

Ecological site R048AY243CO Swale Meadow

Last updated: 3/05/2024
Accessed: 05/10/2025

General information

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

MLRA notes

Major Land Resource Area (MLRA): 048A–Southern Rocky Mountains

MLRA 48A makes up about 45,920 square miles (119,000 square kilometers) and is the southern part of the Rocky Mountains. The Southern Rocky Mountains lies east of the Colorado Plateau, south of the Wyoming Basin and, west of the Great Plains and, and north of the Rio Grande Rift. It is in western and central Colorado, southeastern Wyoming, and northern New Mexico. The headwaters of major rivers such as the Colorado, Yampa, Arkansas, Rio Grande, North Platte and South Plate rivers are located here. This MLRA has numerous national forests, including the Medicine Bow National Forest in Wyoming; the Routt, Arapaho, Roosevelt, Pike, San Isabel, White River, Gunnison, Grand Mesa, Uncompahgre, Rio Grande, and San Juan National Forests in Colorado; the Carson National Forest and part of the Santa Fe National Forest in New Mexico. Rocky Mountain National Park also is in this MLRA.

MLRA 48A is the southern Rocky Mountains physiographic region. The Southern Rocky Mountains consist primarily of two belts of strongly sloping to precipitous mountain ranges trending north to south. Several basins, or parks, are between the belts. Some high mesas and plateaus are included. It is characterized by mountain ranges that were uplifted during the Laramide Orogeny and then had periods of glaciation. The ranges include the Sangre de Cristo Mountains, the Laramie Mountains, and the Front Range in the east and the San Juan Mountains and the Sawatch and Park Ranges in the west. The ranges are dissected by many narrow stream valleys having steep gradients. In some areas the upper mountain slopes and broad crests are covered by snowfields and glaciers. Elevation typically ranges from 6,500 to 14,400 feet (1,980 to 4,390 meters) in this area. The part of this MLRA in central Colorado includes the highest point in the Rockies, Mount Elbert, which reaches an elevation of 14,433 feet (4,400 meters). More than 50 peaks in the part of the MLRA in Colorado are at an elevation of more than 14,000 feet (4,270 meters). Many small glacial lakes are in the high mountains.

The mountains in this area were formed mainly by crustal uplifts during the late Cretaceous and early Tertiary periods. This large MLRA can be subdivided into at least 4 large general divisions. First is the Rockies on the east side of this area are called the "Front Range," which is a fault block that has been tilted up on edge and uplifted and is largely igneous and metamorphic geology. It was tilted up on the east edge, so there is a steep front on the east and the west side is more gently sloping and in the south east there are rocks exposed in the mountains are mostly Precambrian igneous and metamorphic rocks. Second is the tertiary rocks, primarily basalt and andesitic lava flows, tuffs, breccias, and conglomerates, are throughout this area (San Juan Mountains Area). The third division is Northwest part of the MLRA is dominantly sedimentary rock from the cretaceous/tertiary and Permian/Pennsylvanian periods. The fourth subset is the long and narrow Sangre de Cristos mountains uplifted in the Cenozoic are between the Rio Grande rift and the great plains. Many of the highest mountain ranges were reshaped by glaciation during the Pleistocene. Alluvial fans at the base of the mountains are recharge zones for local basin and valley fill aquifers. They also are important sources of sand and gravel.

The average annual precipitation ranges predominantly from 12 to 63 inches. Summer rainfall commonly occurs as high-intensity, convective thunderstorms. About half of the annual precipitation occurs as snow in winter; this proportion increases with elevation. In the mountains, deep snowpacks accumulate throughout the winter and

generally persist into spring or early summer, depending on elevation. Some permanent snowfields and small glaciers are on the highest mountain peaks. In the valleys at the lower elevations, snowfall is lighter and snowpacks can be intermittent. The average annual temperature is 26 to 54 degrees F (-3 to 12 degrees C). The freeze-free period averages 135 days and ranges from 45 to 230 days, decreasing in length with elevation. The climate of this area is strongly dependent upon elevation; precipitation is greater, and temperatures are cooler at the higher elevations. The plant communities vary with elevation, aspect and change in latitudes due to changing in precipitation kind and timing and temperature.

The dominant soil orders in this MLRA are Mollisols, Alfisols, Inceptisols, and Entisols. The soils in the area dominantly have a frigid or cryic soil temperature regime and an ustic or udic soil moisture regime. Mineralogy is typically mixed, smectitic, or paramicaceous. In areas with granite, gneiss, and schist bedrock, Glossocryalfs (Seitz, Granile, and Leadville series) and Haplocryolls (Rogert series) formed in colluvium on mountain slopes. Dystrocryepts (Leighcan and Mummy series) formed on mountain slopes and summits at the higher elevations. In areas of andesite and rhyolite bedrock, Dystrocryepts (Endlich and Whitecross series) formed in colluvium on mountain slopes. In areas of sedimentary bedrock, Haplustolls (Towave series) formed on mountain slopes at low elevations and with low precipitation. Haplocryolls (Lamphier and Razorba series), Argicryolls (Cochetopa series), and Haplocryalfs (Needleton series) formed in colluvium on mountain slopes at high elevations.

Classification relationships

NRCS:

Major Land Resource Area 48A, Southern Rocky Mountains (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS:

M331F- Southern Parks and Rocky Mountain Range Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331G – South Central Highlands Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331H – North Central Highlands and Rocky Mountains Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M331I – North Parks and Ranges Section Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow

M341B – Tavaputs Plateau Section M341 Nevada-Utah Mountains Semi-Desert - Coniferous Forest - Alpine Meadow (Cleland, et al., 2007).

EPA:

21a – Alpine Zone, 21b – Crystalline Subalpine Forests, 21c – Crystalline Mid-Elevations Forests, 21d -Foothill Shrublands, 21e – Sedimentary Subalpine Forests, 21f – Sedimentary Mid-Elevation Forests, 21g – Volcanic Subalpine Forests, and 21h – Volcanic Mid-Elevation Forests < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains North American Deserts (Griffith, 2006).

20c – Semiarid Benchlands and Canyonlands and 20e - Escarpements < 20 Colorado Plateau < 10.1 Cold Deserts < 10 North American Deserts (Griffith, 2006).

USGS:

Southern Rocky Mountain Province and the southern part of Unita Basin Section Colorado Plateaus Province

Ecological site concept

This site occurs flood plains, drainageways, and valley floors. This site has natural sub-irrigation. Slopes is between 0 to 5%. Soils are deep to very deep (> 60+ inches). Soils are derived from alluvium from sandstone and shale or mixed sources. Soil surface texture is loam, with fine-loamy textured subsurface. It has a typic aquic or oxyaquic

ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.

Associated sites

R048AY285CO	Foothill Swale The site occurs in the watershed in areas that receive extra water and fine sediment from surrounding uplands. The soils are deep and loamy in texture with high water-holding capacity. Buried surface horizons and very little rock characterize the soil profile. The soil moisture regime is aridic ustic, and the soil temperature regime is frigid. The aspect of this site is a valley grassland plant community with a rather sparse stand of shrubs. Basin wildrye, western and thickspike wheatgrasses, Indian ricegrass, squirreltail, and Sandburg bluegrass are the dominant grasses. Shrubs include basin big sagebrush, and rubber rabbitbrush.
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Similar sites

R048AY008UT	Wet Fresh Meadow (Willow-Sedge) The soil is deep and affected by wetness. The water table fluctuates during the growing season, generally above 20 inches. Drainage characteristics range from imperfectly to poorly, with the imperfectly drained soils having a higher water table than is common for the site. Surface soils are generally dark colored and high in organic matter content. Textures of these soils range from moderately coarse to fine and are most commonly medium and moderately alkaline and from non-calcareous to strongly calcareous. These soils are forming in lowland areas on nearly level to gently sloping or undulating topography. Parent materials are derived from a wide range of parent rock and lacustrine sediments. Roots and water move readily through these soils above the water table. Water holding capacity is moderate to high and is supplemented by upward capillary movement from the shallow water table. Erosion is not a serious hazard on these soils.
R048AY241CO	Mountain Meadow This site occurs flood plains, stream terraces, drainageways, ephemeral streams, flood-plain step and depressions. This site has natural sub-irrigation. Slopes is between 0 to 12%. Soils are moderately deep to very deep (20 to 60+ inches). Soils are derived from alluvium from sandstone and shale, sedimentary rock, igneous, metamorphic and sedimentary rock, or shale. Soil surface texture is loam, silty clay loam, clay loam, clay, sandy clay loam or sandy loam with fine-loamy or fine textured subsurface. It has a typic aquic or oxyaquic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Carex nebrascensis</i>

Physiographic features

Gently, sloping valley floors, flood plains, and drainageways occur on this site. Slopes are from 0 to 5% degree with direction not affecting the site. Elevation ranges from 5800 feet to 7200 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Valley floor (2) Flood plain (3) Drainageway
Runoff class	Low
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	5,800–7,200 ft
Slope	0–5%

Water table depth	12–72 in
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is about 12 to 16 inches. Of this, approximately 45-55% falls as snow, and 45-55% falls as rain between middle of May to and the end of September. Summer moisture is mostly from thundershowers in July thru October. November to February and June is the driest period of the year with the driest month being June. August to October and March to April is the wettest period and the wettest month is usually April. The average annual total snowfall is 64.8 inches. The snow depth usually ranges from 1 to 5 inches during October thru April. The highest winter snowfall record in this area is 131.9 inches which occurred in 1908-1909. The lowest snowfall record is 11.9 inches during the 1944-1945 winter. The frost-free period typically ranges from 90 to 130 days. The last spring frost is typically the middle of May to the second week of June. The first fall frost is usually the middle of September to the end of September. Mean daily annual air temperature ranges from about 30.7°F to 64.8°F, averaging about 25°F for the winter and 66°F in the summer. Summer high temperatures of mid-80°F to low 80°F are not unusual. The coldest winter temperature recorded was -36°F on February 8, 1933 and the warmest winter temperature recorded was 66°F on February 11, 1962. The coldest summer temperature recorded was 24°F on June 19, 1973 and the warmest was 100°F on August 2, 1902. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Collbran, Colorado Climate Station.

This zone in MLRA 48 will need to be broken up into at multiple land resources zones in future projects based on current knowledge of precipitation and temperature patterns.

West Central Zone Stations: Collbran, Basalt, and Cedaredge. This LRU zone is use in write up above. November to February and June is the driest period of the year with the driest month being June. August to October and March to April is the wettest period and the wettest month is usually April. Frigid

Northwest Zone Climate Stations: Meeker#2. Driest months usually are January and February. Wettest months usually are August and September. Frigid.

Southwest Zone Climate Stations (Precambrian sedimentary and igneous): There are no climate stations in this LRU zone.

Southwest Volcanics: Lake City, Creede, and Hermit 7 ESE. These high elevation and low precipitation areas are cryic with shorter growing season days of 20 to 70 days per year. Wettest months are August and July. Driest months are December thru February.

Northeast (Front Range Igneous and Metamorphic): Grant, Estes park, Hohnholz Ranch, Leadville and Leadville 2 SW. July and August are the wettest months. January is the driest month. The climate stations is this zone are cryic. The growing seasons is 50 to 90 days.

Southeast (Sangre de Cristo Mtns): Westcliffe. Red Wing 1 WSW and Sheep Mountain. The growing season is 90 to 140 days. Driest months are December to February and the wettest are July & August. Frigid.

Table 3. Representative climatic features

Frost-free period (characteristic range)	60-103 days
Freeze-free period (characteristic range)	101-135 days
Precipitation total (characteristic range)	12-16 in
Frost-free period (actual range)	46-112 days
Freeze-free period (actual range)	91-142 days
Precipitation total (actual range)	12-16 in
Frost-free period (average)	81 days

Freeze-free period (average)	118 days
Precipitation total (average)	14 in

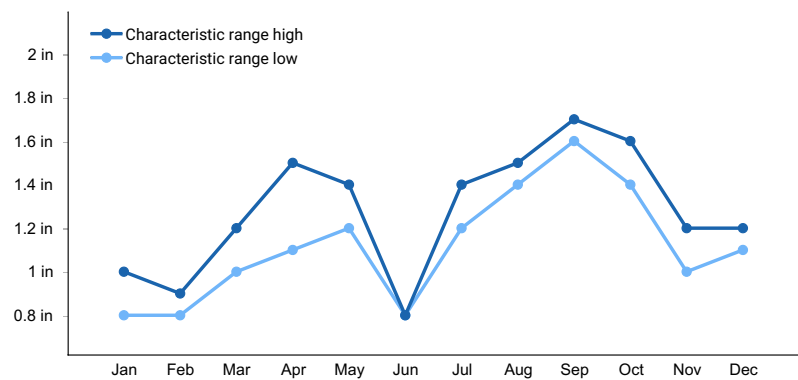


Figure 1. Monthly precipitation range

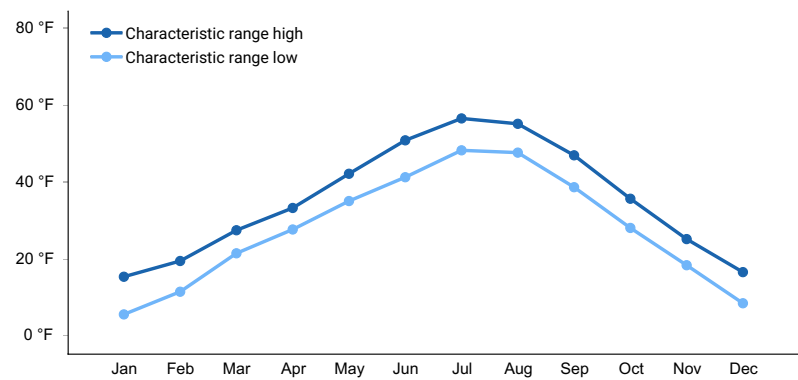


Figure 2. Monthly minimum temperature range

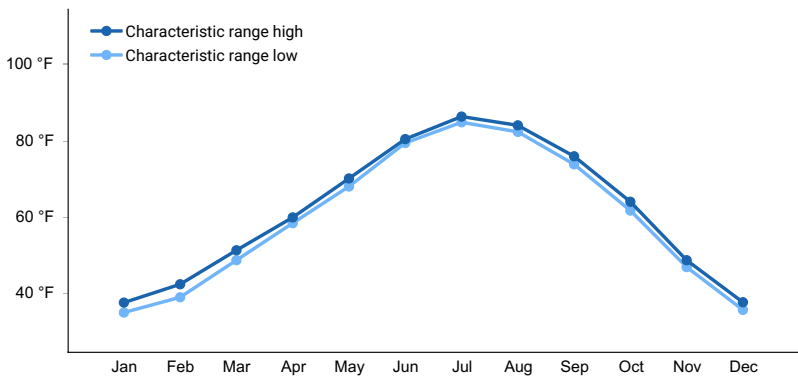


Figure 3. Monthly maximum temperature range

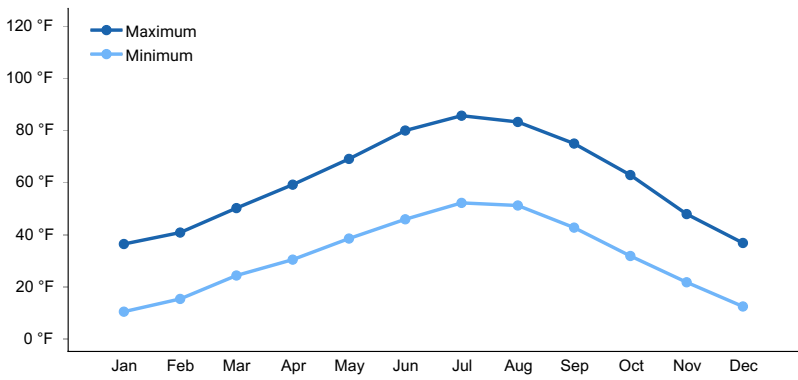


Figure 4. Monthly average minimum and maximum temperature

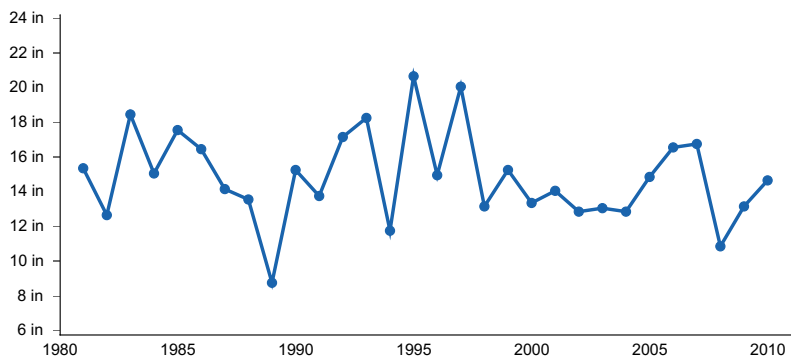


Figure 5. Annual precipitation pattern

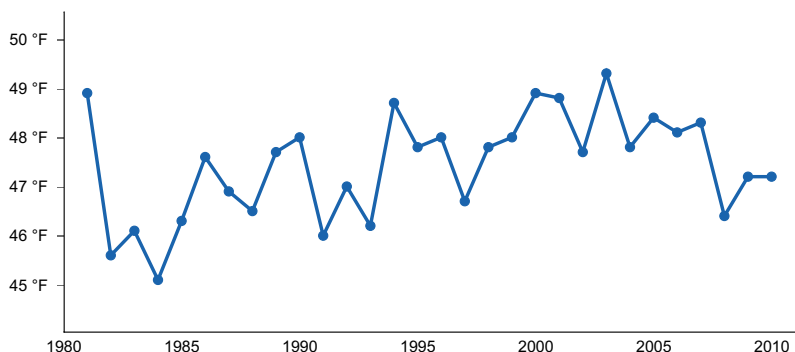


Figure 6. Annual average temperature pattern

Climate stations used

- (1) CIMARRON [USC00051609], Cimarron, CO
- (2) CEDAREDGE 3 E [USC00051443], Cedaredge, CO
- (3) COLLBRAN [USC00051741], Collbran, CO

Influencing water features

Annual precipitation is 12 to 16 inches, but the site is dependent on slight to moderate subirrigation and overflow from run-in water due to the site landscape position.

Soil features

The soils show signs of poor drainage. They are wet most of the year, but in late summer they may show signs of drought. They are very dark colored loam. They may have a peat layer. The lime zone is usually deep. The soils are relatively salt free. The variability of the duration and height of the water table causes considerable variation in plant growth over the site.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Alluvium—sandstone and shale
Surface texture	(1) Loam
Family particle size	(1) Fine-loamy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Moderately slow to moderate
Soil depth	60–100 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%

Available water capacity (Depth not specified)	5.5–7 in
Calcium carbonate equivalent (Depth not specified)	0–15%
Electrical conductivity (Depth not specified)	2–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–5%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include tree harvest, grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, and kinds and times of timber harvest, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram.

The plant communities shown in this State and Transition Model may not represent every possibility but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

The state and transition model was added to fill the provisional ecological site instruction. It is a very general model. More field work and research is needed to make this model specific for each LRU (Land Resource Unit)

State and transition model

R048AY243CO Swale Meadow

State 1: Reference State

1.1 Grass Meadow

Western Wheatgrass, Nebraska sedge, basin wildrye, other grasses other sedges and rushes.

1.2 Grass with Mixed Shrubs

Rushes, and bluegrasses have increased. Nebraska sedge, slender wheatgrass, and tufted hairgrass have decreased. Other grasses other sedges and rushes are present.

1.1A

1.2A

T1A

State 2: Current Potential State

2.1 Grass Meadow

Western wheatgrass, Nebraska sedge, basin wildrye, other grasses other sedges and rushes. Present of introduced grasses (Kentucky blugrass, timothy, redtop) and forbs.

2.1A

2.2 Grasses with Mixed Shrubs

Rushes, Kentucky bluegrass, timothy and redtop are dominant. introduced grasses and forbs may be present.

2.2A

T2A

State 3: Altered State

3.1 Grass Dominated

Seeded grass species, other grasses, shrubs and forbs. Present of introduced grasses and forbs.

3.2A

3.1A

3.2 Grasses with Shrubs

Seeded grass species, shrubs and forbs. Present of introduced grasses and forbs.

Legend

1.1A, 2.1A, 3.1A – lack of fire, improper grazing, prolonged drought, time without disturbance

1.2A, 2.2A, 3.2A – disturbance, fire, insect herbivory of shrubs, proper grazing, wetter climate cycles

T1A – Establishment of non-native invasive plants

T2A – Vegetation and/or mechanical treatments of the landscape

State 1

Reference State

Community 1.1

Reference Plant Community

This is generally a salt free wet to moist meadow occurring in the foothill/upland zone. At the lower elevations, it intergrades into a salt meadow range site. Western wheatgrass dominates over slender wheatgrass, tufted hairgrass, sedges and rushes. Basin wildrye becomes significant on the drier edges of the site. Shrubs are nearly absent, but with deterioration big sagebrush and rubber rabbitbrush invade drier portions of the site. Forbs are rather minor and include yarrow, herbaceous sage (white sagebrush), Solomon-plume, herbaceous cinquefoil, water hemlock, milkweed, shootingstar, aster, gillia, and paintbrush. Small swamp areas include cattail, bulrush, reed and horsetail. The site is treeless. Optimum ground cover is 60%. Invaders on this site are rubber rabbitbrush, big sagebrush, and introduced species. This site supports a plant community of approximately 80-90% grass/grasslike and 10-20% forbs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1275	1700	2075
Forb	225	300	425
Total	1500	2000	2500

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				1500–1900	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	700–1000	–
	Nebraska sedge	CANE2	<i>Carex nebrascensis</i>	100–300	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	100–300	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	50–160	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	50–150	–
	Columbia needlegrass	ACNE9	<i>Achnatherum nelsonii</i>	50–150	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	50–150	–
	rush	JUNCU	<i>Juncus</i>	50–150	–
	Grass-like, perennial	2GLP	<i>Grass-like, perennial</i>	50–100	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	50–100	–
Forb					
2				200–400	
	feathery false lily of the valley	MARAA	<i>Maianthemum racemosum</i> ssp. <i>amplexicaule</i>	25–100	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	25–100	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	25–100	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	25–100	–
	milkweed	ASCLE	<i>Asclepias</i>	25–100	–
	castilla	CASTI	<i>Castilla</i>	25–100	–
	spotted water hemlock	CIMA2	<i>Cicuta maculata</i>	25–100	–
	Rocky Mountain beeplant	CLSE	<i>Cleome serrulata</i>	25–100	–
	darkthroat shootingstar	DOPU	<i>Dodecatheon pulchellum</i>	25–100	–
	scarlet gilia	IPAG	<i>Ipomopsis aggregata</i>	25–100	–
	aster	ASTER	<i>Aster</i>	25–100	–

Animal community

WILDLIFE INTERPRETATIONS:

This site offers a high value rating for bison, elk, and upland game birds. It offers a medium value rating for antelope, deer, cottontail, jackrabbit, and waterfowl.

GRAZING INTERPRETATIONS:

This site offers a high value for cattle, sheep, and horses.

Hydrological functions

This site offers a high value for watershed.

Recreational uses

Medium value.

Wood products

None.

Inventory data references

Field offices in Colorado where the site occurs: Craig, Meeker

Type locality

Location 1: Moffat County, CO	
General legal description	North of highway 40, SW1/4 section 33, T7N, R92W.
Location 2: Moffat County, CO	
General legal description	Nine miles west of Craig in Wet Draw

Other references

Chapman, S.S., G.E. Griffith, J.M. Omernik, A.B. Price, J. Freeouf, and D.L. Schrupp. 2006. Ecoregions of Colorado. (2-sided color poster with map, descriptive text, summary tables, and photographs). U.S. Geological Survey, Reston, VA. Scale 1:1,200,000.

Cleland, D.T.; Freeouf, J.A.; Keys, J.E.; Nowacki, G.J.; Carpenter, C.A.; and McNab, W.H. 2007. Ecological Subregions: Sections and Subsections for the conterminous United States. Gen. Tech. Report WO-76D [Map on CD-ROM] (A.M. Sloan, cartographer). Washington, DC: U.S. Department of Agriculture, Forest Service, presentation scale 1:3,500,000; colored.

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Approval

Kirt Walstad, 3/05/2024

Acknowledgments

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--Site Development and Testing Plan--:

Future work to validate and further refine the information in this Provisional Ecological Site Description is necessary. This will include field activities to collect low-, medium-, and high-intensity sampling, soil correlations, and analysis of that data.

Additional information and data is required to refine the Plant Production and Annual Production tables for this ecological site. The extent of MLRA 48A must be further investigated.

Field testing of the information contained in this Provisional ESD is required. As this ESD is moved to the Approved ESD level, reviews from the technical team, quality control, quality assurance, and peers will be conducted.

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)	C. Holcomb, F. Cummings, S. Jaouen
Contact for lead author	
Date	01/20/2005
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):** Expect < 5% bare ground on wetter areas and 10-15% bare ground on drier edges/areas. Extended drought can cause bare ground to increase.

5. **Number of gullies and erosion associated with gullies:** None to rare. Due to off-site influence. If present, edges rounded and vegetated.

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

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 anticipated to be 5-6 at soil surface.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soils are typically deep and poorly drained. Surface texture ranges from fine sandy loams to clay loams with a weak fine granular structure. The A-horizon can be up to 20 inches or more deep. Color varies from light brownish gray to light gray. Obvious mottled.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, sedge/rush, and forb functional/structural groups and diverse root structure/patterns reduces raindrop impact slows overland flow providing increased time for infiltration to occur.
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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: cool season rhizomatous grass >
- Sub-dominant: cool season bunchgrass > sedges/rushes > forbs
- Other:
- Additional:
-
13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal. Decadence and mortality may occur due to drought and lack of disturbance,
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14. **Average percent litter cover (%) and depth (in):** 40-60% litter cover and ranges from 0.50 to 1.0 inches in depth. Litter cover declines during and follo
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1500 lbs./ac. low precip years; 2000 lbs./ac. average precip years; 2500 lbs./ac. above average precip years. After extended drought, production may be reduced by 350 – 800 lbs./ac. or more.
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if**

their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Kentucky bluegrass, Canada thistle and other noxious weeds. Big sagebrush and rabbitbrush can invade edges of swale due to water table fluctuations.

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