USDA Natural Resources Conservation Service

Ecological site R067BY038CO
Wet Meadow

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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.

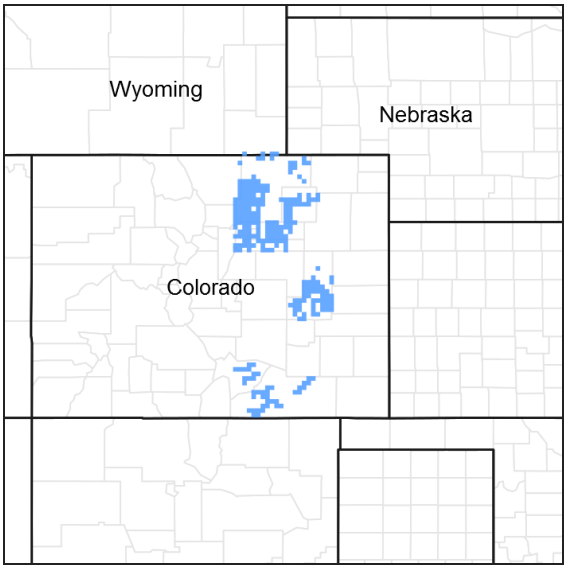


Figure 1. Mapped extent

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): 067B–Central High Plains, Southern Part

MLRA 67B occurs in eastern Colorado and consists 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 and associated tributaries. This MLRA is traversed by Interstate 25, 70 and 76; and U.S. Highways 50 and 287. Major land uses include 54 percent rangeland, 35 percent cropland, and 2 percent pasture and hayland. Urban, developed open space, and miscellaneous land occupy approximately 9 percent. Major 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 to17 inches per year and ranges from 13 inches to over 18 inches, depending upon location. Precipitation occurs mostly during the growing season, often during rapidly developing thunderstorms. Mean annual air temperature (MAAT) is 48 to 52 degrees Fahrenheit. Summer temperatures may exceed 100

degrees Fahrenheit. Winter temperatures may be sub-zero, and snowfall varies from 20 to 40 inches per year. Snow cover frequently melts between snow events.

LRU notes

Land Resource Unit (LRU) A is the northeast portion of MLRA 67B, to an extent of approximately 9 million acres. Most of the LRU is rangeland, and includes the Pawnee National Grassland. Dryland winter wheat/fallow rotations (that may include dryland corn, sunflowers, and 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 degrees Fahrenheit.

LRU B is in the southeast portion of MLRA 67B (2.6 million acres) and includes portions of Baca, Bent, Cheyenne, Kiowa, Las Animas, and Prowers counties. Most of the LRU remains in rangeland and includes the Comanche National Grassland. On the farmed land, a system of dryland winter wheat/fallow rotations (that may include dryland corn, sunflowers, and sorghum) is implemented. Irrigated cropland is found in the Arkansas Valley. The soil moisture regime is aridic ustic and the MAAT is 52 degrees Fahrenheit.

LRU C occurs in portions of Morgan and Weld counties (approximately 1.2 million acres). Most of LRU C is in rangeland. On the farmed land, a system of dryland winter wheat/fallow rotations (that may include dryland corn, sunflowers, and sorghum) is implemented. The soil moisture regime is ustic aridic and the MAAT is 48 degrees Fahrenheit.

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 Land Resource Units (LRUs) A, B, and C. Features such as climate, geology, landforms, and key vegetation further refine these concepts and are described in other sections of the Ecological Site Description (ESD). NOTE: To date, these LRUs are DRAFT.

Relationship to Other Hierarchical Classifications:
NRCS Classification Hierarchy: Physiographic Division, Physiographic Province, Physiographic Section, Land Resource Region, Major Land Resource Area, Land Resource Unit (Fenneman, 1946).
USFS Classification Hierarchy: Domain, Division, Province, Section, Subsection,
Land Type Association: Land Type, Land Type Phase (Cleland et al, 1997).

REVISION NOTES:
The Wet Meadow Ecological Site was developed by an earlier version (2004, revised 2007). This earlier version was based on input from Natural Resources Conservation Service (formerly Soil Conservation Service) and historical information obtained from the Wet Meadow Range Site descriptions (1975). This ESD meets the Provisional requirements of the National Ecological Site Handbook (NESH). This ESD will continue refinement towards an Approved status according to the NESH.

Ecological site concept

This site is a run-on site with the soil surface within four feet of the water table, and will often have redoximorphic features in the upper portion of the soil profile. There are no visible salts on the surface or within the soil profile and it does not have sandy subsoil textures.

Associated sites

R067BY073CO	**Riparian** This ecological site is commonly adjacent.
R067BY029CO	**Sandy Meadow** This ecological site is commonly adjacent.

R067BY031CO	**Sandy Bottomland** This ecological site is commonly adjacent.
R067BY035CO	**Salt Meadow** This ecological site is commonly adjacent.

Similar sites

R067BY035CO	**Salt Meadow** The Salt Meadow Ecological Site has visible salts on the surface or in the soil profile.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Amorpha fruticosa*
Herbaceous	(1) *Andropogon gerardii* (2) *Sorghastrum nutans*

Physiographic features

This site occurs on floodplains of the river valleys and drainageways on the plains. There is an influential water table associated with this site.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Drainageway
Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Occasional to frequent
Ponding frequency	None
Elevation	3,600–5,600 ft
Slope	0–3%
Ponding depth	0 in
Water table depth	6–24 in
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation across the MLRA extent is 14 to 17 inches, and ranges from 13 to over 18 inches, depending on location. Precipitation increases from north to south. Mean Annual Air Temperature (MAAT) is 50 degrees Fahrenheit in the northern part and increases to 52 degrees Fahrenheit in the southern part. Portions of Morgan and Weld counties are cooler and drier, the MAAT is 48 degrees Fahrenheit, 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 degrees Fahrenheit) is 155 days from April 30th to October to 3rd. The average frost-free period (32 degrees Fahrenheit) 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 degrees Fahrenheit and occasionally exceed 100 degrees Fahrenheit. Summer humidity is low and evaporation is high. Winters are characterized with frequent northerly winds, producing severe cold with temperatures

occasionally dropping to -30 degrees Fahrenheit 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.

Table 3. Representative climatic features

Frost-free period (characteristic range)	119-129 days
Freeze-free period (characteristic range)	134-151 days
Precipitation total (characteristic range)	14-17 in
Frost-free period (actual range)	102-132 days
Freeze-free period (actual range)	126-156 days
Precipitation total (actual range)	14-17 in
Frost-free period (average)	121 days
Freeze-free period (average)	142 days
Precipitation total (average)	15 in

Climate stations used

- (1) BRIGGSDALE [USC00050945], Briggsdale, CO
- (2) BYERS 5 ENE [USC00051179], Byers, CO
- (3) GREELEY UNC [USC00053553], Greeley, CO
- (4) NUNN [USC00056023], Nunn, CO
- (5) BRIGHTON 3 SE [USC00050950], Brighton, CO
- (6) CHEYENNE WELLS [USC00051564], Cheyenne Wells, CO
- (7) FLAGLER 1S [USC00052932], Flagler, CO
- (8) KIT CARSON [USC00054603], Kit Carson, CO
- (9) FT MORGAN [USC00053038], Fort Morgan, CO
- (10) SPRINGFIELD 7 WSW [USC00057866], Springfield, CO
- (11) LIMON WSMO [USW00093010], Limon, CO

Influencing water features

There is a seasonal or perennial water table that influences the kinds and amounts of vegetation on this site. The variability in water table provides a mosaic of drier and wetter areas on a meadow. This provides a diversity of non-hydrophytic and hydrophytic vegetation on the site. The water table in some areas is artificially induced, caused by seepage from nearby irrigation ditches, canals, and reservoirs.

Note: This is a general overview for the site concept, and is not a wetland determination.

Soil features

The soils on this site are very deep, very poorly to somewhat poorly drained soils that formed from alluvium from mixed sources. They typically have a moderate to moderately rapid permeability class, but may range to moderately slow. The soil moisture regime is typically aquic. The soil temperature regime is mesic.

The surface layer of the soils in this site are typically sandy loam or loam, but may be variable in some places. The surface layer ranges from 3 to 18 inches thick. The subsoil is typically stratified, with textures ranging from sandy loam, loamy sand, sand, sandy clay loam, clay loam, or silt loam. Rock fragments range from 0 to 40 percent in the underlying material. Soils in this site are typically leached of carbonates at the surface; some soils may have carbonates at the surface and throughout the profile. These soils are typically not susceptible to erosion by water and wind due to the wetness of the soil profile by the seasonal water table. However, these areas may be prone to wind erosion if these areas are drained and the surface is not protected by vegetation.

Major soil series correlated to this ecological site include: Edgewater, Las Animas, Seldom.

Other soil series that have been correlated to this site, but may eventually be re-correlated include: Aquepts, Bijou wet*, Fluvaquentic Haplaquolls, Haplaquolls, Kitcarson, and Wet Alluvial Land.

*Bijou is typically found on terraces or uplands and does not have a water table.

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

Note: Revisions to soil surveys are on-going. For the most recent updates, visit the Web Soil Survey, the official site for soils information: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

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

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Sandy loam (2) Loam
Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Moderately slow to moderately rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2–8 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The Wet Meadow Ecological Site is characterized by three states: Reference, Cool-Season Dominant, and Increased *Bare Ground*. The Reference State is characterized by warm-season tall bunchgrass (big bluestem, switchgrass, Indiangrass), warm-season tall rhizomatous grass (prairie cordgrass), and cool-season grasslike (Nebraska sedge). The Cool-season Dominant State is characterized by cool-season grasslikes (mountain rush, Baltic rush), and bunchgrass (foxtail barley). The Increased *Bare Ground* State is characterized by early successional cool-season grass (foxtail barley), introduced cool-season rhizomatous grass (Kentucky bluegrass), annual grasses, and annual forbs.

The site is subirrigated (i.e. high water table) throughout the growing season. The availability of water has a major influence on the vegetation that will persist on this site.

Today, this is an important site for livestock grazing, especially beef cattle. The management of livestock grazing, coupled with annual climatic variations, has a major influence on the plant communities of this site. Continuous,

heavy grazing without adequate recovery periods following each grazing occurrence causes prairie cordgrass, Indiangrass, big bluestem, switchgrass, Nebraska sedge, and false indigo bush to decrease in frequency and production. Kentucky bluegrass, mountain rush, Baltic rush, scouring rush, and other various grass-likes increase forming a cool-season dominated plant community. Heavy, continuous grazing or excessive defoliation ultimately results in a plant community dominated by foxtail barley and annuals. Excessive litter, decadence, and plant mortality result from the lack of fire or non-use. Extended periods of non-use, lack of fire, or heavy, long term continuous grazing leads to increased bare areas.

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

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

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

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

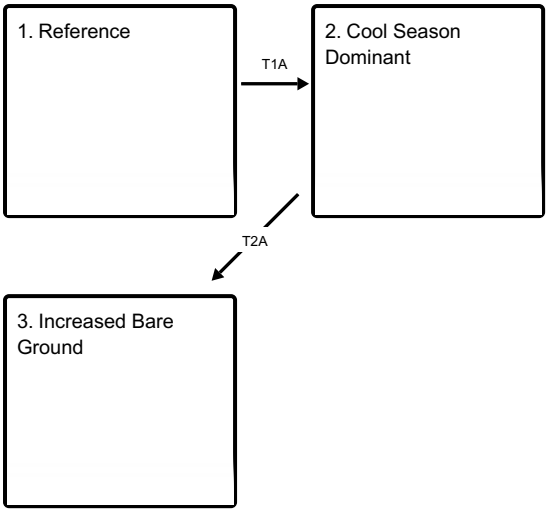
This site developed with occasional fire as part of the ecological processes. Historic fire frequency (pre-industrial) is estimated at 10 to14 years (Guyette, 2012), randomly distributed, and started by lightning at various times throughout the growing season. Early human inhabitants also were likely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

Mechanical treatment consisting of contour pitting, furrowing, terracing, chiseling, and disking has been 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.

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 begins about April 1 and continues to mid-June. Native warm-season plants begin growth about May 1 and continue to about August 15. Regrowth of cool-season plants occurs in September in most years, depending on the availability of moisture.

State and transition model

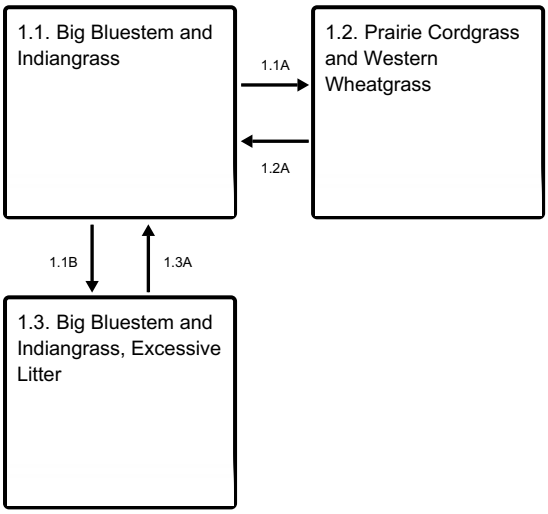
Ecosystem states



T1A - Excessive grazing. Lack of fire.

T2A - Excessive grazing. Lack of fire.

State 1 submodel, plant communities



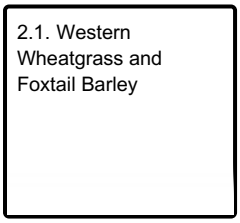
1.1A - Excessive grazing. Lack of fire.

1.1B - Non-use. Lack of fire.

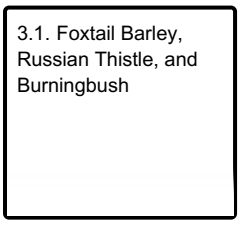
1.2A - Prescribed grazing. Prescribed fire.

1.3A - Prescribed grazing. Prescribed fire.

State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference

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

Dominant plant species

- false indigo bush (*Amorpha fruticosa*), shrub
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Community 1.1
Big Bluestem and Indiangrass

This plant community is the interpretive plant community. This community evolved with grazing by large herbivores and is well suited for grazing by domestic livestock. Historically, fires occurred infrequently. This plant community can be found on areas that receive adequate recovery periods following each grazing event. The potential vegetation is 85 to 95 percent grasses and grass-likes, 5 to10 percent forbs and 1 to 5 percent woody plants. Warm-season tallgrasses dominate this community. The major grasses include big bluestem, Indiangrass, prairie cordgrass, and switchgrass. Other grasses and grass-likes occurring in the community include western wheatgrass, Canada wildrye, mountain rush, Baltic rush, spikerushes, bulrushes, and Nebraska sedge. Key forbs and shrubs include American licorice, Colorado butterfly plant, prairie gentian, and false indigo bush. This plant community is diverse, stable, and productive. The high water table supplies much of the moisture for plant growth. Plant litter is properly distributed with little movement and natural plant mortality is very low. This is a sustainable plant community in terms of soil stability, watershed function, and biologic integrity. Total annual production ranges from 3,500 to 5,000 pounds of air-dry vegetation per acre with a Representative Value of 4,000 pounds.

Dominant plant species

- false indigo bush (*Amorpha fruticosa*), shrub
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	3310	3600	4370
Forb	155	280	425
Shrub/Vine	35	120	205
Total	**3500**	**4000**	**5000**

Figure 9. Plant community growth curve (percent production by month). CO6713, Warm-season dominant, cool-season subdominant; MLRA-67B; lowland water-influenced soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	8	20	30	20	12	5	3	0	0

Community 1.2
Prairie Cordgrass and Western Wheatgrass

Big bluestem, prairie cordgrass, Indiangrass, switchgrass, Canada wildrye, Nebraska sedge, and false indigo bush have decreased. Western wheatgrass may initially increase or decrease depending upon the season of use. Baltic rush has increased. Forbs and shrubs are still present in small amounts. This plant community is at risk of losing the warm-season tallgrasses, palatable forbs, and shrubs. The plants in this community have decreased in frequency and production. Less litter can be expected however, the soil remains stable with water and nutrient cycles are still

functioning, although somewhat impaired. Total annual production ranges from 1,800 to 3,500 pounds per acre air-dry weight during a normal year and averages 2,500 pounds.

Dominant plant species

- false indigo bush (*Amorpha fruticosa*), shrub
- prairie cordgrass (*Spartina pectinata*), grass
- western wheatgrass (*Pascopyrum smithii*), grass

Figure 10. Plant community growth curve (percent production by month). CO6714, Cool-season dominant, warm-season subdominant; MLRA-67B; lowland water-influenced soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	7	25	40	15	7	3	1	0	0

Community 1.3
Big Bluestem and Indiangrass, Excessive Litter

The dominant species are primarily the same as the Reference Community but much of the plant nutrients are tied up in excessive litter. Organic matter oxidizes in the air rather than being incorporated into the soil due to the absence of animal impact. Excessive standing dead canopy levels prevent sunlight from reaching plant crowns and in time can stagnate the plant community. Tallgrasses such as Indiangrass, big bluestem, switchgrass, and prairie cordgrass can become decadent and eventually die. Total annual production varies from 1000 to 3500 pounds of air-dry vegetation per acre.

Dominant plant species

- false indigo bush (*Amorpha fruticosa*), shrub
- big bluestem (*Andropogon gerardii*), grass
- Indiangrass (*Sorghastrum nutans*), grass

Figure 11. Plant community growth curve (percent production by month). CO6715, Warm-season/cool-season codominant, excess litter; MLRA-67B; lowland water influenced soils..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	7	20	35	20	10	5	2	0	0

Pathway 1.1A
Community 1.1 to 1.2

Continuous, heavy grazing without adequate recovery periods between grazing events, and lack of fire shifts this community to the 1.2 Community. Drought accelerates this process. Recurring spring seasonal grazing decreases cool-season plants. Recurring summer grazing decreases warm-season plants and increases cool-seasons.

Pathway 1.1B
Community 1.1 to 1.3

Non-use and lack of fire causes the Reference Community to shift to the 1.3 Community. Plant decadence and standing dead plant material impede energy flow. Water and nutrient cycles are impaired.

Pathway 1.2A
Community 1.2 to 1.1

Grazing that allows for adequate recovery opportunity between grazing events, a proper stocking rate, and prescribed fire shifts this community back to the Reference Plant Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

Pathway 1.3A
Community 1.3 to 1.1

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

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Cool Season Dominant

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. The loss of functional/structural groups such as warm-season tallgrasses and palatable forbs and shrubs reduces biodiversity and productivity.

Dominant plant species

- western wheatgrass (*Pascopyrum smithii*), grass
- foxtail barley (*Hordeum jubatum*), grass

Community 2.1
Western Wheatgrass and Foxtail Barley

The plant community is predominantly cool-season grasses and grass-likes. Baltic rush and foxtail barley have increased and Kentucky bluegrass has invaded. Remnant amounts of western wheatgrass may still persist in localized colonies. Warm-season tallgrasses (prairie cordgrass, big bluestem, Indiangrass, switchgrass) as well as false indigo bush have been removed. This community remains stable but has lost much of its production and diversity. Nutrient cycle is impaired due to the loss of tallgrass species, deep-rooted forbs (legumes and others), and shrubs. Soil compaction can be a concern if continuously grazed during wet cycles. Total annual production ranges from 1,000 to 1,700 pounds per acre air-dry weight during a normal year and averages 1,300 pounds.

Dominant plant species

- western wheatgrass (*Pascopyrum smithii*), grass
- foxtail barley (*Hordeum jubatum*), grass

Figure 12. Plant community growth curve (percent production by month). CO6717, Cool-season dominant; MLRA-67B; lowland water- influenced soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	13	25	30	15	7	3	2	0	0

State 3
Increased Bare Ground

An ecological threshold has been crossed. Erosion and loss of organic matter and carbon reserves are concerns. Nutrient and water cycles and energy flow are impaired. Wind and water erosion may occur at low amounts. Litter amounts are greatly reduced. Mineral crusting caused by raindrop impact disrupts surface soil aggregates, increasing ponding and slowing infiltration. Continued heavy use will cause severe compaction problems. Animal wastes can contaminate ground water or runoff.

Dominant plant species

- foxtail barley (*Hordeum jubatum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Community 3.1
Foxtail Barley, Russian Thistle, and Burningbush

The plant composition consists of primarily foxtail barley and introduced annuals such as Russian thistle and burningbush. Kentucky bluegrass may persist in small amounts. Remnants of western wheatgrass and other species may be present. Compared to the Reference Plant Community, all perennial plants have been greatly reduced with only remnants of the most grazing tolerant species remaining. Plant diversity and production are very low. Total annual production during a normal year ranges from 100 to 600 pounds per acre air-dry weight.

Dominant plant species

- foxtail barley (*Hordeum jubatum*), grass
- Russian thistle (*Salsola*), other herbaceous
- burningbush (*Bassia scoparia*), other herbaceous

Figure 13. Plant community growth curve (percent production by month). CO6714, Cool-season dominant, warm-season subdominant; MLRA-67B; lowland water-influenced soils.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	2	7	25	40	15	7	3	1	0	0

Transition T1A
State 1 to 2

Heavy, continuous grazing without adequate recovery periods between grazing events and lack of fire shift this state across an ecological threshold to the Cool-season Dominant State. Biotic integrity and hydrologic function are impaired as a result of this transition.

Transition T2A
State 2 to 3

Heavy, continuous grazing without adequate recovery periods between grazing events, and lack of fire cause a shift across an ecological threshold to the Increased *Bare Ground* State. Loss of organic matter and carbon reserves, and flooding are concerns.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1				3400–3800	
	big bluestem	ANGE	*Andropogon gerardii*	600–1000	–
	Indiangrass	SONU2	*Sorghastrum nutans*	600–1000	–
	prairie cordgrass	SPPE	*Spartina pectinata*	600–1000	–
	switchgrass	PAVI2	*Panicum virgatum*	600–800	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	200–400	–
	western wheatgrass	PASM	*Pascopyrum smithii*	200–400	–
	Canada wildrye	ELCA4	*Elymus canadensis*	80–200	–
	Grass-like, perennial	2GLP	*Grass-like, perennial*	80–200	–
	Grass, perennial	2GP	*Grass, perennial*	40–200	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	40–120	–
	bulrush	SCIRP	*Scirpus*	40–80	–
	little bluestem	SCSC	*Schizachyrium scoparium*	40–80	–
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	40–80	–
	vine mesquite	PAOB	*Panicum obtusum*	0–40	–
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–40	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	0–40	–
Forb					
2	**Forbs**			200–400	
	Forb, perennial	2FP	*Forb, perennial*	80–200	–
	showy prairie gentian	EUEXR	*Eustoma exaltatum ssp. russellianum*	40–200	–
	Colorado butterfly plant	GANEC	*Gaura neomexicana ssp. coloradensis*	40–80	–
	American licorice	GLLE3	*Glycyrrhiza lepidota*	40–80	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–40	–
	Colorado butterfly plant	OECOC	*Oenothera coloradensis ssp. coloradensis*	0–40	–
	Pennsylvania smartweed	POPE2	*Polygonum pensylvanicum*	0–40	–
	giant goldenrod	SOGI	*Solidago gigantea*	0–40	–
	white heath aster	SYER	*Symphyotrichum ericoides*	0–40	–
	swamp milkweed	ASIN	*Asclepias incarnata*	0–40	–
	threelobe beggarticks	BITR	*Bidens tripartita*	0–40	–
	false boneset	BREU	*Brickellia eupatorioides*	0–40	–
Shrub/Vine					
3				40–200	
	false indigo bush	AMFR	*Amorpha fruticosa*	40–80	–
	Woods' rose	ROWO	*Rosa woodsii*	0–40	–
	western snowberry	SYOC	*Symphoricarpos occidentalis*	0–40	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–40	–

Animal community

WILDLIFE INTERPRETATIONS:

Wet Meadow sites support a unique suite of wildlife species due to their association with river and stream systems. Riparian corridors generally represent areas of increased biodiversity compared to adjacent upland sites, and these sites often occur in those riparian systems. Wet meadows provide habitat components for white-tailed and mule deer, wild turkey, and bobwhite quail. These areas can also have increased diversity of herpetile species.

1.1 Reference Plant Community

The Reference Plant Community provides important habitat components for white-tailed and mule deer, including foraging, bedding, and fawning areas. Wild turkey hens use shrubs for nesting and brood-rearing, and all turkeys use these sites incidentally the rest of the year. The taller grasses, especially switchgrass and prairie cordgrass, provide important nesting habitats for northern bobwhite quail, and snowberry provides the highest quality loafing and escape habitat for this species on this site. Plains and common garter snakes may be found in this plant community, especially if low areas with seasonal water are present.

1.2 Community

The 1.2 Community has reduced tall grasses and shrubs which degrades the overall quality of the site for wildlife. White-tailed and mule deer may move through this community and feed to some extent, but with reduced cover the value for bedding and fawning is also reduced. Northern bobwhite quail use of this community is reduced as well as the tallgrass and shrub components declines. Quail will be absent from sites where these components are entirely absent.

1.3 Community

The 1.3 community has greatly reduced value for wildlife due to the loss of tall grasses and the reduced abundance of shrubs. White-tailed and mule deer may move through this community and feed to some extent, but with reduced cover the value for bedding and fawning is also reduced. Northern bobwhite quail use of this community is reduced as the tallgrass and shrub components decline, and because the litter layer is too thick and dense for quail to navigate.

2.1 Community

The 2.1 Community on this site represents a lower amount of wildlife diversity. White-tailed and mule deer may move through this community but spend little time feeding or bedding. Wild turkey may use the edges of these meadows in the spring for breeding displays but nesting and brood-rearing value has been lost.

3.1 Community

Due to the greatly reduced plant diversity of this site and impairment to nutrient cycling and water infiltration processes, the wildlife community that uses this site is also greatly reduced.

GRAZING INTERPRETATIONS:
The following table lists suggested initial stocking rates for an animal unit (1000-pound beef cow) under continuous grazing (yearlong 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 or 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 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 percent harvest efficiency divided by 912.5 pounds of ingested air-dry vegetation for an animal unit per month (AUM).

Reference PC - (4,000) (1.10)

1.2 PC - (2,500) (0.68)

2.1 PC - (1,300) (0.36)

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.

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

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group A and B. Infiltration is moderate and runoff potential for this site varies from moderately poor to poor depending on ground cover. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff (refer to NRCS Section 4, National Engineering Handbook (USDA–NRCS, 1972–2012) 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 aesthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

Site Development and 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, with minor edits. 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.

Wildlife interpretations, general narrative, and individual plant communities updated to the Provisional level. Hydrology, Recreational Uses, Wood Products, Other Products, Plant Preferences table, and Rangeland Health Reference Sheet carried over from previously “Approved” ESD 2004.

Reference Sheet

The 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:

NRCS Classification Hierarchy:
Physiographic Divisions of the United States (Fenneman, 1946): Physiographic DivisionPhysiographic ProvincePhysiographic SectionLand Resource RegionMajor Land Resource Area (MLRA)Land Resource Unit (LRU).
USFS Classification Hierarchy:
National Hierarchical Framework of Ecological Units (Cleland et al, 181-200): DomainDivisionProvinceSectionSubsectionLandtype AssociationLandtypeLandtype Phase.

Inventory data references

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

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

Those involved in developing the 2004 site description 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.

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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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Rangeland health reference sheet

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

Author(s)/participant(s)	Harvey Sprock, Ben Berlinger, Daniel Nosal
Contact for lead author	Harvey Sprock, Area Rangeland Management Specialist, Greeley, CO
Date	11/17/2004
Approved by	Kirt Walstad
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:** None

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):** None

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** Typically slight, however during major flooding events this site slows water flow and captures litter and sediment.

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

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** SOM ranges from 3 to 5 percent. Soils are very deep, poorly drained with a water table depth from 5 to 36 inches. Color of the A-horizon is dark brown to black at 0 to 6 inches in depth. Surface structure is weak sub-angular blocky with strong surface aggregates.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Raindrop impact is reduced by the diverse grass, forb, shrub functional/structural groups and root structure. This slows overland flow and provides increased time for infiltration to occur. Extended drought, wildfire or both may reduce basal density, canopy cover, and litter amounts (primarily from tall, warm-season bunch and rhizomatous grasses), resulting in decreased infiltration and increased runoff on steep slopes following intense rainfall events.

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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 annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Warm-season tall grasses >>

    Sub-dominant: Cool-season grasslikes > cool-season mid rhizomatous > forbs >

    Other: Cool-season mid grasses = shrubs

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** None to slight.

---

14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 3500 lbs./ac. low precipitation years; 4000 lbs./ac. average; 5000 lbs./ac. high years. Extended drought

may reduce annual production by 750 – 1000 lbs./ac.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Invasive plants should not occur in reference plant community.

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