USDA Natural Resources Conservation Service

Ecological site R048BY232CO
Dry Shallow Loam

Last updated: 9/07/2023
Accessed: 05/12/2025

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): 048B–Southern Rocky Mountain Parks and Valleys

This area is in Colorado (96 percent) and Wyoming (4 percent). It makes up about 2,325 square miles (6,020 square kilometers). The town of Walden, in the northern part of this MLRA, is in a wide valley locally known as North Park. The town of Kremmling is in a valley locally known as Middle Park. The town of Hartsel, in the center of the southern part of the MLRA, is in a broad intermontane basin locally known as South Park. The northern part is bordered by the Medicine Bow, Routt, and Arapaho National Forests, and the southern part is bordered by the San Isabel and Pike National Forests. The Arapaho National Wildlife Refuge is directly south of the town of Walden.

This area is within the Southern Rocky Mountains Province of the Rocky Mountain System. It consists of nearly level to rolling mountain parks and valleys and a few narrow mountain ridges. It occurs as two separate parts in the center of the Southern Rockies. The southern half of the northern part is on the west side of the Continental Divide, and the rest of the MLRA is on the east side of the divide. Elevation ranges from 7,850 to 10,850 feet (2,395 to 3,310 meters). The head waters of North Platte River leaves Colorado and enters Wyoming in the northern half of the northern part of the MLRA (North Park). The headwaters of Colorado River is in the southern half of the northern part of the MLRA (Middle Park). The headwaters of South Platte River is in the southern part of the MLRA (South Park).

The mountain valleys and parks that are characteristic of this MLRA are surrounded by high mountain peaks of the adjacent Southern Rocky Mountains MLRA (48A). Steep slopes give rise to steep-gradient streams that can move cobbles and gravel from the mountain slopes down into the valleys. The coarse textured sediments on the surface of this area were deposited by either glacial meltwater or present-day rivers. Buried deep beneath the sediments is a complex of sedimentary and igneous rocks. Residuum from sedimentary rocks is on the steeper slopes that were not covered by alluvium and glacial outwash.

The average annual precipitation is mainly 10 to 16 inches (255 to 405 millimeters), but it is as high as 28 inches (710 millimeters) at the higher elevations that border the Southern Rocky Mountains MLRA. Precipitation generally increases with elevation. Rainfall occurs as high-intensity, convective thunderstorms during the growing season. About half of the annual precipitation falls as snow. Soil moisture is unevenly distributed within short distances because of snowdrifts. The amount of precipitation is highly influenced by rain shadows. The surrounding peaks receive most of the precipitation as storm systems traverse the area. The average annual temperature is 35 to 42 degrees F (1 to 6 degrees C). The freeze-free period averages 95 days and ranges from 70 to 120 days, decreasing in length with elevation.

The dominant soil order in this MLRA is Mollisols. Alfisols are of lesser extent. The soils are very shallow to deep, generally well drained, and loamy or clayey and have mixed or smectitic mineralogy. The soil temperature regime is dominantly cryic, but it is frigid in some small areas, primarily on south- or west-facing slopes. The soil moisture regime is mainly ustic, but a marginal aridic regime has been identified in areas where the average annual precipitation is less than about 12 inches (305 millimeters). The most extensive great group is Argicryolls (Hodden, Lucky, Parlin, Tiagos, and Cabin series), which commonly formed in outwash and slope alluvium on outwash

terraces, fan remnants, hills, and mountain slopes. Haplocryolls (Redcloud and Tealson series) formed in outwash and slope alluvium on outwash terraces, valley side slopes, hills, and ridges. Haplocryalfs (Gebson and Harsha series) formed in slope alluvium and outwash on outwash terraces, fan remnants, hills, ridges, and mountain slopes. Cryaquolls (Dobrow and Randman series) formed in alluvium on stream terraces and flood plains.

Classification relationships

NRCS:
Major Land Resource Area 48B, Southern Rocky Mountain Parks (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

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

EPA:
21i – Sagebrush Parks and 21j – Grassland Parks < 21 Southern Rockies < 6.2 Western Cordillera < 6 Northwestern Forested Mountains North American Deserts (Griffith, 2006).

USGS: Southern Rocky Mountain Province

Ecological site concept

R048BY232CO Dry Shallow Loam occurs on hills, pediments, ridges and knobs. Slopes are between one to 30 percent. Soils are shallow (7 to 20 inches). Soils are derived from slope alluvium from volcanic breccia, limestone, sandstone, shale, gneiss, granodiorite, and schist; colluvium from limestone; or residuum from limestone and sandstone. Soil surface texture is usually loam, channery loam, very gravelly loam, sandy loam or gravelly sandy loam with loamy or loamy-skeletal textured subsurface. It is a Arizona fescue – Indian ricegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 10 to 16 inches.

Associated sites

R048BY225CO	**Mountain Loam 10-16 PZ South Park** R048BY225CO Mountain Loam 10-16” South Park occurs fan remnants, pediments and hills. Slopes is between 1 to 25%. Soils are deep to very deep (40 to 80 inches). Soils are derived from alluvium; slope alluvium from volcanic breccia, limestone, sandstone, and/or shale; and outwash from sedimentary rock or granite and gneiss. Soil surface texture is usually loam, sandy loam, gravelly loam or very gravelly sandy loam with either a fine-loamy or loamy-skeletal textured subsurface. It is an Arizona fescue – western wheatgrass community.
R048BY227CO	**Dry Loamy Slopes** R048BY227CO Dry Loamy Slopes occurs on fan remnants, pediments, fills, outwash terrace and fan terraces. Slopes is between 3 to 40%. Soils are deep to very deep (40 to 80 inches). Soils are derived from alluvium; slope alluvium from tuff, limestone, sandstone and/or shale; colluvium from tuff; residuum from tuff; or outwash from granite and gneiss or sedimentary rock. Soil surface texture is usually gravelly loam, very cobbly loam or very cobbly sandy loam or sandy loam with fine-loamy or loamy-skeletal textured subsurface. It is a mountain muhly – Arizona fescue community.
R048BY280CO	**Dry Mountain Swale** R048BY280CO Dry Mountain Swale occurs on alluvial flat, stream terraces, drainageways, flood plains and flood-plain steps. Slopes is between 0 to 5%. Soils are very deep (60+ inches). Soils are derived from alluvium. Soil surface texture is usually loam, sandy loam or clay loam with fine-loamy, fine-silty or fine textured subsurface. This site receives extra moisture from surrounding uplands that drain into the area. It is a western wheatgrass – slender wheatgrass community.

Similar sites

R048BY235CO	**Dry Exposure** R048BY235CO Dry Exposure occurs on ridges, mountainsides, breaks, fans and terraces. Slopes is between 10 to 50%. Soils are shallow to moderately deep (5 to 40 inches). Soils are derived from alluvium from sedimentary rock. Soil surface texture is usually cobbly loam or gravelly coarse sandy loam with loamy textured subsurface. It is a needle and thread – prairie Junegrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.
R048AY230CO	**Shallow Loam** R048AY230CO – Shallow Loam occurs on mountain, hills, ridges, mountain sides and mountain slopes. Soils are very shallow to shallow (less than 20 inches) loamy-skeletal soils derived from slope alluvium from trachyte, volcanic breccia, gneiss, granite and/or sandstone; residuum from weathered volcanic breccia, tuff, igneous rock, sandstone or sandstone and shale. Soils surface textures are gravelly to very gravelly loam, gravelly to very gravelly sandy loam, cobbly loam, or very cobbly sandy loam. It is an Arizona fescue-mountain muhly community with scattered mountain mahogany, snowberry and current. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.
R048AY229CO	**Rocky Loam** R048AY229CO – Rocky Loam occurs on ridges, mountainside, mountain slopes and mountains. Soils are very shallow to shallow (less than 20 inches) loamy-skeletal soils derived from residuum from granite, gneiss, phyllite, schist, sandstone and/or limestone. Soil surface texture are generally coarse sandy loams to light clay loams. It is a mountain big sagebrush – western wheatgrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.
R048AY307CO	**Shallow Slopes** R048AY307CO – Shallow Slopes occurs on hillsides, ridges, mountainside and canyon walls. Soils are shallow (less than 20 inches) loamy textured soils derived from residuum from sandstone and limestone. Soil surface textures are generally sandy loam or gravelly sandy loam. It is a black sagebrush –western wheatgrass community.
R048AY240CO	**Shallow Pine** R048AY240CO Shallow Pine occurs on mountains and mountainsides. Slopes are 5 to 50%. Soils are shallow (10 to 20 inches). Soils are derived from slope alluvium from volcanic breccia, gneiss, granite, or sandstone; or residuum from granite, granodiorite or gneiss. Soil surface texture is a gravelly to very gravelly sandy loam or very gravelly loam with loamy-skeletal subsurface. It is a ponderosa pine - Arizona fescue – mountain muhly community. It has a typic 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) *Festuca arizonica* (2) *Achnatherum hymenoides*

Physiographic features

This site is on weathered ridges, knobs and hills with shallow soils over sandstone or volcanic tuff. These low lying ridges can be oriented in any direction. Slopes range from one to 30 percent. Elevation ranges from 8600 to 9600 feet.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Pediment (3) Ridge (4) Knob
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None

Elevation	2,621–2,926 m
Slope	1–30%
Aspect	Aspect is not a significant factor

Climatic features

The climate is semi-arid with precipitation averaging 10 to 16 inches. Total yearly snowfall is 47 to 111 inches. The average monthly precipitation is as follows:

The mean growing season averages approximately 55 to 85 days from June to September; however can be as short as 20 days or extend out to 96 days. In average years, there is sufficient snow melt moisture at the beginning of the growing season to initiate growth in such cool-season grasses as western wheatgrass, mountain muhly, Arizona fescue, needleandthread, bottlebrush squirreltail, and Indian ricegrass. Optimum growth occurs season long as adequate moisture is available, however, moisture is quickly depleted from shallow areas and plant growth ceases. About 50 percent of the annual precipitation falls in the form of rain during the frost free season.

The average annual temperature is 38 to 44 degrees F. Temperatures fall below the freezing mark much of the time in September through May. Frosts can occur from September 1 through June 15.

Wind patterns during the winter redistribute snow resulting in very arid, dry ridge tops and areas of snow accumulation. Steeper south facing slopes have high enough evaporation to reduce effective moisture too low for Arizona fescue to thrive. Vegetation variation due to aspect and moisture patterns should not be confused with ecological retrogression.

The figures below are average monthly precipitation.

Table 3. Representative climatic features

Frost-free period (characteristic range)	28-62 days
Freeze-free period (characteristic range)	67-90 days
Precipitation total (characteristic range)	305-356 mm
Frost-free period (actual range)	20-70 days
Freeze-free period (actual range)	61-96 days
Precipitation total (actual range)	254-406 mm
Frost-free period (average)	45 days
Freeze-free period (average)	79 days
Precipitation total (average)	330 mm

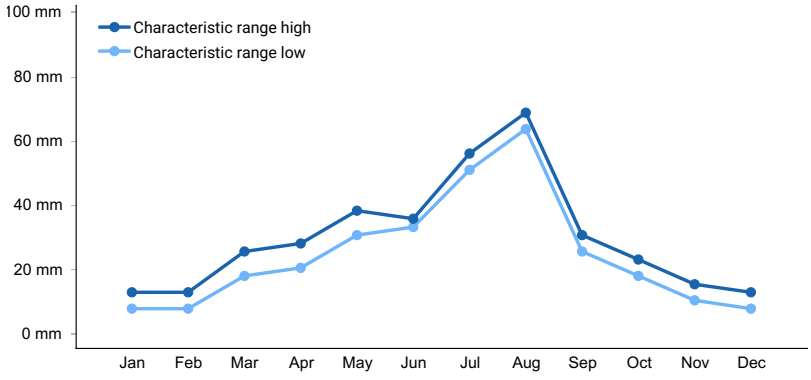


Figure 1. Monthly precipitation range

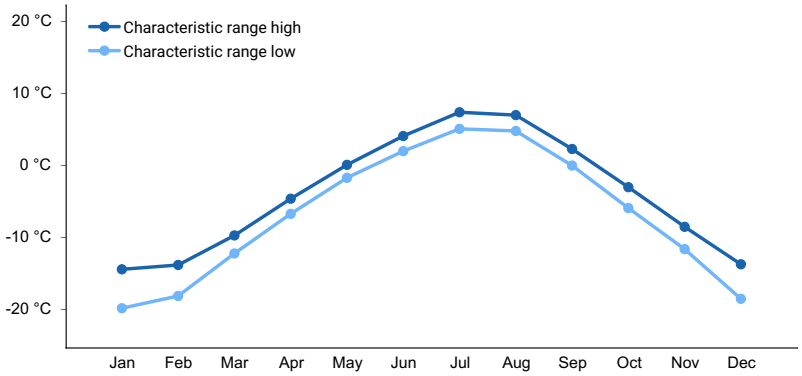


Figure 2. Monthly minimum temperature range

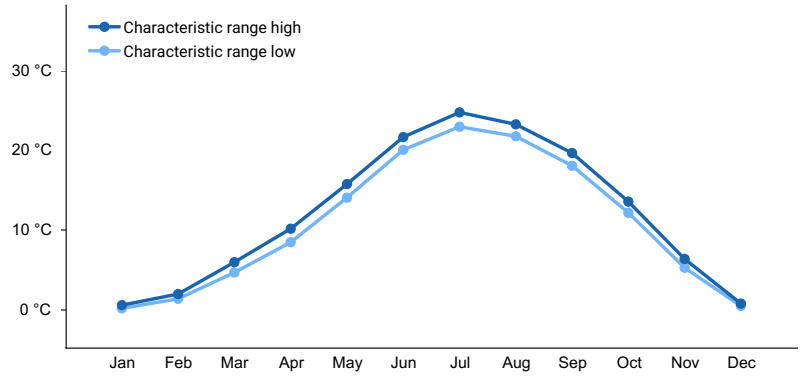


Figure 3. Monthly maximum temperature range

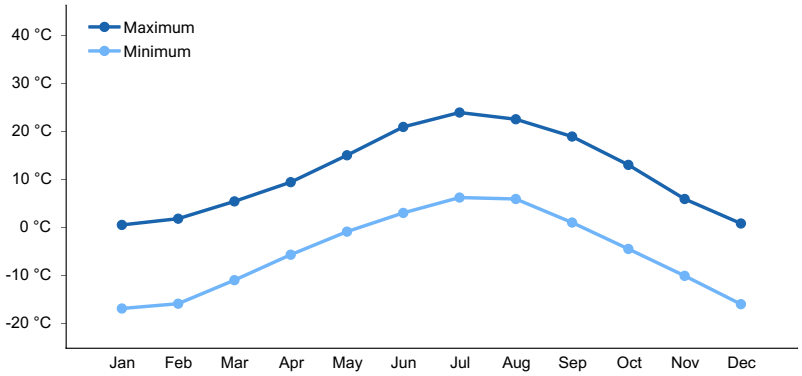


Figure 4. Monthly average minimum and maximum temperature

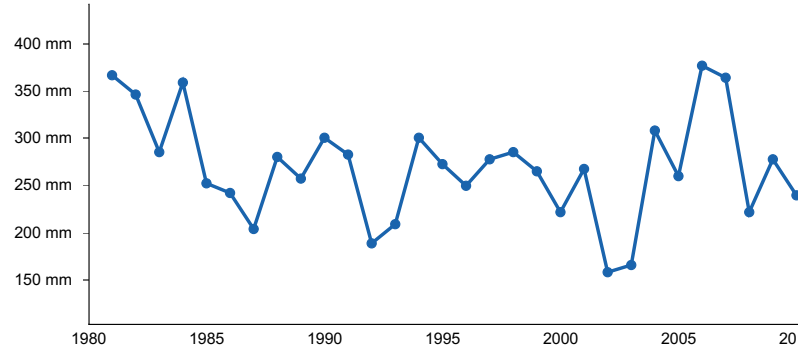


Figure 5. Annual precipitation pattern

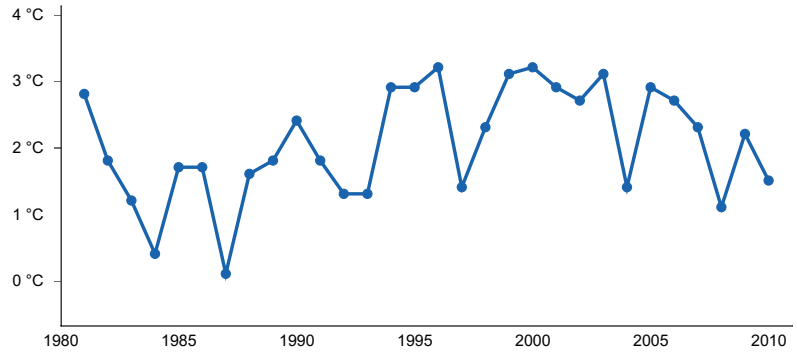


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ANTERO RSVR [USC00050263], Fairplay, CO
- (2) LAKE GEORGE 8 SW [USC00054742], Lake George, CO
- (3) FAIRPLAY S PARK RD [USC00052816], Fairplay, CO

Influencing water features

None

Wetland description

N/A

Soil features

Soils in this site consist of sandy loam surface soils with a moderate intake rate. Subsoil textures are loam, sandy clay loam or gravelly clay loam. Total water holding capacity is limited due to shallow depth to sandstone bedrock or volcanic tuff. Due to the shallow nature, these soils are subject to moderate to high runoff. If the vegetative cover is depleted severe erosion can occur.

Major soils associated with this site

Loamy Soils: Chittum-dry, Chubbs, Newett, and Vorsid

Loamy-Skeletal Soils: Rentsac variant, and Betemer

Table 4. Representative soil features

Parent material	(1) Slope alluvium–volcanic breccia (2) Slope alluvium–limestone, sandstone, and shale (3) Slope alluvium–gneiss (4) Slope alluvium–granodiorite (5) Slope alluvium–schist (6) Colluvium–limestone (7) Residuum–limestone and sandstone (8) Slope alluvium–sandstone
Surface texture	(1) Very gravelly, channery loam (2) Gravelly sandy loam (3) Loam (4) Sandy loam
Family particle size	(1) Loamy (2) Loamy-skeletal
Drainage class	Well drained

Permeability class	Moderately slow to moderately rapid
Soil depth	18–51 cm
Surface fragment cover <=3"	10–40%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	1.27–5.08 cm
Soil reaction (1:1 water) (Depth not specified)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

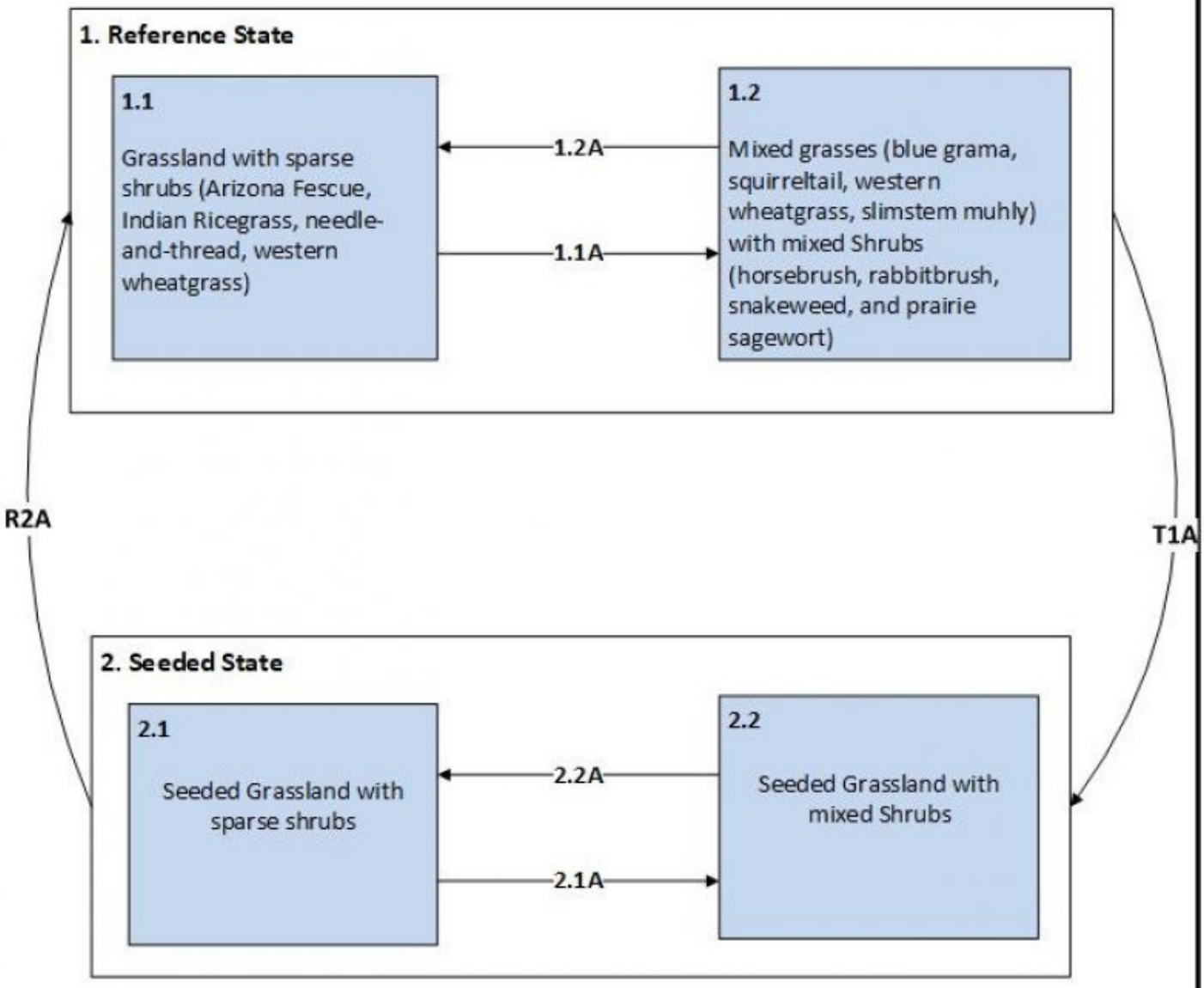
The plant community is about 60 to 75 percent grass, 10 to 20 percent forbs, and 5 to 15 percent shrubs air-dry weight.

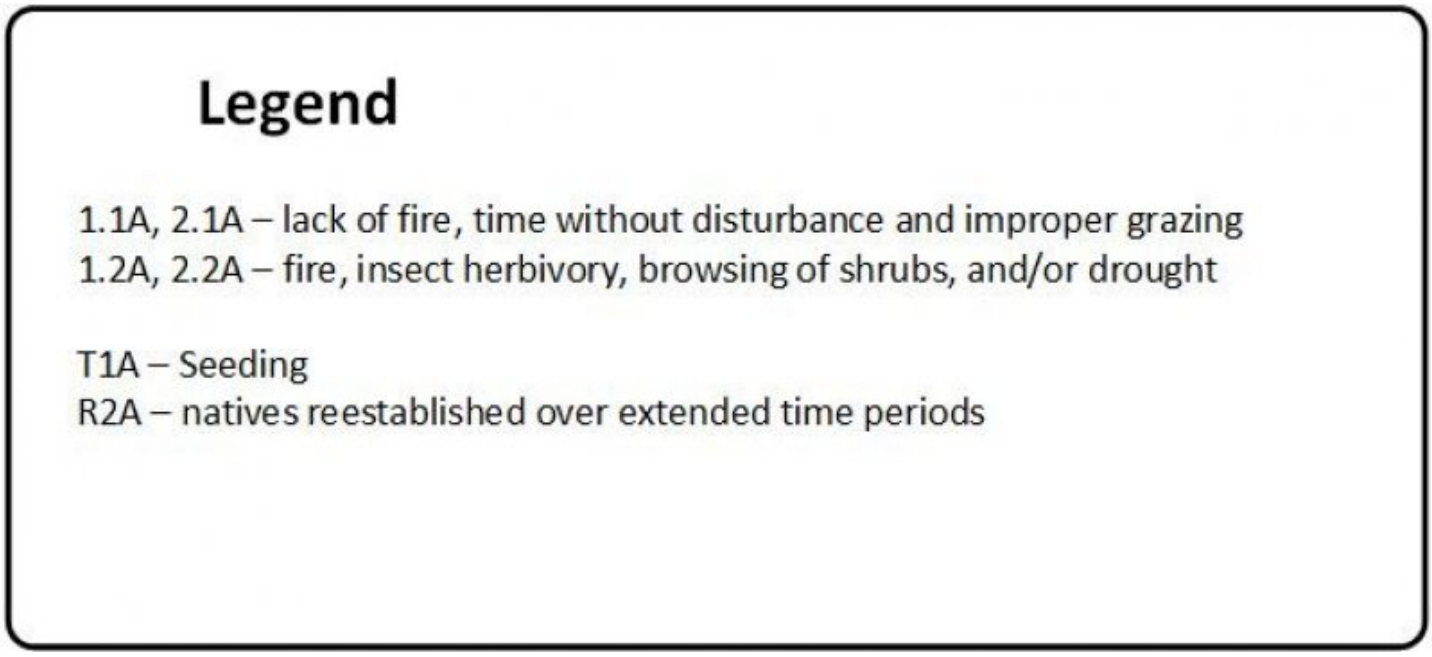
The production is predominantly made up of Arizona fescue, mountain muhly, Indian ricegrass, western wheatgrass, blue grama, and needle and thread grass. Dominance, however, varies with aspect. North facing slopes are dominated by Arizona fescue while south facing slopes are dominated by mountain muhly, blue grama, Indian ricegrass, and needle and thread. Depressional areas included within the site are dominated by western wheatgrass. Windswept, droughty ridge tops are dominated by poor vigor blue grama and slimstem muhly and low growing mat or cushion type forbs such as Nuttall kentrophyta milkvetch, matted nailwort, and germander penstemon. Other forbs that make up the plant community include Parry geranium, sidebells penstemon, Pacific aster, and hairy goldaster.

Shrubs that occur on this site are spineless (gray) horsebrush, fringed sagewort, small (yellow) rabbitbrush, small soapweed, and shrubby cinquefoil. Spineless (gray) horsebrush is dominant over the majority of the site. Fringed sagewort dominates in the depressional areas which have received recent deposition from erosion. Shrubby cinquefoil occurs at the lower edges of exposed bedrock where it receives additional moisture from runoff.

State and transition model

Dry Shallow Loam
R048BY232CO





State 1
Reference State

If ecological retrogression is cattle-induced, Indian ricegrass, mountain muhly, and Arizona fescue decline relatively fast. Blue grama, needle and thread, bottlebrush squirreltail, and western wheatgrass initially increase, but with continued retrogression they also decline. With advanced retrogression, slimstem muhly and poor vigor blue grama become the dominant grasses. Forbs such as sidebells penstemon will decrease with heavy over grazing. Other forbs, such as hairy goldaster, germander penstemon, matted nailwort, and Nuttall Kentrophyta milkvetch will increase. Shrubs such as spineless (gray) horsebrush, small (yellow) rabbitbrush, broom snakeweed, pingue hymenoxys, fringed sage, and small soapweed tend to increase into the available niches left by disappearing grass plants. Basal area (the area of ground surface covered by the perennial vegetation measured one inch above the soil) is approximately 15 percent. Annual production If the range is in excellent condition, the approximate total annual production (air-dry) is: Favorable years 600 pounds/acre Normal years 450 pounds/acre Unfavorable years 300 pounds/acre Of this production 15 to 20 percent will likely be unpalatable or out of reach of grazing animals.

Community 1.1
Reference State

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	219	342	465
Forb	73	101	129
Shrub/Vine	45	62	78
Total	**337**	**505**	**672**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses**			303–381	
	Arizona fescue	FEAR2	*Festuca arizonica*	28–101	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	28–78	–
	needle and thread	HECO26	*Hesperostipa comata*	28–50	–
	blue grama	BOGR2	*Bouteloua gracilis*	28–50	–
	mountain muhly	MUMO	*Muhlenbergia montana*	28–50	–
	western wheatgrass	PASM	*Pascopyrum smithii*	28–50	–
	squirreltail	ELEL5	*Elymus elymoides*	11–22	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	11–22	–
	slimstem muhly	MUFI	*Muhlenbergia filiculmis*	6–11	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–11	–
	mat muhly	MURI	*Muhlenbergia richardsonis*	0–6	–
	Fendler threeawn	ARPUL	*Aristida purpurea var. longiseta*	0–6	–
Forb					
2	**Forbs**			78–129	
	sidebells penstemon	PESE11	*Penstemon secundiflorus*	6–17	–
	germander beardtongue	PETE9	*Penstemon teucrioides*	6–11	–
	spiny milkvetch	ASKEK	*Astragalus kentrophyta var. kentrophyta*	6–11	–
	Parry's geranium	GECAP2	*Geranium caespitosum var. parryi*	6–11	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	6–11	–
	pingue rubberweed	HYRI	*Hymenoxys richardsonii*	6–11	–
	spreading nailwort	PADE4	*Paronychia depressa*	6–11	–
	Pacific aster	SYCH4	*Symphyotrichum chilense*	0–6	–
Shrub/Vine					
3	**Shrubs**			50–78	
	prairie sagewort	ARFR4	*Artemisia frigida*	11–28	–
	yellow rabbitbrush	CHVIS5	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. stenophyllus*	11–28	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	11–28	–
	shrubby cinquefoil	DAFRF	*Dasiphora fruticosa ssp. floribunda*	6–17	–
	soapweed yucca	YUGL	*Yucca glauca*	6–11	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	–
	mountain ball cactus	PESI	*Pediocactus simpsonii*	0–6	–

Animal community

MAJOR INTERPRETATIONS FOR LIVESTOCK GRAZING:
This site is fragile and extreme care should be exercised to avoid overgrazing. Most of this site has already been

severely damaged from continuous selective grazing.

A system of deferred grazing, which varies the season of grazing use in pastures during successive years, is needed to maintain a healthy well-balanced plant community. Additionally, cattle should be allowed to move frequently enough to prevent extended periods of grazing during growing season. Rotation back to a previously grazed site should be deferred for a long enough period to allow grazed plants to recover. Early spring deferment would benefit western wheatgrass, Indian ricegrass and needleandthread most. Summer deferment would benefit all grasses, but especially blue grama.

MAJOR INTERPRETATIONS FOR WILDLIFE:
This range site provides habitats which support a resident animal community that is characterized by a few small mammals and birds and occasional antelope. There is seasonal use by elk for winter forage.

Habitat values for small mammals do not significantly change as ecological conditions changes. With retrogression induced by cattle grazing, value for elk will decline. The increase of forbs and shrubs would increase habitat value for wildlife initially. Retrogression to poor condition will result in erosion on steeper slopes, and habitat values will decline severely for all species.

Hydrological functions

Soils in this site are grouped into the “D” hydrologic group, as outlined in the Soils of Colorado Loss Factors and Erodibility Hydrologic Groupings 1979 Handbook. Field investigations are needed to determine hydrologic cover conditions and hydrologic curve numbers. Refer to NRCS National Engineering Handbook, Section 4, and Peak Flows in Colorado Handbook for more information.

Recreational uses

RECREATION AND NATURAL BEAUTY:
Other than occasional antelope or elk hunting, very little recreational activity occurs. This site has little natural beauty that would attract people.

Wood products

No potential production on this range site.

Other information

MAJOR POISONOUD PLANTS TO LIVESTOCK 3/
Plant Livestock Type of Season
Common Name Affected Poisoning Serious
Gray horsebrush sheep cumulative early spring
Broom snakeweed cattle-sheep cumulative scarce feed
Pingue hymenoxys sheep cumulative spring, summer

3/ For additional information regarding poisoning by specific plants, see Range Technical Note.

ENDANGERED PLANTS AND ANIMALS:
No endangered or threatened species have been identified. Species names to be included as reliable information becomes available.

Inventory data references

This site occurs in Park, Fremont and Teller counties.

Type locality

Location 1: Fremont County, CO

General legal description	Low lying ridges adjacent to upper portions of Badger Creek in Fremont County.

Other references

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Contributors

Suzanne Mayne-Kinney

Approval

Kirt Walstad, 9/07/2023

Acknowledgments

Project Staff:
Suzanne Mayne-Kinney, Ecological Site Specialist, NRCS MLRA, Grand Junction SSO
Chris Fabian, MLRA Soil Survey Leader, NRCS MLRA Fort Collins SSO

Program Support:
Rachel Murph, NRCS CO State Rangeland Management Specialist, Denver
Scott Woodhall, NRCS MLRA Ecological Site Specialist-QA Phoenix, AZ
Eva Muller, Regional Director, Rocky Mountain Regional Soil Survey Office, Bozeman, MT
B.J. Shoup, CO State Soil Scientist, Denver
Eugene Backhaus, CO State Resource Conservationist, Denver

Those involved in developing earlier versions of this site description include: Bob Rayer, retired NRCS Soil Scientist; Herman Garcia, retired CO State RMS and NRCS MLRA Ecological Site Specialist-QA Phoenix, AZ.

--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)	
Contact for lead author	
Date	05/12/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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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):**

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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:

    Sub-dominant:

    Other:

    Additional:

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

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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):**

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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:**

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17. **Perennial plant reproductive capability:**
