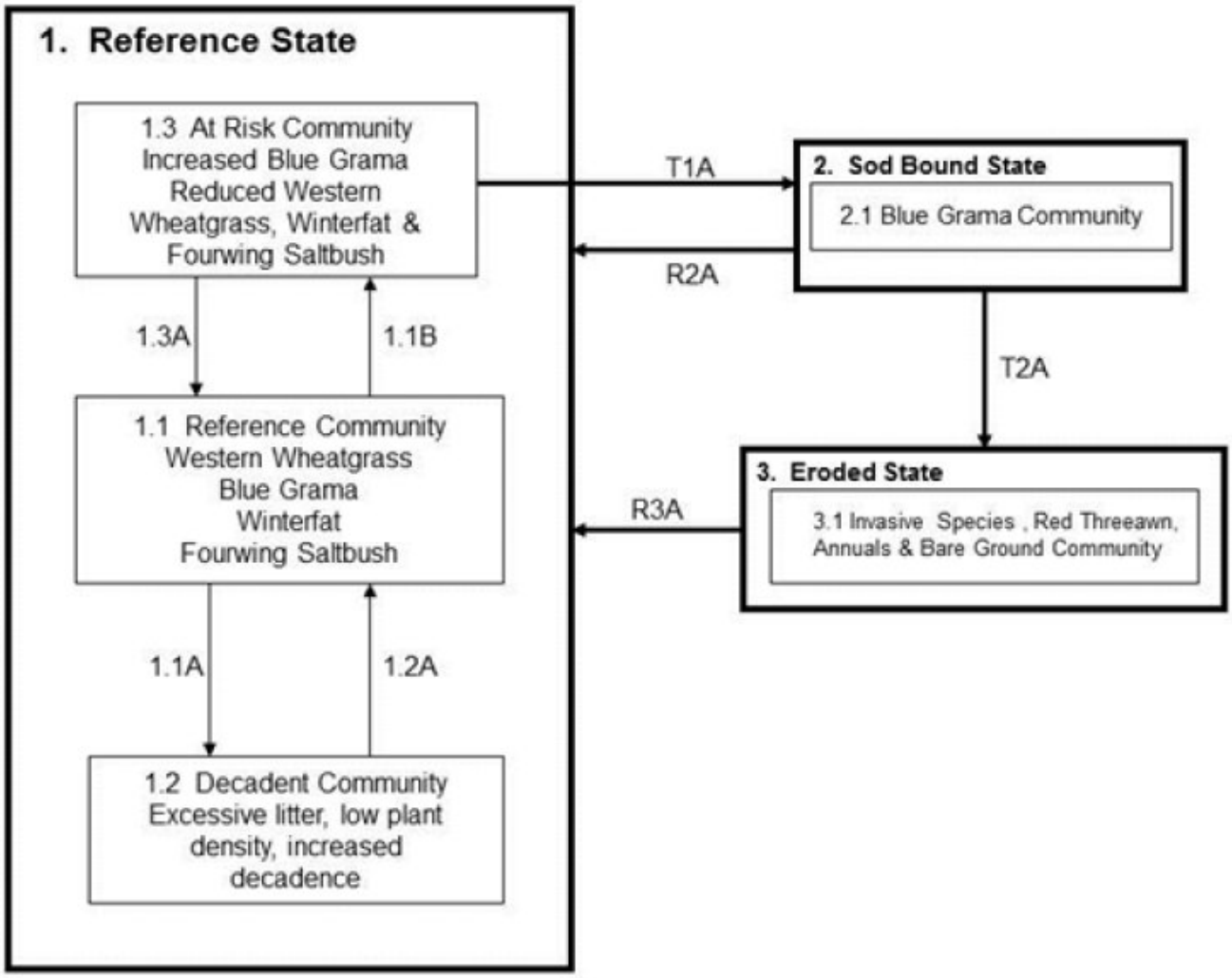


Figure 5. State and Transition Diagram

State 1
Reference State

This is the reference state for the Loamy Foothill ecological site in MLRA 49C.

Community 1.1
Reference Plant Community

Figure 6. Reference Plant Community

This is the interpretive plant community and is considered to be the Reference Plant Community. This plant community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock as well as many wildlife species. It can be found on areas that are properly managed with prescribed grazing that allows for adequate recovery periods following each grazing event. The potential vegetation is about 70-85% grasses and grass-like plants, 10-15% forbs and 5-15% woody plants. The major grasses include western wheatgrass and blue grama. Sub-dominant grasses include green needlegrass and big bluestem. Minor grasses and grass-likes include mountain muhly, little bluestem, sideoats grama, needle-and-thread, prairie junegrass, buffalograss, and sun sedge. Major forbs and shrubs include American vetch, upright prairie coneflower, scarlet globemallow, purple prairieclover, dotted blazing star, winterfat and fourwing saltbush. This plant community is diverse, stable, and productive. Litter is uniformly distributed with very little movement off site and natural plant mortality is very low. It is well suited to carbon sequestration, water infiltration, wildlife use by many species, livestock use, and is esthetically pleasing. Community dynamics, nutrient cycle, water cycle and energy flow are functioning properly. This community is resistant to many disturbances except continuous grazing, tillage and/or development into urban or other uses. Total annual production is 1,700 pounds per acre (air-dry) during an average precipitation year and can range from 1,100 to 2,200 pounds per acre.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	947	1468	1900
Forb	163	247	319
Shrub/Vine	123	191	247
Total	**1233**	**1906**	**2466**

Figure 8. Plant community growth curve (percent production by month). CO4925, Cool season dominant, warm season sub-dominant; MLRA 49C; upland loamy soils. Loamy Foothill in MLRA 49C, Reference Community; Western wheatgrass, blue grama, fourwing saltbush; warm/cool season, mixed, short, and midgrass.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		2	5	15	20	25	20	10	3		

Community 1.2
Decadent Community

This plant community occurs when grazing is removed for long periods of time (rest) in the absence of fire. Plant composition is similar to the Reference Community; however, individual species production and frequency will be lower. White sagebrush (Louisiana sagewort) and/or fringed sagebrush often increase. Introduced species such as diffuse knapweed, spotted knapweed, yellow toadflax, cheatgrass and similar plants may also invade. Much of the nutrients are tied up in excessive litter. The semiarid environment and the absence of animal impact to break down

litter slow nutrient recycling. Aboveground litter also limits sunlight from reaching plant crowns. Many plants, especially bunchgrasses, die off. Thick litter and absence of grazing (with or without fire) reduce seed germination and establishment. In advanced stages, plant mortality can increase and erosion may eventually occur if bare ground increases. Cryptobiotic crusts often develop on bare areas. Once this happens it will require increased input to bring back. Total annual production is 900 pounds per acre (air-dry) during an average precipitation year and can range from 500 to 1,300 pounds per acre.

Community 1.3
At Risk Community with Increased Blue Grama

Figure 9. At Risk Community with Increased Blue Grama

This plant community evolved with long-term continuous grazing and light to heavy stocking. Heavy winter stocking will remove desirable shrubs like fourwing saltbush and winterfat. Recognition of this plant community will enable the land user to implement key management decisions before a significant economic/ecological threshold is crossed. Key species such as western wheatgrass, big bluestem, green needlegrass, American vetch, fourwing saltbush and winterfat have been reduced to remnant amounts. Blue grama has increased, dominates the plant community, and is beginning to take on a sod appearance. Sand dropseed, red threeawn, sixweeks fescue, plains pricklypear, Louisiana sagewort, fringed sagebrush, hairy goldaster and bottlebrush squirreltail have also increased. This plant community is at risk of losing western wheatgrass, big bluestem and green needlegrass which are the major grasses remaining. Once the key species are completely removed and other plants have increased, it will take a long time to bring them back by management alone. Substantial increases in money and other resources will be required to replace the lost species in a short period of time. Total aboveground carbon has been reduced due to decreases in forage and litter production. Reduction of rhizomatous wheatgrass, nitrogen fixing forbs, the shrub component and increased warm season short grasses has begun to alter the biotic integrity of this community. Water and nutrient cycles may be impaired. Total annual production is 1,000 pounds per acre (air-dry) during an average precipitation year and can range from 600 to 1,400 pounds per acre.

Pathway 1.1A
Community 1.1 to 1.2

Non-use (rest) and lack of fire will move this plant community to the Decadent Community with excessive litter, low plant density, and increased decadence.

Pathway 1.1B
Community 1.1 to 1.3

Reference Plant Community

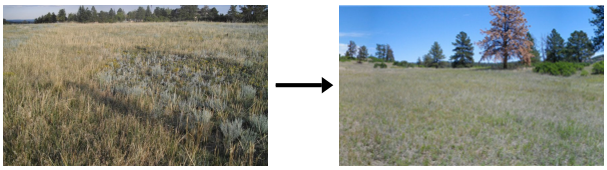
At Risk Community with Increased Blue Grama

Continuous grazing without adequate recovery periods between grazing events will shift this plant community to the At Risk Community with Increased Blue Grama.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing with adequate recovery periods between each grazing event and proper stocking can restore this plant community back to Reference Community.

Pathway 1.3A
Community 1.3 to 1.1



At Risk Community with Increased Blue Grama

Reference Plant Community

Prescribed grazing with adequate recovery periods after each grazing occurrence during the growing season with a proper stocking rate will return the plant community back to the Reference Community.

State 2
Sod Bound State

This is state within the Loamy Foothill ecological site that is very resistant to change. An ecological threshold has been crossed. It resembles a monoculture short grass landscape aspect.

Community 2.1
Blue Grama Community

Figure 10. Sod Bound State Blue Grama Community

This plant community evolved with further continuous grazing and occurs frequently. Fourwing saltbush, winterfat, American vetch, big bluestem and green needlegrass have been removed. Western wheatgrass may persist in depressions (low areas) in trace amounts, greatly reduced in vigor and not readily seen. Blue grama dominates the community with a tight "sodbound" structure. Plains pricklypear, hairy goldaster, fringed sagebrush, Louisiana sagewort, red threeawn, buffalograss, sixweeks fescue and bottlebrush squirreltail have increased. This plant community is resistant to change due to grazing tolerance of blue grama and buffalograss. A significant amount of production and diversity has been lost when compared to the Reference Community. Loss of cool season grasses, the shrub component and nitrogen fixing forbs have negatively impacted energy flow and nutrient cycling. Water infiltration is reduced significantly due to the massive shallow root system "root pan", characteristic of sodbound blue grama and buffalograss. Soil loss may be obvious where flow paths are connected. During periods of extended drought, mortality of blue grama will increase bare ground. It will take a very long time to restore this plant

community back to the Reference Community with improved management. Total annual production is 700 pounds per acre (air-dry) during an average precipitation year and can range from 300 to 1,100 pounds per acre.

Figure 11. Plant community growth curve (percent production by month). CO4922, Blue Grama Sod, MLRA 49. Warm season dominant, shortgrass, MLRA 49.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			2	12	30	35	18	3			

State 3
Eroded State

This state has crossed an ecological threshold. Desertification is obvious. Biological integrity of soils, hydrology and biotic community have been greatly reduced.

Community 3.1
Invasive Species, Red Threeawn, Annuals and Bare Ground

Figure 12. Eroded State, Invasive Species and Bare Ground

This plant community develops with heavy continuous grazing. This is especially prevalent on small acreage properties and/or occupation by prairie dogs. Blue grama may persist in small amounts. Introduced species such as diffuse knapweed, spotted knapweed, cheatgrass, toadflax, kochia and Russian thistle are present. Field bindweed can also be present, especially on prairie dog towns. Litter levels are extremely low. Erosion is evident where flow paths are continuous. Rills may occur on steeper slopes. Wind scoured areas may be apparent on knolls or unprotected areas. The nutrient cycle, water cycle and overall energy flow are greatly impaired. Organic matter/carbon reserves are greatly reduced. This community is not stable. Desertification is obvious. This community may also be created where severe erosion has occurred from disturbances such as tillage, over-lot grading, road cuts, excessive defoliation, etc. If the parent material that the original soil developed from is lost, then another ecological site may evolve. An example of this is a ponderosa pine plant community that may develop, assuming a seed source and appropriate parent material are present. If the same parent material is still present then re-seeding or the slow process of developing soil and vegetation (primary succession) will start. This is a very slow process (40-100 years or more). Total annual production is 400 pounds per acre (air-dry) during an average precipitation year and can range from 100 to 700 pounds per acre.

Figure 13. Plant community growth curve (percent production by month). CO4923, Snakeweed, Pioneer Annual/Perennials, Bare Ground; MLRA 49. Warm/cool season, annual/perennial forbs.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		5	10	20	25	30	10				

Transition T1A
State 1 to 2

Continuous grazing without adequate recovery periods between grazing events shifts this plant community across an ecological threshold to the Sod Bound State.

Restoration pathway R2A
State 2 to 1

Long term prescribed grazing with adequate recovery periods following each grazing event and proper stocking over long periods of time move this plant community to the Reference State or associated successional plant community assuming an adequate seed/vegetative source is available. This process may take greater than 40 years.

Transition T2A
State 2 to 3

Long-term continuous grazing without adequate recovery periods following each grazing event and/or heavy continuous grazing will shift this plant community to the Invasive Species, Red threeawn, Annuals and Bare Ground Community. This transition may take greater than 20 years, but with heavy stocking it can occur in less than five years. Weed infestation, erosion and loss of organic matter/carbon reserves are concerns.

Restoration pathway R3A
State 3 to 1

Long term prescribed grazing with adequate recovery periods between each grazing event and proper stocking can eventually move this community back to the Reference State or associated successional plant community assuming an adequate seed/vegetative source is available. This process may take greater than 40 years.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass/Grasslike**			897–1793	
	western wheatgrass	PASM	*Pascopyrum smithii*	235–572	–
	blue grama	BOGR2	*Bouteloua gracilis*	118–215	–
	green needlegrass	NAVI4	*Nassella viridula*	59–143	–
	big bluestem	ANGE	*Andropogon gerardii*	95–133	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	38–72	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	12–72	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	12–72	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	12–72	–
	mountain muhly	MUMO	*Muhlenbergia montana*	38–72	–
	little bluestem	SCSC	*Schizachyrium scoparium*	38–72	–
	switchgrass	PAVI2	*Panicum virgatum*	12–43	–
	Grass, perennial	2GP	*Grass, perennial*	0–43	–
	muttongrass	POFE	*Poa fendleriana*	12–43	–
	Sandberg bluegrass	POSE	*Poa secunda*	12–43	–
	Canada wildrye	ELCA4	*Elymus canadensis*	12–29	–
	Geyer's sedge	CAGE2	*Carex geyeri*	12–29	–
	squirreltail	ELEL5	*Elymus elymoides*	0–15	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–15	–

	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–15	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–15	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–15	–
Forb					
2	**Forbs**			168–280	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	17–34	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	17–34	–
	dotted blazing star	LIPU	*Liatris punctata*	17–34	–
	lacy tansyaster	MAPIP	*Machaeranthera pinnatifida ssp. pinnatifida*	17–34	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	17–34	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	17–34	–
	Forb, perennial	2FP	*Forb, perennial*	17–34	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	17–34	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	17–34	–
	Drummond's milkvetch	ASDR3	*Astragalus drummondii*	17–34	–
	purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	17–34	–
	American vetch	VIAM	*Vicia americana*	17–34	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–17	–
	rosy pussytoes	ANRO2	*Antennaria rosea*	0–17	–
	tarragon	ARDR4	*Artemisia dracunculus*	0–17	–
	textile onion	ALTE	*Allium textile*	0–17	–
	threadleaf ragwort	SEFLF	*Senecio flaccidus var. flaccidus*	0–17	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–17	–
Shrub/Vine					
3	**Shrubs**			62–185	
	fourwing saltbush	ATCA2	*Atriplex canescens*	17–84	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	17–84	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	17–34	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	17–34	–
	prairie sagewort	ARFR4	*Artemisia frigida*	17–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–17	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–17	–
	prairie rose	ROAR3	*Rosa arkansana*	0–17	–
	soapweed yucca	YUGL	*Yucca glauca*	0–17	–

Animal community

Wildlife Interpretations:
The diversity of grasses, forbs, and shrubs found in the various plant communities on this ecological site provide habitat for a large number of wildlife species. These species are reflective of the transitional nature of the site, situated between the forested habitats in MLRA 48A with grassland habitats in MLRA 67B. Historic large grazers

that influenced these plant communities were elk, mule deer and possibly bison. Changes in the composition of the plant community when moving from the Reference Community to other communities on this ecological site may result in dramatic species shifts in the bird population. The friable soils make this community attractive to reptiles and burrowing mammals. The occasional wetland, riparian area, spring, or stock pond found on this ecological site provides essential seasonal water needed for reproductive habitat by amphibians. Because of a lack of permanent water, fish are not commonly expected on this site.

Reference Community:
Western Wheatgrass, Blue Grama, Winterfat, Fourwing Saltbush Plant Community.
The balance of grasses, forbs, and shrubs in this community provide habitat for a variety of vertebrate species. Pollinators are attracted to the forbs, while birds such as black-billed magpie, vesper and lark sparrow, and red-tailed hawks can be found.
Reptile species expected in this plant community include western rattlesnake, western bullsnake, many lined skink, and six-lined racerunner may use the site to meet all or parts of their life requisites. The presence of desirable grasses and the topographical variations attract mule deer and elk to some degree. White-tailed jackrabbit, coyote, Northern pocket gopher, badger, long-tailed weasel, and several species of mice are small mammals that commonly use this site for food and cover.

At Risk Community: Increased Blue Grama, reduced Western Wheatgrass, Winterfat and Fourwing Saltbush Plant Community.
The reduction of forbs in this plant community will reduce pollinator insect use. Sparrows and magpies will be less common because of the uniformity of grass height and reduction of shrubs. Reptiles and small mammals in this community will still be similar to the Reference Community species. Lark buntings and horned lark will become more common.

Decadent Community: Excessive litter, Low Plant Density, Increased Decadence.
The reduction of desirable shrubs and forbs, combined with the increase in litter will result in a slight change in wildlife species when compared with the Reference Community. Western rattlesnake and other reptiles using the Reference Community will still be found here. Lark bunting and horned lark will use this plant community. Deer and elk will no longer find abundant browse plants or lush forage and therefore will not likely use this community. There will be an increase in small mammals especially mice. Hawks will continue to use this community because it will be easy to spot prey.

Sod Bound State - Blue Grama Community.
The loss of desirable shrubs and forbs will result in a change in wildlife species when compared with the Reference Community. Grasshoppers will be the common insect. Western rattlesnake and other reptiles using the Reference Community will still be found here. Lark bunting and horned lark will be more abundant and replace the vesper and lark sparrows. Hawks will continue to use this site because it will be easy to spot prey. Black-tailed prairie dog will use the site. Deer and elk will not be able to meet their life requisites on this site.

Eroded State: Invasive Species, Red Threeawn, Annuals and Bare Ground Community.
The loss of shrubs and desirable grasses and increased bare ground will result in a change in wildlife species when compared with the Reference Community. Pollinators will be attracted to the annuals in this community. Western rattlesnake and other reptiles using the Reference Community will still be found here. Lark bunting and horned lark will continue to use this plant community although they will not be as abundant as in the Sod Bound Community. Small mammals, especially mice, will be found in this community. Hawks will continue to use this site because it will be easy to spot prey. Deer and elk will not be able to meet their life requisites on this site.

Recreational uses

The Reference State of this ecological site will provide quality recreational uses such as camping, hiking, horseback riding, and viewing of wildlife. Limited small game and large game hunting may also be available in more rural areas and on public land.

Wood products

Limited. Firewood where ponderosa pine and/or Gambel oak occurs.

Other references

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Rangeland health reference sheet

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

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Date	09/09/2013
Approved by	Rachel Murph
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

2. **Presence of water flow patterns:** Typically none, if present short and disconnected

3. **Number and height of erosional pedestals or terracettes:** None

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 3% or less bare ground, with bare patches generally less than 2-3 inches in diameter. Extended drought can cause bare ground to increase upwards to 5-15% with bare patches reaching upwards to 6-12 inches in diameter.

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal and short

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class rating anticipated to be 5-6 in interspace at soil surface. Soil surface is stabilized by decomposing organic matter.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Average SOM is 2-4%. Soils are deep and well drained. Surface texture ranges from loam to fine sandy loam. A-horizon ranges from 4-10 inches in depth with brown to dark grayish brown color and a weak to medium sub-angular blocky parting to a moderate fine granular structure.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Cover from sod forming grasses, bunchgrasses, forbs and shrubs reduce bare ground. Raindrop impact is reduced as well as overland flow, providing increased time for infiltration to occur. Dense stands of blue grama can limit infiltration due to high root densities. Extended drought may reduce short/mid bunchgrass basal cover resulting in decreased infiltration and increased runoff following intense storms.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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: cool season mid rhizomatous >

    Sub-dominant: cool season mid bunchgrass/grasslikes > warm season tallgrass > shrubs = warm season shortgrass > warm season mid bunchgrass = other forbs >= leguminous forbs

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Typically minimal. Expect slightly more bunchgrass mortality during and following drought. Lack of disturbance will increase occurrence of decadence.

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14. **Average percent litter cover (%) and depth (in):** 35-50% litter cover at 0.25 inch depth. Litter cover during and following extended drought ranges from 15-25%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,100 lbs/ac low precipitation years; 1,700 lbs/ac average precipitation years; 2,200 lbs/ac above average precipitation years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 300-500 lbs/ac or more.

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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:** Invasive plants should not occur in reference plant community. Annuals may temporarily occupy the site following extended fire or drought if a seed source is available.

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17. **Perennial plant reproductive capability:** The only limitations are weather-related, wildfire, natural disease and insects that may temporarily reduce reproductive capability.
