USDA Natural Resources Conservation Service

Ecological site R034BY116UT
Desert Shallow Gypsum

Last updated: 3/05/2022
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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): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.

The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

The soils of this site formed mostly eolian deposits and/or slope alluvium over gypsiferous residuum weathered from sandstone and shale. Surface soils are gravelly loam to fine sandy loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are shallow to moderately deep, well-drained, and have moderately rapid permeability. pH is slightly to moderately alkaline. Available water-holding capacity ranges from 1.5 to 5 inches of water in the upper 40 inches of soil. The soil moisture regime is typic aridic and the soil temperature regime is mesic. Precipitation ranges from 5-8 inches annually.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ephedra torreyana*
Herbaceous	Not specified

Physiographic features

This site occurs on dissected structural benches and gypsum hills.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Hill
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	4,300–6,200 ft
Slope	3–20%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Average annual precipitation is 5 to 8 inches. Approximately 60-70 percent occurs as rain from March through September. On the average, November through February are the driest months and July through October are the wettest months. The mean annual air temperature is 8.4 degrees celsius and the soil temperatures are in the mesic regime. The average freeze-free period is 120 to 160 days. In average years, plants begin growth around March 15 and end growth around October 15

Table 3. Representative climatic features

Frost-free period (characteristic range)	120-160 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	5-8 in

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

The soils of this site formed mostly eolian deposits and/or slope alluvium over gypsiferous residuum weathered from sandstone and shale. Surface soils are gravelly loam to fine sandy loam in texture. Rock fragments may be present on the soil surface and throughout the profile, but generally make up less than 35 percent of the soil volume. These soils are shallow to moderately deep, well-drained, and have moderately rapid permeability. pH is slightly to moderately alkaline. Available water-holding capacity ranges from 1.5 to 5 inches of water in the upper 40 inches of soil. The soil moisture regime is typic aridic and the soil temperature regime is mesic. Precipitation ranges from 5-8 inches annually.

Table 4. Representative soil features

Parent material	(1) Slope alluvium–sandstone and shale (2) Eolian deposits–sandstone and shale (3) Residuum–sandstone and shale
Surface texture	(1) Fine sandy loam (2) Gravelly loam
Family particle size	(1) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	5–40 in
Soil depth	5–40 in
Surface fragment cover <=3"	2–23%
Surface fragment cover >3"	0–1%
Available water capacity (Depth not specified)	1.5–5 in
Calcium carbonate equivalent (Depth not specified)	0–25%
Electrical conductivity (Depth not specified)	0–4 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–3
Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–24%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

State 1: Reference State
The main driver of plant community change in the reference state is drought. In wet years, this site can support perennial grasses, particularly James' galleta and Indian ricegrass. However, due to harsh gypsum soils and low water-holding capacity, dry years can result in a loss of perennial grasses. The resilience of this site to drought conditions will be lower on shallower soils with lower water holding capacity and/or harsher soil conditions. This state is susceptible to non-native invasive species establishment. Disturbances such as livestock grazing and recreation can increase the likelihood of invasion by promoting germination sites and/or seed sources for non-native species. However, Russian thistle is capable of establishing on this site in the absence of disturbance.

Community Phase 1.1: Torrey's jointfir shrubland with perennial grasses.
This plant community phase is dominated by Torrey’s jointfir, shadscale, James' galleta, and Indian ricegrass. Galleta is typically the dominant perennial grass species. Other perennial grasses may or may not be present. Other perennial shrubs, and forbs may be present and cover is variable.

Community Phase Pathway 1.1A
This pathway occurs when climatic events, such as drought disfavor the establishment and persistence of perennial grasses. Improper livestock grazing and/or surface disturbance may accelerate this transition.

Community Phase 1.2: Torrey's jointfir shrubland.
This plant community phase is dominated by Torrey’s jointfir, and other shrubs. Grasses are limited or absent from the community.

Community Phase Pathway 1.2A
This pathway occurs when weather events, such as years with normal to above average precipitation favor the establishment and persistence of perennial grasses.

Transition T1A
This transition occurs with the establishment of non-native invasive species. Disturbances that promote this transition include season long continuous grazing of perennial grasses, prolonged drought, recreation or other surface disturbances. However, invasive species such as Russian thistle can invade intact perennial plant communities with little to no disturbance. Once invasive plants are found in the plant community, a return to the reference state is not likely.

State 2: Invaded State
The invaded state resembles the reference state in both community structure and function, but non-native species, notably Russian thistle, are present. As a result, the resilience of the state is somewhat reduced and the possibility of further degradation is greater.

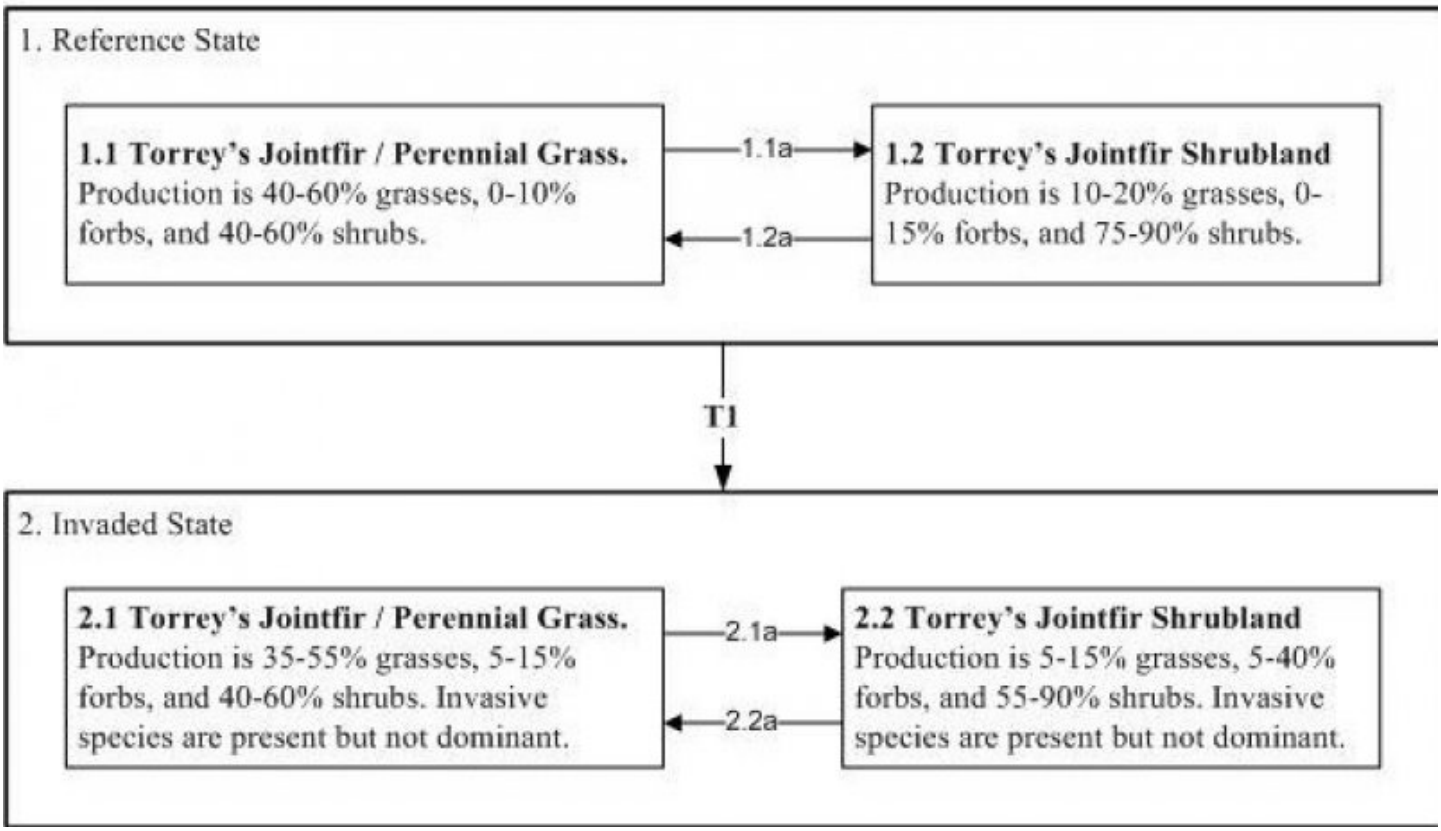
Community Phase 2.1: Torrey's jointfir / Perennial grasses
This plant community is similar to Reference State Community 1.1. except that invasive species are now present. Dominant species are Torrey’s jointfir, shadscale, James' galleta and Indian ricegrass. Galleta is typically the dominant perennial grass species in this plant community phase.

Community Phase Pathway 2.1A
This pathway occurs when weather events, such as drought disfavor the establishment and persistence of perennial grasses. Improper livestock grazing and/or surface disturbance may accelerate this transition. Annuals such as Russian thistle, mustards, and cheatgrass may be able to take advantage of these conditions during short term wet spells.

Community Phase 2.2: Torrey's jointfir with invasives
This plant community is similar to Reference State Community 1.2 except that invasive species are now present. Perennial grasses are greatly reduced, and Russian thistle or other invasive annuals may take advantage of the unused resources. This phase may produce annuals, but it is still dominated by Torrey's jointfir and other native shrubs.

Community Phase Pathway 2.2A
This pathway occurs when weather events, such as years with normal to above average precipitation favor the establishment and persistence of perennial grasses. Carefully managed livestock grazing, where present can accelerate this transition. Annual species such as Russian thistle, mustards, and cheatgrass may also increase during this period--especially if they have banked seed in the soil for many years.

State and transition model



Approval

Kirt Walstad, 3/05/2022

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	05/11/2025
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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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):**

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

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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):**

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:**