Ecological site R047XB450UT
Mountain Shallow Loam (ponderosa pine)

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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): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. The southern half is in the High Plateaus of the Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south, and the Uinta Mountains, which trend east and west. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongated shape. Structurally, they consist of a broadly folded anticline that has an erosion-resistant quartzite core. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters).

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, but Precambrian rocks are exposed in the Uinta Mountains. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east. The southern Wasatch Mountains consist of Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks.

The average precipitation is from 8 to 16 inches (203 to 406 mm) in the valleys and can

range up to 73 inches (1854 mm) in the mountains. In the northern and western portions of the MLRA, peak precipitation occurs in the winter months. The southern and eastern portions have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of precipitation occurs during the summer months. The average annual temperature is 30 to 50 degrees Fahrenheit (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. Mesic temperature regimes come in on the lower elevations and south facing slopes in the southern portion of this MLRA. The soil moisture regime is typically xeric in the northern part of the MLRA, but grades to ustic in the extreme eastern and southern parts. The mineralogy is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

E47B is the Wasatch Mountains South MLRA. It occurs in the Loa, Panguitch, New Harmony area. Most of Zion, Bryce Canyon National Parks and Cedar Breaks National Monument are in this area. This area is composed of mountain ranges that run north and south.

Ecological site concept

The soils of this site formed mostly in alluvium from calcareous sandstone and/or limestone. Surface soils are gravelly silt loam, extremely stony loam to gravelly loam in texture. Rock fragments may be present on the soil surface and throughout the profile and can make up more than 35 percent of the soil volume. These soils are shallow, well to somewhat excessively drained, and have moderate to moderately rapid permeability. pH is slightly to moderately alkaline. Available water-holding capacity ranges from 1.0 to 2.0 inches of water in the upper 20 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 16 to 22 inches annually.

Associated sites

R047XB446UT	**Mountain Shallow Loam (mountain big sagebrush)** Sites can occur adjacent to each other.

Similar sites

R047XB433UT	**Mountain Loam (ponderosa pine)** Sites have similar floral characteristics, however soils on this site are deeper.

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site typically occurs on mountain slopes, breaks and mesas. Slopes normally range from 2 to 60 percent but may occasionally be steeper. Slope steepness, aspect and elevation will influence the vegetative floristics of this site. Sites are typically located between 6,000 to 9,000 feet in elevation. Runoff is medium to very high.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Breaks (3) Mesa
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,829–2,743 m
Slope	2–60%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by cold, snowy winters and cool, moist summers. Approximately 50 percent of the moisture comes during the plant growth period from April 1 through September 30. On the average April, May, and June are the driest months and July, August, and September are the wettest months. Average annual precipitation is 16 to 22 inches.

Table 3. Representative climatic features

Frost-free period (characteristic range)	70-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	406-559 mm

Influencing water features

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

Wetland description

N/A

Soil features

The soils of this site formed mostly in alluvium from calcareous sandstone and/or limestone. Surface soils are gravelly silt loam, extremely stony loam to gravelly loam in texture. Rock fragments may be present on the soil surface and throughout the profile and can make up more than 35 percent of the soil volume. These soils are shallow, well to somewhat excessively drained, and have moderate to moderately rapid permeability. pH is slightly to moderately alkaline. Available water-holding capacity ranges from 1.0 to 2.0 inches of water in the upper 20 inches of soil. The soil moisture regime is mostly ustic and the soil temperature regime is frigid. Precipitation ranges from 16 to 22 inches annually.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Alluvium–calcareous sandstone
Surface texture	(1) Gravelly, extremely stony loam (2) Gravelly silt loam
Family particle size	(1) Loamy-skeletal (2) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	25–51 cm
Soil depth	25–51 cm
Surface fragment cover <=3"	15–48%
Surface fragment cover >3"	0–34%
Available water capacity (Depth not specified)	2.54–5.08 cm
Calcium carbonate equivalent (Depth not specified)	0–30%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0

Soil reaction (1:1 water) (Depth not specified)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	9–76%
Subsurface fragment volume >3" (Depth not specified)	0–34%

Ecological dynamics

State 1

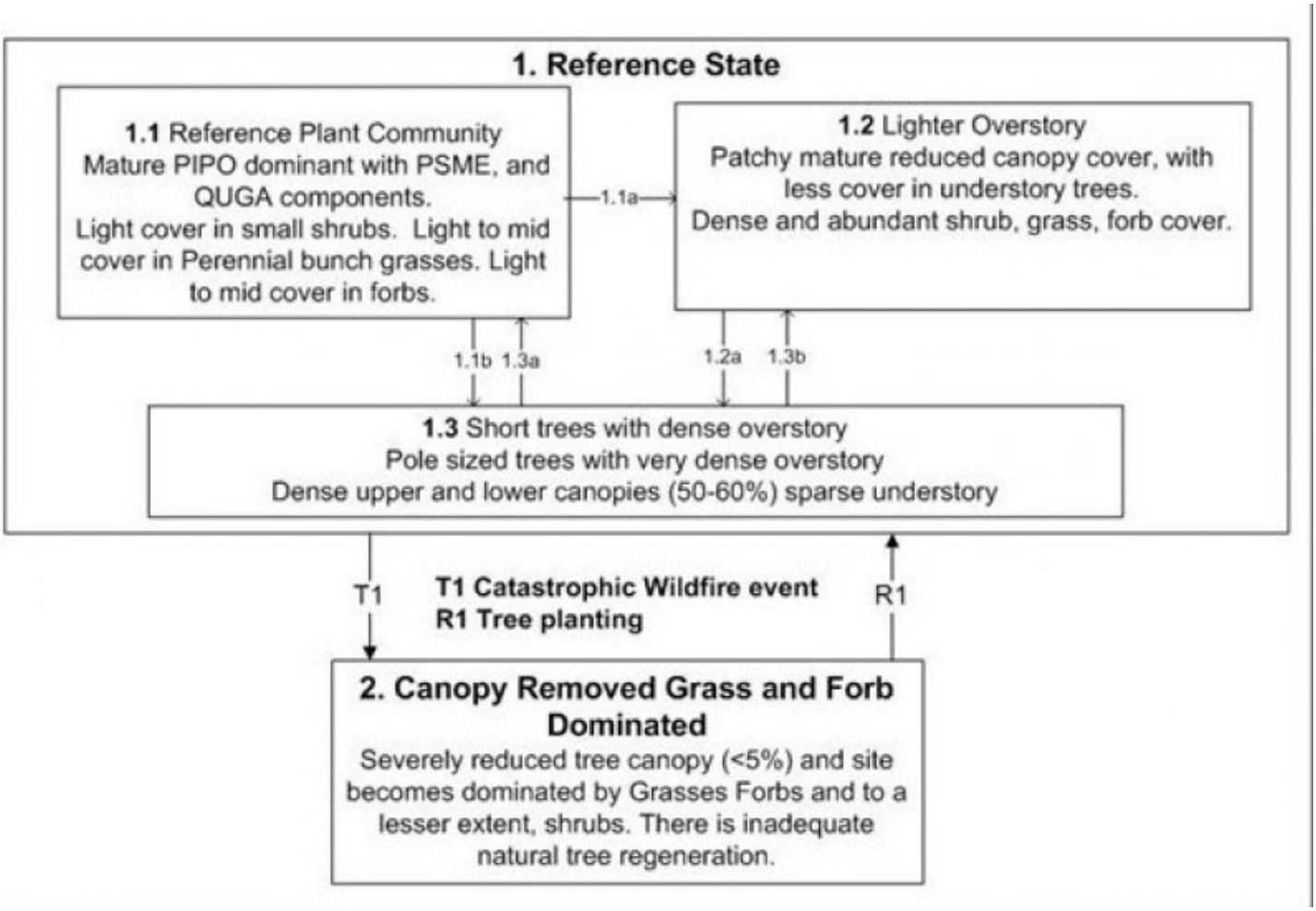
Community Phase 1.1
Open mature ponderosa pine with a large diversity of grasses and forbs and pockets of shrubs. Pre-settlement forests were irregularly spaced, uneven-aged stands with trees growing together in small even-aged groups and grassy meadows between these age groups.

Community Phase 1.2
The reduced canopy results in higher production on the forest floor of grass, forbs and to some extent shrubs.

Community Phase 1.3
Canopy openings are filled in by ponderosa pine, Douglas fir and associated shrubs forming an even aged stand of young trees.

State 2
Tree canopy drastically reduced leaving site dominated by grasses, forbs and sprouting shrubs.

State and transition model



Community Phase Pathway 1.1a

Partial removal of mature PIPO canopy achieved through timber harvest, or Bark beetle infestation. The reduced canopy results in higher production on the forest floor of grass, forbs and to some extent shrubs.

Community Phase Pathway 1.1b

Removal of majority of mature PIPO canopy achieved through timber harvest, or Bark beetle infestation.

Community Phase Pathway 1.2a

Openings are filled in by natural regeneration of Ponderosa pine, forming an even aged tight canopy of sapling to pole size PIPO

Community Phase Pathway 1.3a

Trees mature and are thinned more heavily than 1.3b, through fire or timber harvest forming a patchy and mature canopy.

Community Phase Pathway 1.3b

Trees mature and are thinned either naturally or through Pre-commercial thinning forming a mature canopy.

Transition 1

Catastrpohic removal of most trees to the point of no natural regeneration

Restoration Pathway 1

Tree planting restores forest community.

Inventory data references

Information presented here has been derived from NRCS clipping data and other inventory data. Field observations from range trained personnel were also used.

Other references

Alexander, R. R. 1985. Major habitat types, community types, and plant communities in the Rocky Mountains. USDA- Forest Service Rocky Mountain Forest and Range Experiment Station. General technical report RM-123. 105p.

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Parson, R. E. 1996. A History of Rich County. Utah State Historical Society, County Commission, Rich County, Utah. Keywords: [Rich County, Utah, Historic land use, European settlements]

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Western Regional Climate Center, Western U.S. Climate Historical Summaries. Available at: http://www.wrcc.dri.edu/summary/Climsmut.html. Accessed 15 June 2009.

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Contributors

M. Dean Stacy

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	02/08/2026
Approved by	Kendra Moseley
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):**

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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):**

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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:**
