United States Department of Agriculture
Natural Resources Conservation Service
Ecological Site Description

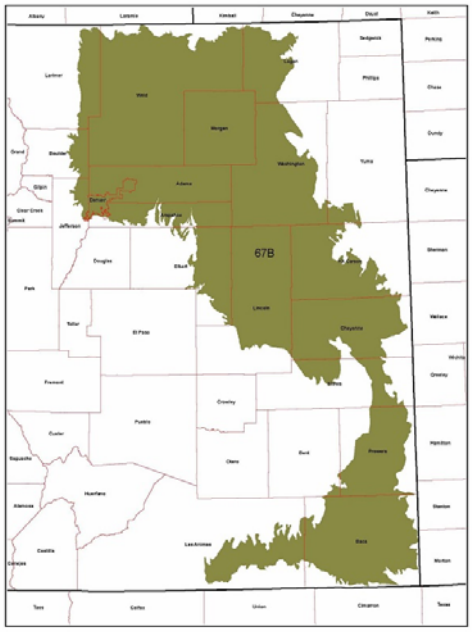
Section I: Ecological Site Characteristics

Ecological Site Identification and Concept

Site stage: **Provisional**

Provisional: an ESD at the provisional status represents the lowest tier of documentation that is releasable to the public. It contains a grouping of soil units that respond similarly to ecological processes. The ESD contains 1) enough information to distinguish it from similar and associated ecological sites and 2) a draft state and transition model capturing the ecological processes and vegetative states and community phases as they are currently conceptualized. The provisional ESD has undergone both quality control and quality assurance protocols. It is expected that the provisional ESD will continue refinement towards an approved status.

Site name: **Loamy Slopes**
/ *Krascheninnikovia lanata* / *Bouteloua gracilis* - *Pascopyrum smithii*
(/ winterfat / blue grama - western wheatgrass)
Site type: Rangeland
Site ID: R067BY008CO
Major land resource area (MLRA): 067B-Central High Plains, Southern Part



MLRA 67B, Eastern Colorado

MLRA 67B-Central High Plains, Southern Part is located in eastern Colorado. It is comprised of rolling plains and river valleys. Some canyonlands occur in the southeast portion. The major rivers are the South Platte and Arkansas which flow from the Rocky Mountains to Nebraska and Kansas. Other rivers in the MLRA include the Cache la Poudre and Republican. The rivers have many tributaries. This ecological site is traversed by I-25, I-70 and I-76, and U.S. Highways 50 and 287. Major land uses include 54% rangeland, 35% cropland, and 2% pasture and hayland. Urban and developed open space, and miscellaneous land occupy approximately 9% of the remainder. Cities in this area include Fort Collins, Greeley, Sterling, and Denver. Other cities include Limon, Cheyenne Wells, and Springfield. Land ownership is mostly private. Federal lands include Pawnee and Comanche National Grasslands (U.S. Forest Service), Sand Creek Massacre National Historic Site (National Park Service), and Rocky Mountain Arsenal National Wildlife Refuge (U.S. Fish & Wildlife Service). State Parks include Cherry Creek and Chatfield Reservoirs, and Barr and Jackson Lakes.

This region is periodically affected by severe drought, including the historic “Dust Bowl” of the 1930s. Dust storms may form during drought years, in windy periods. Elevations range from
3,400 to 6,000 feet. The Average annual precipitation ranges from 14-17 inches per year, and ranges from 13 inches to over 18 inches, depending on location. Precipitation occurs mostly during the growing season, often during rapidly developing thunderstorms. Mean annual air temperature (MAAT) is 48-52°F. Summer temperatures may exceed 100°F. Winter temperatures may be sub-zero, and snowfall varies from 20-40 inches per year. Snow cover frequently melts between snow events.

Ecological Site Concept

This site occurs on gently sloping to steep slopes in an upland position on plains. It is co-dominated by warm-season shortgrass and cool-season midgrasses, along with a minor component of forbs and shrubs.

Physiographic Features

This site occurs on shoulders and backslopes of hills and on side slopes, nose slopes, or head slopes of interfluves on dissected plains.

Landform: (1) Hill
(2) Ridge

	Minimum	Maximum
Elevation (feet):	3800	6000
Slope (percent):	6	15
Water table depth (inches):	80	80
Flooding		
Frequency:	None	None
Ponding		
Depth (inches):	0	0
Frequency:	None	None
Runoff class:	Medium	Very high
Aspect:	No Influence on this site	

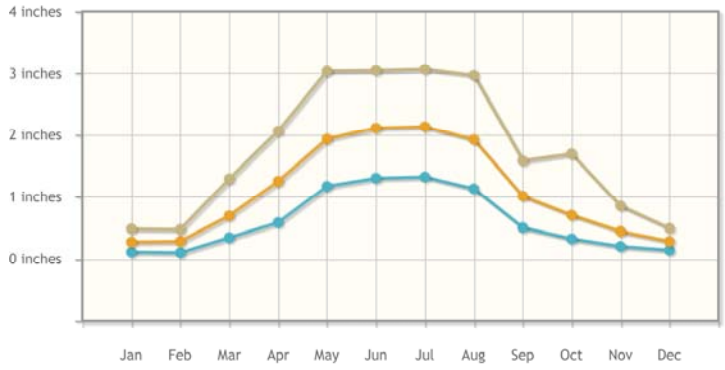
Climatic Features

Average annual precipitation across the MLRA extent is 14 to 17 inches, and ranges from 13 inches to over 18 inches, depending on location. The average is 15 inches. Precipitation increases from north to south. Mean Annual Air Temperature (MAAT) is 50°F in the northern part and increases to 52°F in the southern part. Portions of Morgan and Weld counties (in the northern part) are cooler and drier, the MAAT is 48°F, and average precipitation is 13 to14 inches per year. Two-thirds of the annual precipitation occurs during the growing season from mid-April to late September. Snowfall averages 30 inches per year, area-wide, but varies by location from 20 to 40 inches per year. Winds are estimated to average 9 miles per hour annually. Daytime winds are generally stronger than at night, and occasional strong storms may bring periods of high winds with gusts to more than 90 mph. High-intensity afternoon thunderstorms may arise. The average length of the freeze-free period (28°F) is 155 days from April 30th to October to 3rd. The average frost-free period (32°F) is 136 days from May 11th to September 24th. July is the hottest month, and December and January are the coldest months. Summer temperatures average 90°F and occasionally exceed 100°F. Summer humidity is low and evaporation is high. Winters are characterized with frequent northerly winds, producing severe cold with temperatures occasionally dropping to -30°F or lower. Blizzard conditions may form quickly. For detailed information, visit the Western Regional Climate Center website: Western Regional Climate Center>Historical Data>Western U.S. Climate summaries, NOAA Coop Stations>Colorado http://www.wrcc.dri.edu/summary/Climsmco.html Eastern Colorado was strongly affected by extended drought conditions in the “Dust Bowl” period of the 1930’s, with recurrent drought cycles in the 1950s and 1970s. Extreme to exceptional drought conditions have re-visited the area from 2002 to 2012, with brief interludes of near normal to normal precipitation years. Long-term effects of these latest drought events have yet to be determined. Growth of native cool-season plants begin about April 1 and continue to mid-June. Native warm-season plants begin growth about May 1 and continue to about August 15. Regrowth of cool-season plants occur in September in most years, depending on moisture. Note: The climate described here is based on historic climate station data in the past 30 to 50 years, and is averaged to provide an overview of 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/or heating on mixed-grass prairie ecosystems, and how it may relate to future plant communities (i.e. potential shifts in dominant and sub-dominant groups, changes in growing season length, responses of cool-season and warm-season grasses, etc.) is on-going.

	Averaged
Frost-free period (days):	129
Freeze-free period (days):	150
Mean annual precipitation (inches):	15.89

Monthly Precipitation (Inches):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	0.48	0.47	1.29	2.06	3.04	3.05	3.07	2.97	1.58	1.69	0.85	0.49
Medium	0.27	0.28	0.69	1.25	1.93	2.11	2.13	1.92	1.01	0.70	0.44	0.28
Low	0.11	0.10	0.34	0.58	1.17	1.30	1.32	1.13	0.50	0.32	0.20	0.14



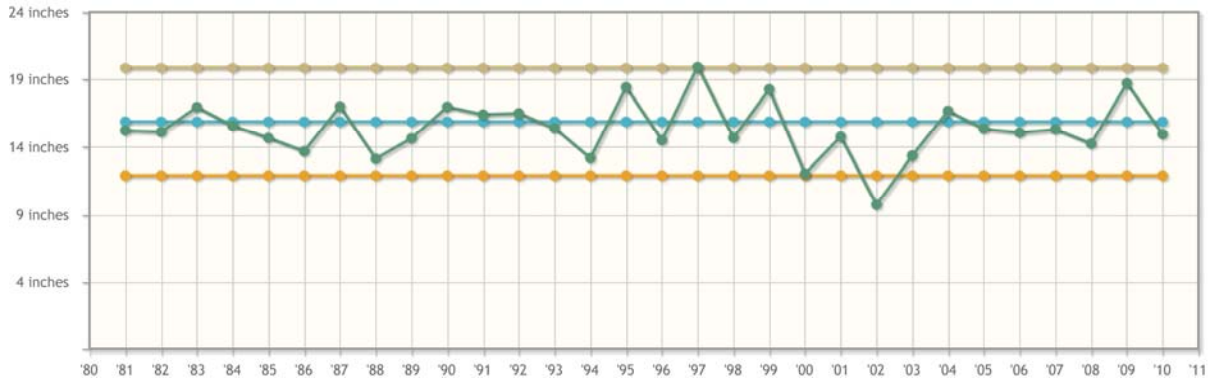
Monthly Temperature (°F):

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	43.4	46.4	55.4	63.7	73.3	83.6	90.2	87.8	79.4	66.7	52.7	42.8
Low	13.5	16.4	24.3	32.1	42.4	51.6	57.3	55.9	46.2	33.8	22.3	13.7

30 Year Annual Rainfall (inches):

1981 N	1982 N	1983 N	1984 N	1985 N	1986 N	1987 N	1988 N	1989 N	1990 N	1991 N	1992 N	1993 N	1994 N	1995 N
15.24	15.13	16.97	15.59	14.68	13.69	17.02	13.14	14.65	16.99	16.42	16.51	15.4	13.19	18.42
1996 N	1997 H	1998 N	1999 N	2000 N	2001 N	2002 D	2003 N	2004 N	2005 N	2006 N	2007 N	2008 N	2009 N	2010 N
14.51	19.95	14.69	18.27	12.04	14.77	9.74	13.37	16.69	15.36	15.07	15.32	14.25	18.71	14.96

D-Drought N-Normal H-Heavy



Climate stations: (1) BRIGGSDALE [USC00050945], Weld County CO 80611. Period of record 1981-2010
(2) BRIGHTON 3 SE [USC00050950], Adams County CO 80601. Period of record 1981-2010
(3) BYERS 5 ENE [USC00051179], Adams County CO 80103. Period of record 1981-2010
(4) CHEYENNE WELLS [USC00051564], Cheyenne County CO 80810. Period of record 1981-2010
(5) FLAGLER 1S [USC00052932], Kit Carson County CO 80815. Period of record 1981-2010
(6) FT MORGAN [USC00053038], Morgan County CO 80701. Period of record 1981-2010
(7) GREELEY UNC [USC00053553], Weld County CO 80631. Period of record 1981-2010
(8) KIT CARSON [USC00054603], Cheyenne County CO 80825. Period of record 1981-2010
(9) NUNN [USC00056023], Weld County CO 80648. Period of record 1981-2010
(10) SPRINGFIELD 7 WSW [USC00057866], Baca County CO 81073. Period of record 1981-2010
(11) LIMON WSMO [USW00093010], Lincoln County CO 80828. Period of record 1981-2010

Influencing Water Features

There are no water features of the ecological site or adjacent wetland/riparian regimes that influence the vegetation and/or management of the site that make it distinctive from other ecological sites. Many of the map units in this ESD have a 1% to 3% hydric component for swales, drainageways, or playas.

Representative Soil Features

The soils on this site are very deep, well drained soils that formed from loess or eolian deposits. They typically have a moderate to moderately slow permeability class, but range to slow in some soils. The available water capacity is typically moderate, but ranges to low in some soils. Available water is the portion of water in a soil that can be readily absorbed by plant roots. This is the amount of water released between the field capacity and the permanent wilting point. As fineness of texture increases, there is a general increase in available moisture storage from sands to loams and silt loams. 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. The surface layer ranges from 3 to 8 inches thick. The subsoil is typically clay loam or loam, but may include silt loam or silty clay loam. Soils in this site typically have free carbonates at the surface, but some soils may be leached to 13 inches. These soils are susceptible to erosion by water and wind. The potential for water erosion accelerates with increasing slope.

Surface soil structure is granular to subangular blocky, and structure below the surface is prismatic or subangular blocky. Soil structure describes the manner in which soil particles are aggregated and defines the nature of the system of pores and channels in a soil. Together, soil texture and structure help determine the ability of the soil to hold and conduct the water and air necessary for sustaining life.

Major soil series correlated to this ecological site include: Adena, Baca, Buick, Colby (6-15% slope), Kimst, Norka, Stoneham, Ulmet, and Wiley.

Other soil series that have been correlated to this site, but may eventually be re-correlated include: Kim, Ulm, and Ulysses. In some areas this ecological site is associated with slopes greater than 15 percent (formerly known as Loess Breaks). Soils in these areas may have a much thinner surface horizon due to increased erosion. These areas may also contain a higher number of gullies or bare ground. Cat-steps may be present on the steeper slopes.

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

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

Parent materials
Kind: Loess, Eolian deposits
Surface texture: (1) Loam
(2) Silt loam

	Minimum	Maximum
Surface fragments <=3" (% cover):	0	0
Surface fragments >3" (% cover):	0	0
Subsurface fragments <=3" (% volume):	0	5
Subsurface fragments >3" (% volume):	0	0

Drainage class: Well drained
Permeability class: Slow to moderate

	Minimum	Maximum
Depth (inches):	80	80
Available water capacity (inches):	3.00	9.00
Electrical conductivity (mmhos/cm):	0	2
Sodium adsorption ratio:	0	0
Calcium carbonate equivalent (percent):	0	15
Soil reaction (1:1 water):	6.6	8.4
Soil reaction (0.01M $CaCl_2$):	6.0	7.9

Plant Communities

Ecological Dynamics of the Site

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 Slopes Ecological Site is characterized by four states: Reference, Warm-Season Shortgrass, Severely Eroded, and Tilled States. The Reference State is characterized primarily by warm-season shortgrass (blue grama), cool-season midgrass (western wheatgrass, green needlegrass), and a minor amount of warm-season midgrass (sideoats grama, little bluestem). The Little Bluestem/Low Plant Density State has a plant community similar to the Reference State with reduced density and increased little bluestem. The Warm-Season Shortgrass State is characterized by a warm-season short bunchgrass (blue grama) and stoloniferous grass (buffalograss). The Severely Eroded State is characterized by remnant buffalograss, with increased annual grasses and forbs. The Tilled State has been mechanically disturbed by equipment, and includes either a variety of reseeded warm- and cool-season grasses (seeded community) or early successional plants as well as annual grasses and forbs (go-back community).

The Loamy Slopes ecological site, in minor instances, can occur on slopes greater than 15 percent. On steeper slopes, the very deep loam or silt loam soils can severely erode and display a rough and broken landscape appearance. The former Loess Breaks ecological site (less than 1,400 acres in MLRA 67B) was developed to describe this condition. The plant communities associated with the steep broken condition will resemble those found in Loamy Slopes. The Reference Plant Community plant composition on the steep broken condition will show more warm-season mid bunchgrass (little bluestem and sideoats grama) and a corresponding decrease in the amount of cool-season mid rhizomatous grass (western wheatgrass). Total annual production will decrease slightly as a result of the steep slopes and broken landscape condition.

This region was historically occupied by large grazing animals such as bison and elk, along with 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 has impacted the vegetation and continues today.

Historically, it is believed, grazing patterns by herds of large ungulates was 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, to increase water infiltration.

Recurrent drought has historically impacted the vegetation of this region. Changes in species composition will vary depending upon the duration and severity of the drought cycle, and prior grazing management. Recent 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 10-14 years (Guyette, 2012), randomly distributed, and started by lightning at various times throughout the growing season. It's thought that 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.

Grazing by large herbivores, without adequate recovery periods following each grazing occurrence, will cause species such as blue grama and buffalograss to increase and eventually form a sod. Green needlegrass, western wheatgrass, big bluestem and switchgrass will decrease in frequency and production as well as key shrubs such as fourwing saltbush and winterfat. American vetch, purple prairie clover, and other highly palatable forbs also will decrease. Fendler threeawn, annuals and bare ground increases under heavy continuous grazing, excessive defoliation, or long-term non-use. Much of this ecological site has been tilled and used for crop production. Other areas of this ecological site have been converted to suburban residence and small acreages, especially near the larger communities. This is an important site for livestock grazing, especially beef cattle. Today the management of livestock grazing has been a major influence on the ecological dynamics of the site. This management, coupled with the effects of annual climatic variations, largely dictates the plant communities for the site.

Mechanical treatment consisting of contour pitting/furrowing, terracing, chiseling, and disking was practiced in the past. It was theorized that the use of this high-input technology would improve production and plant composition on rangeland. These high-cost practices have shown to have no significant long-term benefits on production or plant composition, and have only resulted in a permanently rough ground surface. Prescribed grazing that mimics the historic grazing of herds of migratory herbivores, as described earlier, has been shown to result in desired improvements based on management goals for this ecological site.

The following is a diagram illustrates the common plant communities that can occur on the Sandy Plains site and the community pathways (CP) among plant communities. Plant Communities are identified by 1.1, 1.2 etc. and are described in the narrative. Bold lines surrounding each state represent ecological thresholds. Transitions (T) indicate the transition across an ecological threshold to another state. Once a threshold has been crossed into another state, it may not be feasible to return to the original state, even with significant management inputs and practices. The ecological processes plant communities, community pathways, transition and/or restoration pathways will be discussed in more detail in the plant community descriptions following the diagram.

State-and-Transition Diagram

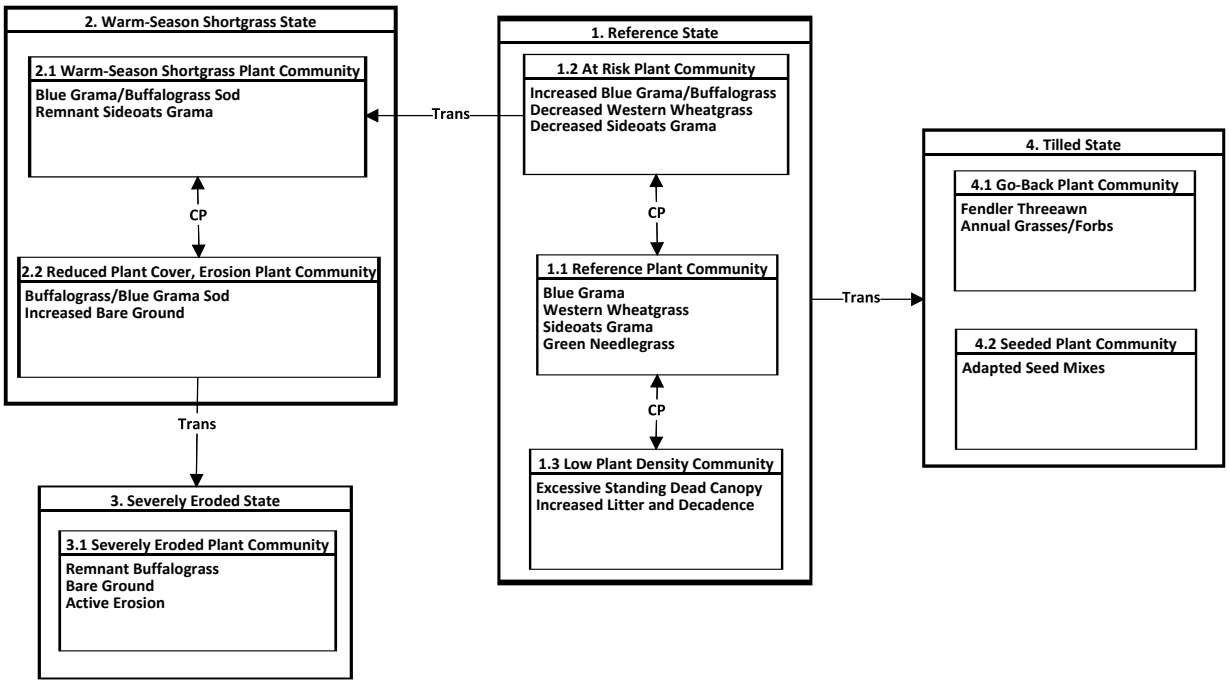


Diagram Legend

T 1.2-2.1	Continuous grazing at moderate to heavy stocking without adequate recovery opportunity
T 1-4	Tillage
T 2.2-3	Long-term heavy continuous grazing, with over-stocking, without adequate recovery opportunity
CP 1.1-1.2	Continuous grazing without adequate recovery
CP 1.1-1.3	Non-Use, No Fire
CP 1.2-1.1	Grazing with adequate recovery opportunity, drought followed by normal precipitation
CP 1.3-1.1	Grazing with adequate recovery opportunity, fire
CP 2.1-2.2	Continuous grazing without adequate recovery opportunity
CP 2.2-2.1	Long-term prescribed grazing

State 1: Reference State

The Reference State is characterized by two distinct plant community phases: Reference Plant Community, and At-Risk Plant Community. The plant communities, and various successional stages between them, represent the natural range of variability due to the disturbance regimes applicable to the site.

Community Phase 1.1: Reference Plant Community

This is the interpretive plant community. This plant community and associated soils developed with large herbivores (bison, elk, deer and pronghorn). It is well suited for domestic livestock use, wildlife use and is aesthetically pleasing. This plant community 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 a mixed grass prairie consisting of approximately 85 percent grasses and grass-like plants, 10 percent forbs, and 5 percent shrubs. Blue grama, western wheatgrass, and sideoats grama are the primary grasses in this community. Secondary species include green needlegrass, needle and thread, big bluestem, buffalograss, switchgrass, threadleaf and sun sedge. Big bluestem and switchgrass are most likely to be located in a lower position on the landform which receives more water. Little bluestem occurs in minor amounts. This community has a diverse forb population, most of which occur in small amounts. A minor component of shrubs include winterfat, fourwing saltbush, Arkansas rose, fringed sagebrush, pricklypear, and yucca.

Western wheatgrass is considered a primary cool-season midgrass in this plant community. It is a valuable forage plant in late spring and/or early summer, and heavily relied upon for early season grazing. Western wheatgrass can provide late season (early fall) grazing in years when soil moisture is adequate.

This community is diverse and productive. Litter is properly distributed with very little movement off-site and natural plant mortality is very low. It is well-

suited to carbon sequestration, effective water cycle, wildlife and livestock use, and is aesthetically pleasing. Community dynamics, nutrient cycle, water cycle, and energy flow are functioning properly.

This plant community is resistant to many disturbances except continuous moderate to heavy grazing, plowing and/or development into urban or other uses. The community can be maintained with proper stocking and prescribed grazing that allows for adequate recovery time following each grazing occurrence.

Total annual production during an average year ranges from 500 to 1,500 pounds of air dry vegetation per acre per year and will average 1,000 pounds. These production figures are the fluctuations expected during favorable, normal and unfavorable years due to the timing and amount of precipitation and temperature. Total annual production should not be confused with species productivity, which is the annual production representing the variability by species throughout the extent of the community phase (i.e. variation of soil characteristics and topography).

Community Phase Pathway 1.1 to 1.2
Continuous moderate to heavy grazing without adequate recovery periods between grazing events, and/or extended drought, and/or reduced fire frequency shifts this plant community toward the At-Risk Plant Community. Biotic integrity will be altered and water & nutrient cycles will be impaired as a result of this community pathway.

Community Phase Pathway 1.1 to 1.3
Non-use or lack of fire will shift the Reference Plant Community to the Low Plant Density Plant Community. Plant decadence and standing dead plant material will impede energy flow. Water and nutrient cycles may become impaired as a result of this community pathway.

Reference Plant Community Plant Species Composition

Grass/Grasslike

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	Annual Production (pounds per acre) High	Foliar cover (percent) Low	Foliar cover (percent) High
1					750	900		
		Grass, perennial	2GP		10	50		
		Indian ricegrass	ACHY	*Achnatherum hymenoides*	0	10		
		big bluestem	ANGE	*Andropogon gerardii*	10	30		
		Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0	10		
		sideoats grama	BOCU	*Bouteloua curtipendula*	70	200		
		buffalograss	BODA2	*Bouteloua dactyloides*	10	30		
		blue grama	BOGR2	*Bouteloua gracilis*	200	300		
		threadleaf sedge	CAFI	*Carex filifolia*	10	30		
		sun sedge	CAINH2	*Carex inops subsp. heliophila*	0	20		
		squirreltail	ELELE	*Elymus elymoides subsp. elymoides*	0	10		
		needle and thread	HECOC8	*Hesperostipa comata subsp. comata*	10	50		
		prairie Junegrass	KOMA	*Koeleria macrantha*	0	10		
		ring muhly	MUTO2	*Muhlenbergia torreyi*	0	10		
		green needlegrass	NAVI4	*Nassella viridula*	150	200		
		western wheatgrass	PASM	*Pascopyrum smithii*	300	400		
		switchgrass	PAVI2	*Panicum virgatum*	10	30		
		little bluestem	SCSC	*Schizachyrium scoparium*	30	100		
		sand dropseed	SPCR	*Sporobolus cryptandrus*	0	10		

Forb

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	Annual Production (pounds per acre) High	Foliar cover (percent) Low	Foliar cover (percent) High
2					50	100		
		Forb, perennial	2FP		10	30		
		Cuman ragweed	AMPS	*Ambrosia psilostachya*	0	10		
		tarragon	ARDR4	*Artemisia dracunculus*	0	10		
		twogrooved milkvetch	ASBI2	*Astragalus bisulcatus*	0	10		
		woolly locoweed	ASMO7	*Astragalus mollissimus*	0	10		
		narrowleaf milkvetch	ASPE5	*Astragalus pectinatus*	0	10		
		purple prairie clover	DAPUP	*Dalea purpurea var. purpurea*	10	20		
		stiff sunflower	HEPAP2	*Helianthus pauciflorus subsp. pauciflorus*	0	10		
		hairy false goldenaster	HEVI4	*Heterotheca villosa*	0	10		
		dotted blazing star	LIPU	*Liatris punctata*	0	10		
		rush skeletonplant	LYJU	*Lygodesmia juncea*	0	10		
		lacy tansyaster	MAPIP4	*Machaeranthera pinnatifida var. pinnatifida*	0	10		
		crownleaf evening primrose	OECO2	*Oenothera coronopifolia*	0	10		
		purple locoweed	OXLA3	*Oxytropis lambertii*	0	10		
		white locoweed	OXSE	*Oxytropis sericea*	0	10		
		New Mexico groundsel	PANEM	*Packera neomexicana var. mutabilis*	0	10		
		broadbeard beardtongue	PEAN4	*Penstemon angustifolius*	0	10		
		silverleaf Indian breadroot	PEAR6	*Pediomelum argophyllum*	0	10		
		woolly plantain	PLPA2	*Plantago patagonica*	0	10		
		slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0	10		
		upright prairie coneflower	RACO3	*Ratibida columnifera*	0	10		
		scarlet globemallow	SPCO	*Sphaeralcea coccinea*	10	20		
		stiff greenthread	THFI	*Thelesperma filifolium*	0	10		
		American vetch	VIAM	*Vicia americana*	10	50		

Shrub/Vine

Group	Group name	Common name	Symbol	Scientific name	Annual Production (pounds per acre) Low	Annual Production (pounds per acre) High	Foliar cover (percent) Low	Foliar cover (percent) High
3					50	150		
		Shrub (>.5m)	2SHRUB		10	30		

prairie sagewort	ARFR4	*Artemisia frigida*	0	10
fourwing saltbush	ATCA2	*Atriplex canescens*	20	80
rubber rabbitbrush	ERNAN5	*Ericameria nauseosa var. nauseosa*	0	10
spinystar	ESVIV	*Escobaria vivipara var. vivipara*	0	10
broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0	10
winterfat	KRLA2	*Krascheninnikovia lanata*	20	70
plains pricklypear	OPPO	*Opuntia polyacantha*	0	10
prairie rose	ROAR3	*Rosa arkansana*	10	30
soapweed yucca	YUGL	*Yucca glauca*	0	10

Annual Production by Plant Type

	Annual Production (lbs/ac)		
Plant type	Low	Representative value	High
Grass/Grasslike	410	825	1240
Forb	45	75	105
Shrub/Vine	45	100	155
Total	500	1000	1500

Plant Growth Curve

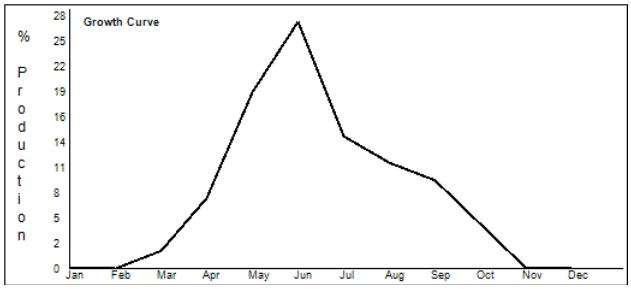
Growth curve number: CO6701

Growth curve name: Cool Season/Warm Season Co-dominant; MLRA-67B; upland fine-textured soils.

Growth curve description:

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	20	28	15	12	10	5	0	0



Community Phase 1.2: At-Risk Plant Community

This plant community evolved with continuous grazing without adequate recovery opportunity, moderate stocking, and in some instances heavy winter stocking. Recognition of this plant community will enable the land user to implement key management decisions before a significant economic/ecological threshold is crossed.

Blue grama and buffalograss have increased in abundance. Threadleaf and sun sedge commonly increase. Small soapweed may also increase. Western wheatgrass, little bluestem, big bluestem, switchgrass, sideoats grama, American vetch, winterfat, and fourwing saltbush have been reduced in abundance, but are still present and are at risk of being further reduced.

Reduction of rhizomatous wheatgrass, nitrogen fixing forbs, shrub component and increased warm season shortgrasses has begun to shift the plant composition dominance between warm and cool-season grasses. Litter levels are reduced when compared to the Reference Plant Community. Nutrient cycles are at risk of becoming impaired. As buffalograss and blue grama become more dominant, water infiltration reduces and runoff can increase causing erosion of steeper slopes and off-site sedimentation.

Total annual production during an average year range from 400 to 900 pounds of air-dry vegetation per acre per year and averages 700 pounds.

Community Phase Pathway 1.2 to 1.1
Grazing with adequate recovery opportunity after each occurrence, with proper stocking, will return this plant community back to the Reference Community, relative to climatic conditions. Drought followed by a return of normal precipitation may cause western wheatgrass to increase, resembling more closely the Reference Plant Community.

Transition 1.2 to 3.1
Continuous grazing at moderate to heavy stocking without adequate recovery periods between grazing events shifts this plant community across an ecological threshold toward the Warm-Season Shortgrass Plant Community.

Plant Growth Curve

Growth curve number: CO6708

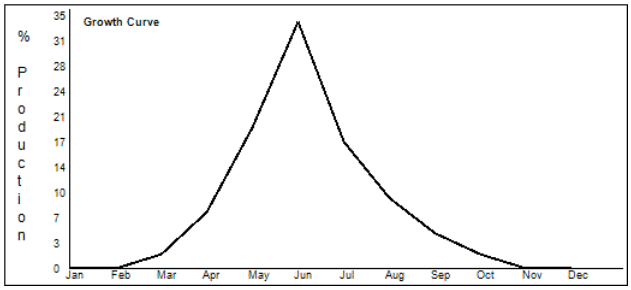
Growth curve name: Warm-Season/Cool-Season Co-dominant; MLRA-67B; upland fine-textured soils.

Growth curve description:

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

0	0	2	8	20	35	18	10	5	2	0	0



Community Phase 1.3: Low Plant Density Plant Community

This plant community develops when grazing is removed (non-use or rest) for long periods of time in the absence of fire.

Many nutrients are tied up in increased litter and above-ground dead canopy. The semiarid environment and the absence of animal traffic to break down litter impairs nutrient recycling. Standing dead canopy limits sunlight from reaching plant crowns. Many plants, especially bunchgrasses (blue grama) may die off. Increased litter and absence of grazing or fire reduce seed germination and establishment.

In advanced stages, plant mortality can increase and erosion may eventually occur as bare ground increases. Once this happens it will require increased energy input in terms of practice cost and management to bring back.

Total annual production can vary greatly. An average year may range from 50 to 600 pounds of air-dry vegetation per acre per year and averages 350 pounds.

Community Phase Pathway 1.3 to 1.1
The return of grazing with adequate recovery opportunity between grazing events with proper stocking, and fire, will cause a shift back to the Reference Plant Community. This change can occur in a relatively short time frame with the return of these disturbances.

Transition 1 to 4

Mechanical tillage of this ecological site will cause an immediate transition across an ecological threshold to the Tilled State. This transition can occur from any plant community and it is irreversible.

State 2: Warm-Season Shortgrass State

The Warm-Season Shortgrass State is characterized by two plant community phases, the Warm-Season Shortgrass and Reduced Plant Cover, Erosion Plant Community. 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 edaphic (soil characteristics) 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/or buffalograss to grazing, the development of a shallow root system (aka root pan), and subsequent changes in hydrology and nutrient cycling. Extended drought may cause extensive mortality of blue grama (as seen in recent drought years). However, there is insufficient information at this time to determine the outcome of this event. The loss of other functional/structural groups such as cool-season rhizomatous grass, warm-season bunchgrasses, forbs, and shrubs, reduces the biodiversity and productivity of this state.

Community Phase 2.1: Warm-Season Shortgrass Plant Community

This plant community developed under sustained continuous grazing at moderate to heavy stocking without adequate recovery opportunity. Buffalograss and blue grama dominate the community and have developed into a sod-bound condition. Remnant amounts of sideoats grama remain especially on steeper slopes. Threadleaf and sun sedge have increased. Small soapweed may continue to increase. Western wheatgrass, little bluestem, big bluestem, switchgrass, American vetch, winterfat and fourwing saltbush have been removed.

The Warm-Season Shortgrass Plant Community is very stable, resistant to change due to the high tolerance of blue grama and/or buffalograss to grazing, the development of a shallow root system (aka root pan), and subsequent changes in hydrology and nutrient cycling. Extended drought may cause extensive mortality of blue grama (as seen in recent drought years). However, there is insufficient information at this time to determine the outcome of this event. The loss of other functional/structural groups such as cool-season rhizomatous grass, warm-season bunchgrasses, forbs, and shrubs, reduces the biodiversity and productivity of this site.

Plant diversity, plant vigor and litter levels are significantly reduced. Water cycle, nutrient cycle and energy flow has been severely impaired do to the significant changes in root structure and overall production. Infiltration due to the sodbound conditions characteristic of buffalograss and blue grama is reduced. Off-site flooding and erosion are concerns. Desertification is advancing.

Total annual production during an average year ranges from 350 to 800 pounds of air-dry vegetation per acre per year and averages 500 pounds.

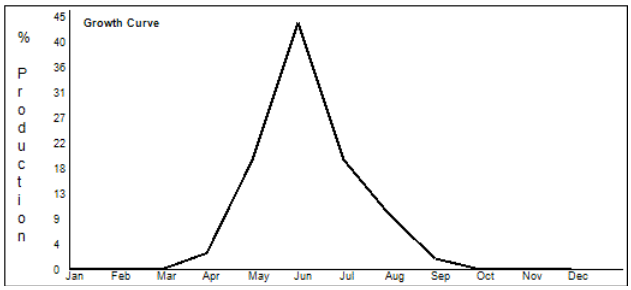
Community Phase Pathway 2.1 to 2.2
Continuous grazing without adequate recovery periods between grazing events will shift this plant community to the Reduced Plant Cover, Erosion Plant Community.

Plant Growth Curve

Growth curve number:	CO6707
Growth curve name:	Warm-Season Dominant; MLRA-67B; upland fine-textured soils.
Growth curve description:	

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	3	20	45	20	10	2	0	0	0



Community Phase 2.2: Reduced Plant Cover, Erosion Plant Community

This plant community develops with long-term continuous grazing without adequate recovery opportunity following each grazing occurrence. Blue grama, buffalograss, red threeawn, ring muhly and broom snakeweed are the dominant plants.

Erosion has increased. Flow paths, rills and small gullies are common. Nutrient cycle, water cycle and overall energy flow have been severely impaired. Desertification is obvious.

Total annual production during an average year ranges from 200 to 500 pounds of air dry vegetation per acre per year and averages 350 pounds.

Community Phase Pathway 2.2 to 2.1
Prescribed grazing that allows adequate recovery periods between grazing events, with proper stocking, will move this plant community back to the Warm-Season Shortgrass Plant Community. The time involved with this community pathway will depend on the degree of soil degradation.

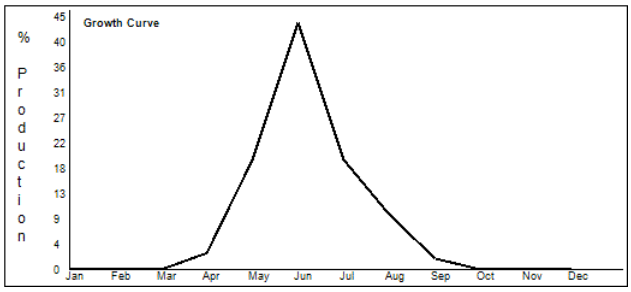
Transition 2.2 to 3
Long-term heavy continuous grazing, with over-stocking, in the absence of adequate recovery periods between grazing events will drive this plant community across an ecological threshold to the Severely Eroded State and the Severely Eroded Plant Community. A different ecological site may evolve if original parent material is lost.

Plant Growth Curve

Growth curve number:	CO6707
Growth curve name:	Warm-Season Dominant; MLRA-67B; upland fine-textured soils.
Growth curve description:	

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	3	20	45	20	10	2	0	0	0



State 3: Severely Eroded State
This state is characterized by the Severely Eroded Plant Community. It results from long-term heavy continuous grazing without adequate recovery opportunity between grazing events. An ecological threshold has been crossed with the development of this state.

Community Phase 3.1: Severely Eroded Plant Community

Sideoats grama, and blue grama have been removed. Sustained long-term heavy continuous grazing without adequate recovery opportunity will eventually lead to severe erosion. Soil/site stability and hydrologic function have become significantly impaired due to accelerated water and wind erosion. Biologic diversity has been reduced resulting in impairment of the biotic integrity of the plant community. 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. Plant pedestals caused by wind scouring are common. 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 advanced.

With minor soil loss, the slow process of developing soil and vegetation will start by similar processes as described for the Go-back Land Plant Community. This is a very slow process. Re-seeding can expedite this process.

Due to accelerated erosion, another ecological site may evolve through secondary successional processes.

State 4: Tilled State

This state is characterized by the Severely Eroded Plant Community. It results from long-term heavy continuous grazing without adequate recovery opportunity between grazing events. An ecological threshold has been crossed with the development of this state.

Community Phase 4.1: Go-Back Plant Community

Go-back land is created when the soil is tilled or farmed (sodbusted) and abandoned. All of the native plants are destroyed, soil organic matter is reduced, soil structure is changed and a plowpan or compacted layer is formed. Residual synthetic chemicals often remain from past farming operations and erosion processes may be active.

An early annual plant community such as Russian thistle, kochia, and other introduced annuals invade the area and initiate the revegetation process. These plants give some protection for erosion and start to rebuild some organic matter. This plant community may last for several years. Fendler threeawn and sand dropseed will eventually establish and dominate the site. In many instances, small soapweed begins to re-establish and can occur in significant amounts. If a seed source is available, little bluestem can become established with or without the sand dropseed. Little bluestem can dominate the community for many years. Eventually some native species will establish. Revegetation practices are very costly.

Production can vary from 0 to 500 pounds of air-dry vegetation per acre per year depending on the soil present, the state of secondary succession, and climatic conditions.

With minor soil loss, the slow process of developing soil and vegetation will start. This is a very slow process. Re-seeding can expedite this process.

Community Phase 4.2: Seeded Plant Community

This community results from any plant community which was tilled or degraded over time by continuous grazing and is seeded to adapted native plant species. A seed mixture of grasses, forbs and shrubs can be used to accomplish various management objectives however, revegetation is costly.

This plant community can vary considerably depending on the amount of soil erosion, the species seeded, and post-seeding management.

Section II: Ecological Site Interpretations

Animal Community

WILDLIFE INTERPRETATIONS:

The combination of grasses, forbs and shrubs found on the ecological site provide habitat for numerous wildlife species. Historic large grazers that influenced these communities were bison, elk, mule deer, and pronghorn. Bison are no longer widely distributed in their historic range. Pronghorn are the most abundant ungulates using this ecological site, followed by mule deer. Domestic grazers share these habitats with wildlife. The grassland communities of eastern Colorado are home to many bird species. Changes in the composition of the plant community when moving from the Reference Community to other communities on this ecological site may result in species shifts in bird species. The occasional wetland or spring found on this site provides essential seasonal water needed for reproductive habitat by some reptiles and amphibians. Because of a lack of permanent water, fish are not common.

1.1 Reference Plant Community
Pronghorn are the most abundant ungulate on this site, followed by mule deer. This site also supports a high diversity of migratory grassland birds including grasshopper sparrow, McCown's longspur, chestnut-collared longspur and loggerheaded shrike among others. Reptiles using this community include and western rattlesnake. Swift fox will use this community, especially for denning activities.

1.2 At-Risk Community
This community is very similar to the Reference Community therefore the value for wildlife is not significantly different. Wildlife species using this this plant community would similar to those using the Reference Community.

1.3 Low Plant Density Community
Due to the increased little bluestem and yucca, birds that favor taller structure, like grasshopper sparrow, will use this plant community. The yucca blossoms are preferred forage for pronghorn and deer.

2.1 Warm Season Shortgrass Plant Community
The loss of tall structure grasses and reduced forb diversity affects the diversity of wildlife species using this plant community. Pronghorn will use this community but it has reduced forage value. Swift fox will continue to use these areas due to decreased visual obstruction. Grassland birds preferring shorter structure grasses will occur here and these include horned lark, McCown’s and chestnut collared longspurs, loggerheaded shrike among others.

2.2 Reduced Plant Cover, Erosion Plant Community
This community is similar to the Warm Season Shortgrass Community. However blue grama/buffalograss have been reduced, and bare ground and soil erosion has increased. Therefore the value for wildlife have been reduced. Wildlife species using this this plant community would be similar to those using the Warm Season Shortgrass Community.

3.1 Severely Eroded Plant Community
Due to reduced plant diversity, cover and forage for many wildlife species is limited in this community.

4.1 Go-Back Plant Community
This community is very similar to the Reduced Plant Cover, Erosion Community therefore the value for wildlife is not significantly different and similar species will use both communities. Wildlife values will change over time, as plant succession progresses from annuals and bare ground after plow-out, to early successional perennials (Fendler threeawn, sand dropseed, etc.).

4.2 Seeded Plant Community
Wildlife use of tilled and replanted fields is dependent on the plant species used in the planted seed mix. The purpose of the seeding (i.e. reclamation, soil erosion control, livestock grazing, targeted wildlife species, etc.) affects the usability for wildlife. If wildlife use is a primary concern, then seed mixes must be designed to meet species specific habitat requirements.

GRAZING INTERPRETATIONS:
The following table lists suggested initial stocking rates for an animal unit (1000 pound beef cow) under continuous grazing (year-long grazing or growing season long grazing) based on normal growing conditions. However, continuous grazing is not recommended. These estimates should only be used as preliminary guidelines in the initial stages of the conservation planning process. Often, the existing plant composition does not entirely match any particular plant community described in this ecological site description. Therefore, field inventories are always recommended to document plant composition, total production, and palatable forage production. Carrying capacity estimates that reflect on-site conditions should be calculated using field inventories.

If the following production estimates are used, they should be adjusted based on animal kind/class and on the specific palatability of the forage plants in the various plant community descriptions. Under a properly stocked, properly applied, prescribed grazing management system that provides adequate recovery periods following each grazing event, improved harvest efficiencies will eventually result in increased carrying capacity. See USDA-NRCS Colorado Prescribed Grazing Standard and Specification Guide (528).

The stocking rate calculations are based on the total annual forage production in a normal year multiplied by 25% harvest efficiency divided by 912.5 pounds of ingested air-dry vegetation for an animal unit per month.

Plant Community (PC) Production (lbs./acre) and Stocking Rate (AUM/acre)

Reference PC- (1000) (0.27)

At-Risk PC - (700) (0.19)

Warm-Season Shortgrass PC - (500) (0.14)

Reduced Plant Cover, Erosion PC - (350) (.10)

Severely Eroded PC - (*) - (*)

Low Plant Density PC - (350) (*)

Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide yearlong forage under prescribed grazing for cattle, sheep, horses and other herbivores.

* Highly variable; stocking rate needs to be determined on site.

Plant Preference by Animal Kind

Animal kind: Sheep, Deer, antelope

Common name	Scientific name	Plant part	J	F	M	A	M	J	J	A	S	O	N	D
Indian ricegrass	*Achnatherum hymenoides*	Entire plant	D	D	D	P	P	P	D	D	D	D	D	D
Cuman ragweed	*Ambrosia psilostachya*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
big bluestem	*Andropogon gerardii*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
tarragon	*Artemisia dracunculus*	Leaves	U	U	U	U	U	U	U	U	U	U	U	U
prairie sagewort	*Artemisia frigida*	Entire plant	U	U	U	D	D	D	D	D	D	U	U	U
Fendler threeawn	*Aristida purpurea var. longiseta*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
twogrooved milkvetch	*Astragalus bisulcatus*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
woolly locoweed	*Astragalus mollissimus*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
narrowleaf milkvetch	*Astragalus pectinatus*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
fourwing saltbush	*Atriplex canescens*	Leaves	P	P	P	D	D	D	D	D	D	P	P	P
sideoats grama	*Bouteloua curtipendula*	Entire plant	U	U	U	D	D	D	P	P	P	U	U	U
buffalograss	*Bouteloua dactyloides*	Entire plant	D	D	D	D	D	D	P	P	P	D	D	D
blue grama	*Bouteloua gracilis*	Entire plant	D	D	D	P	P	P	P	P	P	D	D	D
threadleaf sedge	*Carex filifolia*	Entire plant	U	U	U	P	P	P	N	N	N	D	D	D
sun sedge	*Carex inops subsp. heliophila*	Entire plant	U	U	U	P	P	P	D	D	D	D	D	D
purple prairie clover	*Dalea purpurea var. purpurea*	Entire plant	U	U	U	P	P	P	P	P	P	U	U	U
squirreltail	*Elymus elymoides subsp. elymoides*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
rubber rabbitbrush	*Ericameria nauseosa var. nauseosa*	Leaves	D	D	D	D	D	D	D	D	D	D	D	D
spinystar	*Escobaria vivipara var. vivipara*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
broom snakeweed	*Gutierrezia sarothrae*	Leaves	N	N	N	N	N	N	N	N	N	N	N	N
needle and thread	*Hesperostipa comata subsp. comata*	Entire plant	N	N	N	D	D	D	N	N	N	D	D	D
stiff sunflower	*Helianthus pauciflorus subsp. pauciflorus*	Entire plant	U	U	U	D	D	D	P	P	P	U	U	U
hairy false goldenaster	*Heterotheca villosa*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
winterfat	*Krascheninnikovia lanata*	Entire plant	P	P	P	P	P	P	P	P	P	P	P	P
dotted blazing star	*Liatris punctata*	Entire plant	U	U	U	D	D	D	P	P	P	U	U	U
rush skeletonplant	*Lygodesmia juncea*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
lacy tansyaster	*Machaeranthera pinnatifida var. pinnatifida*	Entire plant	N	N	N	U	U	U	U	U	U	N	N	N
ring muhly	*Muhlenbergia torreyi*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U

green needlegrass	*Nassella viridula*	Entire plant	U	U	U	P	P	P	D	D	D	D	D	D
crownleaf evening primrose	*Oenothera coronopifolia*	Entire plant	N	N	N	U	U	U	U	U	U	N	N	N
plains pricklypear	*Opuntia polyacantha*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
purple locoweed	*Oxytropis lambertii*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
white locoweed	*Oxytropis sericea*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
New Mexico groundsel	*Packera neomexicana var. mutabilis*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
western wheatgrass	*Pascopyrum smithii*	Entire plant	U	U	U	P	P	P	D	D	D	D	D	D
switchgrass	*Panicum virgatum*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
broadbeard beardtongue	*Penstemon angustifolius*	Entire plant	U	U	U	P	P	P	P	P	P	U	U	U
silverleaf Indian breadroot	*Pediomelum argophyllum*	Entire plant	N	N	N	U	U	U	U	U	U	N	N	N
woolly plantain	*Plantago patagonica*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
slimflower scurfpea	*Psoralidium tenuiflorum*	Entire plant	N	N	N	U	U	U	U	U	U	N	N	N
upright prairie coneflower	*Ratibida columnifera*	Entire plant	U	U	U	P	P	P	P	P	P	U	U	U
prairie rose	*Rosa arkansana*	Leaves	U	U	U	D	D	D	D	D	D	U	U	U
little bluestem	*Schizachyrium scoparium*	Entire plant	N	N	N	D	D	D	D	D	D	N	N	N
scarlet globemallow	*Sphaeralcea coccinea*	Entire plant	U	U	U	P	P	P	P	P	P	U	U	U
sand dropseed	*Sporobolus cryptandrus*	Entire plant	N	N	N	U	U	U	D	D	D	N	N	N
stiff greenthread	*Thelesperma filifolium*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
American vetch	*Vicia americana*	Entire plant	D	D	D	P	P	P	P	P	P	D	D	D
soapweed yucca	*Yucca glauca*	Entire plant	D	D	D	P	P	P	N	N	N	D	D	D

Animal kind: Cattle, Horse, Bison, elk

Common name	Scientific name	Plant part	J	F	M	A	M	J	J	A	S	O	N	D
Indian ricegrass	*Achnatherum hymenoides*	Entire plant	D	D	D	P	P	P	D	D	D	D	D	D
Cuman ragweed	*Ambrosia psilostachya*	Entire plant	U	U	U	D	D	D	D	D	D	U	U	U
big bluestem	*Andropogon gerardii*	Entire plant	U	U	U	D	D	D	P	P	P	D	D	D
tarragon	*Artemisia dracunculus*	Leaves	U	U	U	U	U	U	U	U	U	U	U	U
Fendler threeawn	*Aristida purpurea var. longiseta*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
twogrooved milkvetch	*Astragalus bisulcatus*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
woolly locoweed	*Astragalus mollissimus*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
narrowleaf milkvetch	*Astragalus pectinatus*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
fourwing saltbush	*Atriplex canescens*	Leaves	P	P	P	D	D	D	D	D	D	P	P	P
sideoats grama	*Bouteloua curtipendula*	Entire plant	U	U	U	D	D	D	P	P	P	U	U	U
buffalograss	*Bouteloua dactyloides*	Entire plant	D	D	D	D	D	D	P	P	P	D	D	D
blue grama	*Bouteloua gracilis*	Entire plant	D	D	D	P	P	P	P	P	P	D	D	D
threadleaf sedge	*Carex filifolia*	Entire plant	U	U	U	D	D	D	U	U	U	D	D	D
sun sedge	*Carex inops subsp. heliophila*	Entire plant	U	U	U	P	P	P	D	D	D	D	D	D
purple prairie clover	*Dalea purpurea var. purpurea*	Entire plant	U	U	U	P	P	P	P	P	P	D	D	D
squirreltail	*Elymus elymoides subsp. elymoides*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
rubber rabbitbrush	*Ericameria nauseosa var. nauseosa*	Leaves	N	N	N	N	N	N	N	N	N	D	D	D
spinystar	*Escobaria vivipara var. vivipara*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
broom snakeweed	*Gutierrezia sarothrae*	Leaves	N	N	N	N	N	N	N	N	N	N	N	N
stiff sunflower	*Helianthus pauciflorus subsp. pauciflorus*	Entire plant	U	U	U	D	D	D	P	P	P	U	U	U
hairy false goldenaster	*Heterotheca villosa*	Entire plant	U	U	U	U	U	U	D	D	D	U	U	U
winterfat	*Krascheninnikovia lanata*	Entire plant	P	P	P	P	P	P	D	D	D	P	P	P
dotted blazing star	*Liatris punctata*	Entire plant	U	U	U	U	U	U	D	D	D	U	U	U
rush skeletonplant	*Lygodesmia juncea*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
lacy tansyaster	*Machaeranthera pinnatifida var. pinnatifida*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
ring muhly	*Muhlenbergia torreyi*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
green needlegrass	*Nassella viridula*	Entire plant	U	U	U	P	P	P	D	D	D	D	D	D
crownleaf evening primrose	*Oenothera coronopifolia*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
plains pricklypear	*Opuntia polyacantha*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
purple locoweed	*Oxytropis lambertii*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
white locoweed	*Oxytropis sericea*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
New Mexico groundsel	*Packera neomexicana var. mutabilis*	Entire plant	T	T	T	T	T	T	T	T	T	T	T	T
western wheatgrass	*Pascopyrum smithii*	Entire plant	U	U	U	P	P	P	D	D	D	D	D	D
switchgrass	*Panicum virgatum*	Entire plant	U	U	U	D	D	D	D	D	D	U	U	U
broadbeard beardtongue	*Penstemon angustifolius*	Entire plant	U	U	U	D	D	D	U	U	U	U	U	U
silverleaf Indian breadroot	*Pediomelum argophyllum*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
woolly plantain	*Plantago patagonica*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
slimflower scurfpea	*Psoralidium tenuiflorum*	Entire plant	N	N	N	N	N	N	N	N	N	N	N	N
upright prairie coneflower	*Ratibida columnifera*	Entire plant	U	U	U	U	U	U	D	D	D	U	U	U
prairie rose	*Rosa arkansana*	Leaves	U	U	U	D	D	D	D	D	D	U	U	U
little bluestem	*Schizachyrium scoparium*	Entire plant	U	U	U	D	D	D	P	P	P	U	U	U
scarlet globemallow	*Sphaeralcea coccinea*	Entire plant	U	U	U	U	D	D	D	D	D	U	U	U
sand dropseed	*Sporobolus cryptandrus*	Entire plant	U	U	U	D	D	D	U	U	U	N	N	N

stiff greenthread	*Thelesperma filifolium*	Entire plant	U	U	U	U	U	U	U	U	U	U	U	U
American vetch	*Vicia americana*	Entire plant	D	D	D	P	P	P	P	P	P	D	D	D
soapweed yucca	*Yucca glauca*	Entire plant	D	D	D	P	P	P	N	N	N	D	D	D

Legend: P=Preferred; D=Desirable; U=Undesirable; N=Not consumed; E=Emergency; T=Toxic; X=Used, but degree of utilization unknown

Hydrology 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 and 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% 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% have the greatest potential to have reduced infiltration and higher runoff (refer to NRCS Section 4, National Engineering Handbook (NEH-4) for runoff quantities and hydrologic curves).

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 esthetic value that appeals to visitors.

Wood Products

No appreciable wood products are present on the site.

Other Products

Site Development & Testing Plan

General Data (MLRA and Revision Notes, Hierarchical Classification, Ecological Site Concept, Physiographic, Climate, and Water Features, and Soils Data):
Updated, All “Required” items complete to Provisional level

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

Updated. All “Required” items complete to Provisional “+” level.
NOTE: Annual Production Table is from the “Previously Approved” ESD (2004). The Species Composition List is also from the 2004 version. These will need review for future updates at Approved level.

Each Alternative State/Community
Complete to Provisional level

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

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

Livestock Interpretations updated to reflect Total Annual Production revisions in each plant community (Provisional “+”).

Wildlife interpretations, general narrative, and individual plant communities updated (Provisional “+”). Hydrology, Recreational Uses, Wood Products, Other Products, and Plant Preferences table, carried over from previously “Approved” ESD (2004).

There are few existing NRI or 417 Inventories for this site. More field data collection is needed to support this site concept.

Reference Sheet
Rangeland Health Reference Sheet carried over from previously “Approved” ESD (2004).
The current Reference Sheet was previously approved in 2007.
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)

Other Information

Relationship to Other Hierarchical Classifications:

Relationship to Other Classifications:
NRCS Classification Hierarchy:
Physiographic Divisions of the United States (Fenneman, 1946): Physiographic Division>Physiographic Province>Physiographic Section>Land Resource Region>Major Land Resource Area (MLRA)>Land Resource Unit (LRU).
USFS Classification Hierarchy:
National Hierarchical Framework of Ecological Units (Cleland et al, 181-200):
Domain>Division>Province>Section>Subsection>Landtype Association>Landtype>Landtype Phase.

Supporting Information

Associated Sites

Site name	Site ID	Site narrative

Loamy Plains	R067BY002CO	Loamy Plains
Overflow	R067BY036CO	Overflow
Clayey Plains	R067BY042CO	Clayey Plains (somewhat associated)

Similar Sites

Site name	Site ID	Site narrative
Loess Breaks	R067BY052CO	The Loess Breaks site is located on steeper slopes, presence of broken areas within the landscape.
Gravel Breaks	R067BY063CO	The Gravel Breaks site occurs on shallow, gravelly soils.

State Correlation

This site has been correlated with the following states: CO

Inventory Data References

Information presented here has been derived from NRCS clipping data, numerous ocular estimates and other inventory data. Field observations from experienced range trained personnel were used extensively to develop this ecological site description. Specific data information is contained in individual landowner/user case files and other files located in county NRCS field offices.

Those involved in developing the 2004 site descriptions include: Harvey Sprock, Rangeland Management Specialist, CO-NRCS; Ben Berlinger, Rangeland Management Specialist, CO-NRCS; James Borchert, Soil Scientist, CO-NRCS; Terri Skadeland, Biologist, CO-NRCS.

Inventory Data References by Plot (Range-417, Wood-4, Wood-5)

	Sample ID					
Data source	Number	Year	State code	County code	State	County
R-417	0018308121	1983	08	121	Colorado	Washington

Other Inventory Data References

Data source	Number of records	Sample period	State	County
NRI	1	2008	Colorado	Cheyenne
NRI	1	2013	Colorado	Cheyenne
NRI	1	2009	Colorado	Logan

Hierarchical Classification Relationships

MLRA 67B is in the Colorado Piedmont and Raton Sections of the Great Plains Province (USDA, 2006). The MLRA is further defined by LRUs A, B, and C. Features such as climate, geology, landforms, and key vegetation further refine these LRU concepts, and are described in other sections of the Ecological Site Description (ESD).
NOTE: To date, these LRU's are DRAFT.

LRU A is the northeast portion of MLRA 67B, to an extent of approximately 9.0 million acres. Most of the LRU is rangeland, and includes the Pawnee National Grassland, managed by the U.S. Forest Service. Dryland winter wheat/fallow rotations (that may include dryland corn, sunflowers, and/or sorghum) are grown in most counties. Irrigated cropland is utilized in the South Platte Valley. Small acreage and urban ownership are more concentrated on the Front Range. This LRU is found in portions of Adams, Arapahoe, Elbert, Kit Carson, Larimer, Lincoln, Logan, Washington, and Weld counties. Other counties include Boulder, Cheyenne, Denver, Jefferson, and Yuma. The soil moisture regime is Aridic Ustic. The mean annual air temperature (MAAT) is 50° F.

LRU B is in the southeast portion of MLRA 67B (2.6 million acres) and include portions of Baca, Bent, Cheyenne, Kiowa, Las Animas, and Prowers counties. Most of the LRU remains agricultural. Most of LRU B is rangeland and includes the Comanche National Grassland. Dryland winter wheat/fallow rotations (that may include dryland corn, sunflowers, and/or sorghum) are grown. Irrigated cropland is used in the Arkansas Valley. The soil moisture regime is Aridic Ustic and the MAAT is 52°F.

LRU C occurs in portions of Morgan and Weld counties (approximately 1.2 million acres). Most of LRU C is in rangeland. Dryland winter wheat/fallow rotations (that may include dryland corn, sunflowers, and/or sorghum) are grown. The soil moisture regime is Ustic Aridic and the MAAT is 48°F.

REVISION NOTES:
The Loamy Slopes site was developed by an earlier version of the Loamy Slopes ESD (2004, revised 2007). This earlier version of the Loamy Slopes ESD (2004) was based on input from NRCS (formerly Soil Conservation service) and historical information obtained from the Loamy Slopes range site descriptions (1975, revised 1983). 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.

Other References

Data collection for this ecological site was done in conjunction with the progressive soil surveys within the 67B Central High Plains (Southern Part) of Colorado. It has been mapped and correlated with soils in the following soil surveys: Adams County, Arapahoe County, Baca County, Bent County, Boulder County, Cheyenne County, El Paso County Area, Elbert County, Eastern Part, Kiowa County, Kit Carson County, Larimer County Area, Las Animas County Area, Lincoln County, Logan County, Morgan County, Prowers County, Washington County, Weld County, Northern Part, and Weld County, Southern Part.

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Quality Assurance

Provisional Status Verfied by David Kraft (8/3/2017)

Reference Sheet

Author(s)/participant(s): Harvey Sprock, Ben Berlinger, Daniel Nosal

Contact for lead author: Harvey Sprock, Area Rangeland Management Specialist, Greeley,CO

Date: 1/12/2005 **MLRA:** 067B **Ecological Site:** Loamy Slopes R067BY008CO This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community cannot be used to identify the ecological site.

Composition (indicators 10 and 12) based on: X Annual Production, Foliar Cover, Biomass

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Indicators. For each indicator, describe the potential for the site. Where possible, (1) use numbers, (2) include expected range of values for above- and below-average years for **each** community and natural distrurbance regimes within the reference state, when appropriate and (3) cite data. Continue descriptions on separate sheet.

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

2. **Presence of water flow patterns:** Typically none, if present (steeper slopes following intense storms) short and not connected.

3. **Number and height of erosional pedestals or terracettes:** None. “Cat-steps” naturally occur on this site.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, standing dead, 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 10-20% with bare patches reaching upwards to 6-12 inches in diameter. Cross sectional viewing of this site appears to have more bare ground than vertical viewing due to cat-steps.

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. Movement of 1-2 feet is possible following intense rain storms.

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.

9.

Soil surface structure and SOM content (include type and strength of structure, and A-horizon color and thickness): Average SOM is 1-2%. Soils are typically deep to very deep. Surface texture is typically silt loam. The A-horizon is 0-4 inches in depth. Soil is grayish brown, weak fine platy to weak fine granular structure.

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10. **Effect on plant community composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, forb, shrub canopy and root structure reduces raindrop impact and slows overland flow providing increased time for infiltration to occur. Extended drought reduces short/mid bunchgrasses causing decreased infiltration and increased runoff following intense storms.

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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

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground weight using symbols: >>, >, = to indicate much greater than, greater than, and equal to) with dominants and sub-dominants and "others" on separate lines:**
    Dominant: cool season mid rhizomatous >
    Sub-dominant: cool season bunchgrass/grasslikes > warm season short bunchgrass > warm season mid bunchgrass > shrubs > leguminous forbs >
    Other: warm season short stoloniferous > warm season forbs > cool season forbs
    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 slight mortality/decadence during and following drought, fire and/or long-term lack of disturbance.

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14. **Average percent litter cover (30-45%) and depth (.25inches):** Litter cover during and following extended drought ranges from 15-30%.

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15. **Expected annual production (this is TOTAL above-ground production, not just forage production):** 500 lbs./ac. low precip years; 1000 lbs./ac. average precip years; 1500 lbs./ac. above average precip years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 350 – 600 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 indicator, we are describing what is NOT expected in the reference state for the ecological site:** Invasive plants should not occur in reference plant community. Cheatgrass, Russian thistle, kochia, other non-native annuals may invade following extended drought or fire assuming 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.

Reference Sheet Approval

Approval	Date
Herman B. Garcia, State Rangeland Management Specialist	12/5/2007