

Ecological site R048BY296CO Claypan

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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.

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

R048BY296CO Claypan occurs on hills, ridges, alluvial fans and terraces. Slopes is between 0 to 15%. Soils are moderately deep to deep (20 to 60 inches). Soils are derived from alluvium from sedimentary rock; colluvium from sandstone and shale; residuum from shale; or slope alluvium from sandstone and shale. Soil surface texture is usually loam or clay with fine textured subsurface. It is a little sagebrush – western wheatgrass – pine needlegrass community. It has an aridic ustic moisture regime. The effective precipitation ranges from 12 to 16 inches.

Associated sites

R048AY247CO	<p>Deep Clay Loam R048AY247CO Deep Clay Loam occurs on hills, hillsides, mountain-slope, complex landslides, alluvial fans, and structural benches. Slopes is between 0 to 35%. Soils are deep (60+ inches). Soils are derived from colluvium and slide deposits from igneous, metamorphic and sedimentary rocks, and/or alluvium, residuum or complex landslide deposits from shale. Soil surface texture is loam, clay loam or silty clay loam with fine-textured subsurface. 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.</p>
R048BY241CO	<p>Mountain Meadow R048BY241CO Mountain Meadow occurs on flood plains, stream terraces, drainageways and alluvial flats. Slopes is between 0 to 5%. Soils are moderately deep to very deep (25 to 100 inches). Soils are derived from alluvium from igneous and metamorphic rock. Soil surface texture is usually loam, fine sandy loam, silty clay loam or sandy clay loam with fine-loamy, fine-loamy over sandy-skeletal or coarse-loamy textured subsurface. It is a tufted hairgrass – Nebraska sedge community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>
R048BY237CO	<p>Stony Loam R048BY237CO Stony Loam occurs on mountain-slopes, ridges, fans and moraines. Slopes is between 20 to 70%. Soils are very deep (60+ inches). Soils are derived from till; colluvium from igneous and metamorphic rock; or residuum from igneous and metamorphic rock. Soil surface texture is usually stony loam, cobbly loam, extremely stony sandy loam, gravelly sandy loam, very gravelly sandy loam, or very cobbly sandy loam with loamy-skeletal textured subsurface. It is a bluebunch wheatgrass – needlegrass community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>
R048BY261CO	<p>Salt Flats R048BY261CO Salt Flats occurs on drainageways and stream terraces in Middle and North Park. Slopes is between 0 to 5%. Soils are very deep (60+ inches). Soils are derived from alluvium from sedimentary rock (Coalmont Formation). Soil surface texture is usually sandy loam with fine textured subsurface. Soils have a natric horizon and are strongly alkali and saline. It is a big sagebrush – greasewood – western wheatgrass – saltgrass community. The effective precipitation ranges from 9 to 12 inches.</p>

R048BY231CO	<p>Dry Mountain Loam R048BY231CO Dry Mountain Loam occurs on alluvial fans, valley sides, mountainsides, fans, terraces, and outwash plains. Slopes is between 0 to 30%. Soils are moderately deep to very deep (20 to 60 inches). Soils are derived from alluvium from sedimentary rock; colluvium from basalt or sandstone; or outwash. Soil surface texture is usually loam or with fine-loamy textured subsurface. It is a Wyoming big sagebrush – needlegrass – bluebunch wheatgrass community.</p>
R048AY292CO	<p>Deep Loam R048AY292CO Deep Loam occurs alluvial fans, terraces, hills, fan remnants, valley sides, and structural benches. Slopes is between 0 to 25%. Soils are deep (60+ inches) in depth. Soils are derived from alluvium from basalt, or sandstone and shale; colluvium from sandstone and shale; slope alluvium from sandstone and shale or eolian deposits from sandstone and shale. Soil surface texture is loam, sandy clay loam or very channery loam, with a fine-loamy subsurface. It is a mountain big sagebrush – needle and thread community.</p>
R048BY224CO	<p>Dry Salt Playa R048BY224CO Dry Salt Playa occurs drainageways, alluvial flats and playas. Slopes is between 0 to 5%. Soils are deep to very deep (40 to 80 inches). Soils are derived from alluvium. Soil surface texture is usually coarse sandy loam with fine textured subsurface. This soil has gypsum and salt accumulations. It is a seepweed – alkali cordgrass – saltgrass community.</p>

Similar sites

R048BY222CO	<p>Loamy Park R048BY222CO Loamy Park occurs on flood plains, flood-plain steps, hills, fans and stream terrace. Slopes is between 0 to 15%. Soils are very deep (60+ inches). Soils are derived from alluvium or colluvium. Soil surface texture is usually loam or sandy loam with fine-loamy textured subsurface. It is an Arizona fescue – mountain muhly community. It has a typic ustic moisture regime. The effective precipitation ranges from 16 to 20 inches.</p>
R048BY225CO	<p>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. It has an aridic ustic moisture regime. The effective precipitation ranges from 10 to 16 inches.</p>
R048AY247CO	<p>Deep Clay Loam R048AY247CO Deep Clay Loam occurs on hills, hillsides, mountain-slope, complex landslides, alluvial fans, and structural benches. Slopes is between 0 to 35%. Soils are deep (60+ inches). Soils are derived from colluvium and slide deposits from igneous, metamorphic and sedimentary rocks, and/or alluvium, residuum or complex landslide deposits from shale. Soil surface texture is loam, clay loam or silty clay loam with fine-textured subsurface. 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.</p>

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia arbuscula</i>
Herbaceous	(1) <i>Pascopyrum smithii</i> (2) <i>Achnatherum pinetorum</i>

Physiographic features

Topography of this site blends in with adjacent sites. Slopes range from level to 15 percent. The site may cover an extremely small area. Site delineations are usually very exact forming a definite line between this and another site. Elevation for the site ranges from 8000 feet to 9000 feet above sea level.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge (3) Alluvial fan (4) Terrace
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	2,438–2,743 m
Slope	0–15%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is about 12 to 16 inches. Of this, approximately 65 to 75 percent falls as snow, and 25 to 35 percent falls as rain between middle of June to and the end of September. Summer moisture is mostly from thundershowers in June thru September. November thru March is the driest period of the year with the driest month being February. July and August are the wettest months.

The average annual total snowfall is 77.1 inches. The snow depth usually ranges from one to 16 inches during September thru May. The highest winter snowfall record in this area is 174.8 inches which occurred in 1983-1984. The lowest snowfall record is 35 inches during the 1980-1981 winter.

The frost-free period typically ranges from 30 to 85 days. The last spring frost is typically the middle of June to the first of July. The first fall frost is usually the middle of August to the second week of September.

Mean daily annual air temperature ranges from about 21.8°F to 51.1°F, averaging about 16°F for the winter and 56°F in the summer. Summer high temperatures of low-70°F to mid-70°F are not unusual. The coldest winter temperature recorded was -46°F on January 10, 1962 and the warmest winter temperature recorded was 58°F on December 24, 1971. The coldest summer temperature recorded was 21°F on June 1, 1990 and the warmest was 89°F on July 1, 2002. Wide yearly and seasonal fluctuations are common for this climatic zone. Data taken from Western Regional Climate Center (2018) for Grand Lake 6 SSW, Colorado Climate Station.

This zone in MLRA 48B will need to be broken up into at least 2 land resources zones in future projects based on current knowledge of precipitation and temperature patterns based on North Park-Middle Park and South Park. Lake George 8 SW is in South Park. Green MT Dam, Spicer, and Rand are in North Park. Williams Fork Dam, Hot Sulphur Springs 2 SW and Grand Lake 6 SSW are in Middle Park. Middle Park is used in the write-up above.

North Park has growing season of 15 to 45 days; July and August are the wettest months; and the driest month is February. North Park: Green Mountain Dam, Spicer, and Rand.

South Park has a growing season of 80 to 110 days with July and August being the wettest months and January is the driest month. Lake George 8 SW

Effective precipitation is limited by the low water intake rate of the soil. Over Fifty percent of the precipitation falls in the form of snow. Optimum growing season for native plants is mid-April to the first of July. Winters are cold with deep snow cover. Native plants are favored by spring moisture from accumulated snow. July and August are normally dry months during the growing season.

Table 3. Representative climatic features

Frost-free period (characteristic range)	34-43 days
Freeze-free period (characteristic range)	80-84 days
Precipitation total (characteristic range)	356-381 mm
Frost-free period (actual range)	30-45 days

Freeze-free period (actual range)	79-85 days
Precipitation total (actual range)	305-406 mm
Frost-free period (average)	39 days
Freeze-free period (average)	82 days
Precipitation total (average)	381 mm

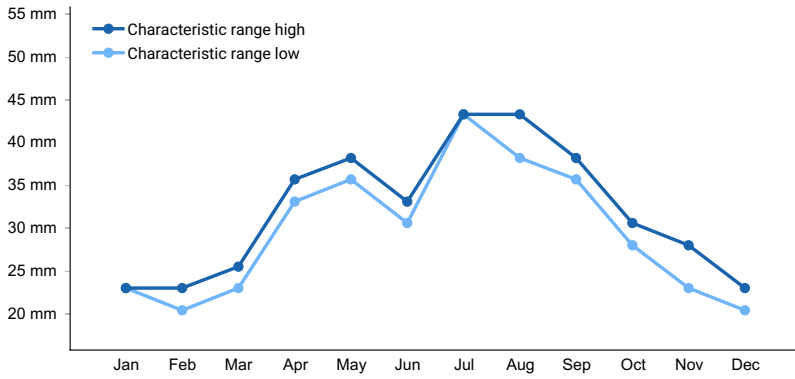


Figure 1. Monthly precipitation range

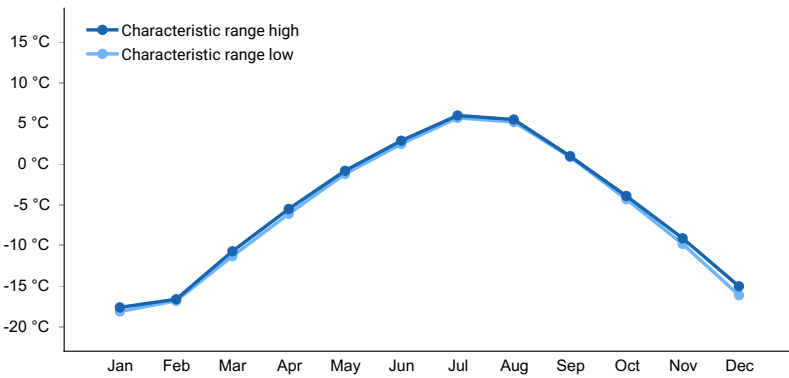


Figure 2. Monthly minimum temperature range

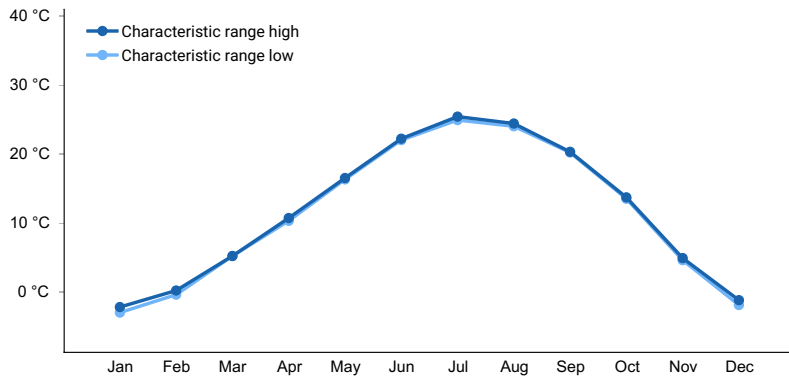


Figure 3. Monthly maximum temperature range

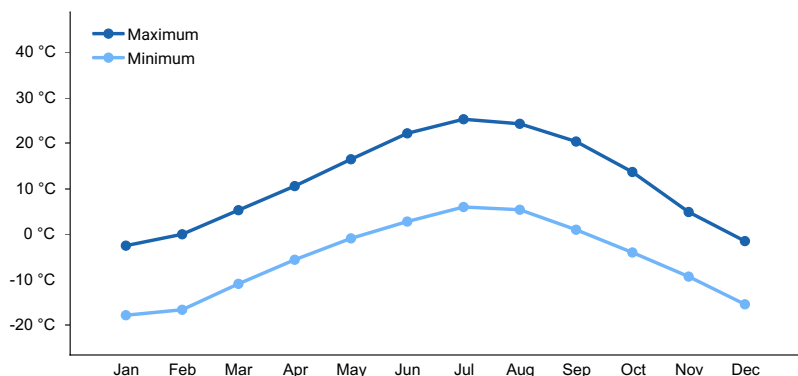


Figure 4. Monthly average minimum and maximum temperature

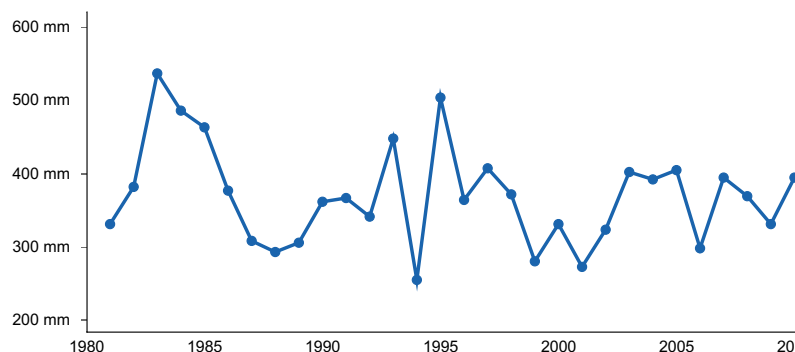


Figure 5. Annual precipitation pattern

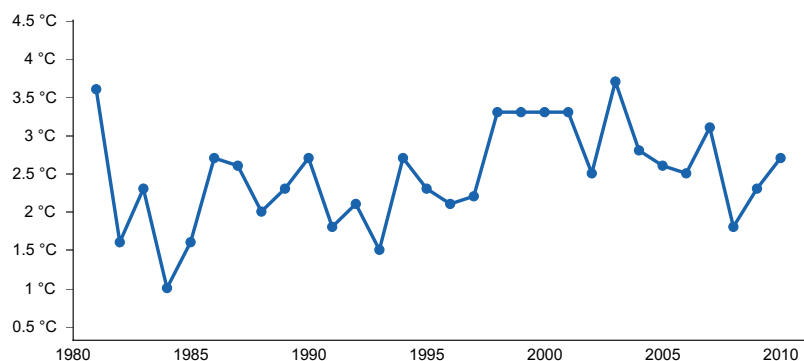


Figure 6. Annual average temperature pattern

Climate stations used

- (1) GRAND LAKE 6 SSW [USC00053500], Granby, CO
- (2) WILLIAMS FORK DAM [USC00059096], Parshall, CO

Influencing water features

None

Soil features

Subsoil characteristics limit type of plant growth. The subsoil is strongly structured and fine textured. The subsoil restricts water permeability and plant moisture availability due to the high swelling clay. The A horizons range in thickness from 1 to 5 inches and the texture may be loam or clay. The soil subsurface at 20 inches is at least 35 to 45% clay content.

Soils in this site are:

Aaberg clay loam

Brinkert clay loam
Coalmont clay loam

Table 4. Representative soil features

Parent material	(1) Alluvium–sedimentary rock (2) Colluvium–sandstone and shale (3) Residuum–shale (4) Slope alluvium–sandstone and shale
Surface texture	(1) Loam (2) Clay
Family particle size	(1) Fine
Drainage class	Well drained
Permeability class	Slow
Soil depth	51–152 cm
Surface fragment cover ≤3"	0–10%
Surface fragment cover >3"	0–5%
Available water capacity (Depth not specified)	10.67–17.02 cm
Soil reaction (1:1 water) (Depth not specified)	6.6–7.8
Subsurface fragment volume ≤3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–5%

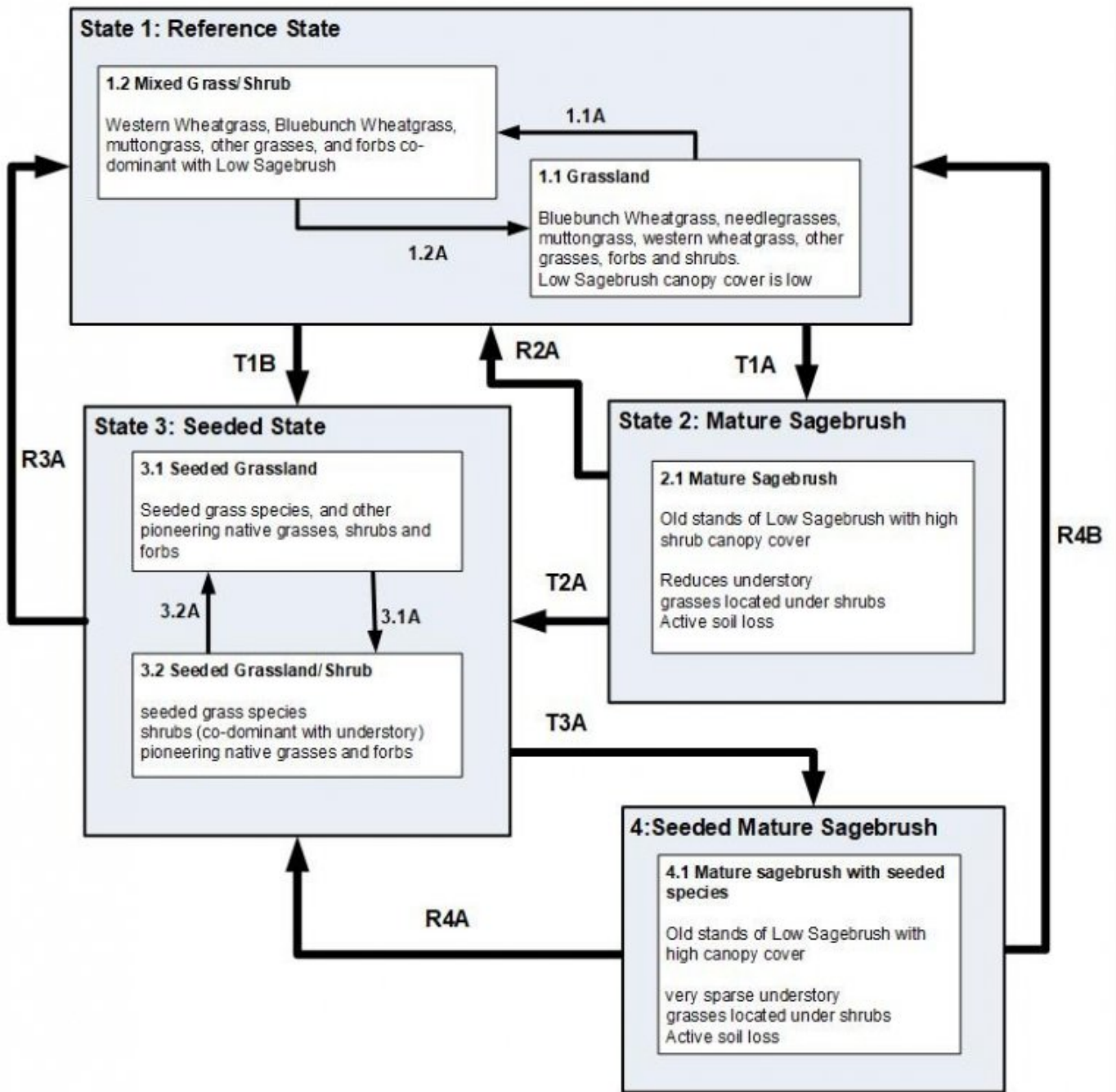
Ecological dynamics

The aspect of this site is that of a very abrupt and obvious boundary low appearing shrub dominated community. Little sagebrush is the dominant shrub species, Vasey rabbitbrush is often present. On drier areas of this site, Gardner's and mat saltbush are present. Prairie Junegrass, bluebunch wheatgrass, muttongrass, squirreltail, Nevada bluegrass, and western wheatgrass are the principal grass species. Important forb species include low phlox, daisy, western yarrow, buckwheat, pussytoes, fringed sagewort, and onions. Other plants present on this site in different localities include big sagebrush, pine needlegrass, thickspike wheatgrass, streambank wheatgrass, stonecrop, native clovers, herbaceous cinquefoil, asters and bluebells.

This site is treeless.

State and transition model

R048BY296CO Claypan



Legend

1.1A, 3.1A, T1A, T3A – Extended improper grazing, lack of fire, extended drought, time without disturbance, and/or lack of insect/pathogen outbreaks

1.2A, 3.2A, R4A – Fire, proper grazing, wet climatic cycles, vegetative treatments, and/or small scale insect/pathogen outbreaks

T1B, T2A – Seeded herbaceous species planted and/or shrub removal

R2A – fire, vegetation treatments, insect herbivory, drought, proper grazing, wet climatic cycles, and/or encroached shrub removal

R3A – intensive management and inputs maybe required to return to reference state, wet climatic years, native plantings, vegetative treatments, proper grazing and/or fire

State 1
Reference State

Community 1.1
Grassland

The aspect of this site is that of a very abrupt and obvious boundaries of low statured shrub dominated community. Low sagebrush is the dominant shrub species, Vasey's rabbitbrush is often present. On drier areas of this site, Gardner's and mat saltbush are present. Prairie Junegrass, bluebunch wheatgrass, muttongrass, squirreltail, Sandberg bluegrass, and western wheatgrass are the principal grass species. Important forb species include low phlox, daisy, western yarrow, buckwheat, pussytoes, fringed sagewort, and onions. Other plants present on this site in different localities include big sagebrush, pine needlegrass, thickspike wheatgrass, streambank wheatgrass, stonecrop, native clovers, herbaceous cinquefoil, asters and bluebells. This site is treeless.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	123	269	499
Shrub/Vine	163	224	308
Forb	50	67	90
Total	336	560	897

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			196–336	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	84–140	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	22–56	–
	muttongrass	POFE	<i>Poa fendleriana</i>	22–56	–
	pine needlegrass	ACPI2	<i>Achnatherum pinetorum</i>	22–56	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–56	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	11–39	–
Forb					
2	Forbs			56–84	
	rosy pussytoes	ANRO2	<i>Antennaria rosea</i>	11–56	–
	phlox	PHLOX	<i>Phlox</i>	11–56	–
	clover	TRIFO	<i>Trifolium</i>	11–56	–
	aster	ASTER	<i>Aster</i>	11–56	–
	fleabane	ERIGE2	<i>Erigeron</i>	11–56	–
	buckwheat	ERIOG	<i>Eriogonum</i>	11–56	–
Shrub/Vine					
3	Shrubs			168–280	
	little sagebrush	ARAR8	<i>Artemisia arbuscula</i>	140–224	–
	Vasey's rabbitbrush	CHVA2	<i>Chrysothamnus vaseyi</i>	22–56	–
	mat saltbush	ATCO4	<i>Atriplex corrugata</i>	0–17	–
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	0–17	–

Animal community

INTERPRETATIONS FOR GRAZING ANIMAS:

This site provides medium value rating for sheep and low value rating for cattle and horses.

INTERPRETATIONS FOR GRAZING WILDLIFE:

This site provides a medium value rating for antelope and jackrabbit. It provides a low rating for deer, cottontail, and upland gram birds. It is not used by elk or waterfowl.

Hydrological functions

The site provides a medium value rating for watershed.

Recreational uses

RECREATION AND NATURAL BEAUTY:

This site provides a low value rating for recreation and natural beauty.

Wood products

This site does not produce any wood products.

Other information

RARE, THREATENED OR ENDANGERED PLANTS AND ANIMALS:

To be added when known.

Total Annual Production:

Favorable years 800 pounds per Ac air dry

Median years 500 pounds per Ac air dry

Unfavorable years 300 pounds per Ac air dry

The site occurs in the Craig, Kremmling, Meeker, Steamboat Springs, and Walden field offices.

Other references

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Approval

Kirt Walstad, 9/07/2023

Acknowledgments

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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	05/12/2024
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:**

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

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:

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

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**
