USDA Natural Resources Conservation Service

Ecological site F047XC405UT
Mountain Cobbly Sandy 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 MLRA includes the Uinta Mountains, which trend east and west. 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. Rocks exposed in the Uinta mountains are Precambrian. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east.
The average precipitation can range up to 73 inches (1854 mm) in the mountains. The Uinta mountains 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 Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. The soil moisture regime is typically ustic. The minerology is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy, sandy or sandy–skeletal.

Ecological site concept

The soils of this site formed mostly in colluvium and slope alluvium derived from various parent materials including metamorphic and sedimentary rock. Surface soils are very cobbly fine sandy loam in texture. Rock fragments are evident throughout the profile, but make up less than 60 percent of the soil volume. These soils are very deep, well-drained to excessively drained. The pH is neutral to slightly alkaline. Available water-holding capacity ranges from 1.2 to 4.7 inches of water in the upper 40 inches of soil. The soil moisture regime is ustic and the soil temperature regime is frigid.

Associated sites

R047XC462UT	**Mountain Stony Loam (mountain big sagebrush)** Sites often occur adjacent to each other.

Similar sites

R047XC453UT	**Mountain Shallow Sandy Loam (ponderosa pine)** Site has similar floristic characteristics but is shallower.

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa*
Shrub	(1) *Arctostaphylos patula* (2) *Cercocarpus montanus*
Herbaceous	(1) *Festuca occidentalis*

Physiographic features

This ecological site typically occurs on mountain slopes and outwash fans. Slopes normally range from 10 to 50 percent but may occasionally be steeper. Slope steepness, aspect and elevation will influence the vegetative floristics of this site. Sites are typically located between 7,600 to 8,500 feet in elevation. Runoff is high to very high.

Table 2. Representative physiographic features

Landforms	(1) Outwash fan (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	7,600–8,500 ft
Slope	10–50%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	4–70%

Climatic features

The climate of this site characterized by cold, snowy winters and cool summers. The average annual precipitation ranges from 16 to 22 inches. March thru May and August, are typically the wettest months with June and July being the driest. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter, and spring rains. Summer thunderstorms are intermittent and sporadic in nature, and thus, are less reliable sources of moisture to support vegetative growth on this site.

Table 4. Representative climatic features

Frost-free period (characteristic range)	50-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	16-22 in
Frost-free period (average)	70 days
Freeze-free period (average)	
Precipitation total (average)	20 in

Influencing water features

This site is not influenced by water from a wetland or stream.

Wetland description

N/A

Soil features

The soils of this site formed mostly in colluvium and slope alluvium derived from various parent materials including metamorphic and sedimentary rock . Surface soils are very cobbly fine sandy loam in texture. Rock fragments are evident throughout the profile, but make up less than 60 percent of the soil volume. These soils are very deep and well-drained to excessively drained. pH is neutral to slightly alkaline. Available water-holding capacity ranges from 1.2 to 4.7 inches of water in the upper 40 inches of soil. The soil moisture regime is ustic and the soil temperature regime is frigid.

Table 5. Representative soil features

Parent material	(1) Colluvium–metamorphic and sedimentary rock (2) Slope alluvium–metamorphic and sedimentary rock
Surface texture	(1) Cobbly very fine sandy loam
Family particle size	(1) Sandy-skeletal
Drainage class	Well drained to excessively drained
Permeability class	Moderate to rapid
Available water capacity (0-60in)	1.2–4.7 in
Calcium carbonate equivalent (0-60in)	0%
Electrical conductivity (0-60in)	0 mmhos/cm
Sodium adsorption ratio (0-60in)	0
Soil reaction (1:1 water) (0-60in)	6.6–7.4
Subsurface fragment volume <=3" (0-60in)	21–23%
Subsurface fragment volume >3" (0-60in)	25–30%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Slow to rapid
Available water capacity (0-60in)	Not specified
Calcium carbonate equivalent (0-60in)	Not specified
Electrical conductivity (0-60in)	Not specified
Sodium adsorption ratio (0-60in)	Not specified
Soil reaction (1:1 water) (0-60in)	Not specified
Subsurface fragment volume <=3" (0-60in)	Not specified

Subsurface fragment volume >3" (0-60in)	Not specified

Ecological dynamics

a. Herbaceous:

Vegetation is dominated by grasses and forbs under full sunlight. This stage is experienced after a major disturbance such as crown fire or tree harvest. Skeleton forest (dead trees) remaining after fire or residual trees left following harvest have little or no affect on the composition and production of the herbaceous vegetation.

b. Shrub-Herbaceous:

Herbaceous vegetation and woody shrubs dominate the site. Various amounts of tree seedlings (less than 20 inches in height) may be present up to the point where they are obviously a major component of the vegetal structure.

c. Sapling:

In the absence of disturbance, the tree seedlings develop into saplings (20 inches to 4.5 feet in height) with a range in canopy cover of about 5 to 10 percent. Vegetation consists of grasses, forbs, and shrubs in association with tree saplings.

d. Immature Forest:

The visual aspect and vegetal structure are dominated by ponderosa pine greater than 4.5 feet in height. Seedlings and saplings are present in the understory. Understory vegetation is moderately influenced by a tree overstory canopy about 10 to 20 percent. Lodgepole pine and quaking aspen are principal seral associates.

e. Mature Forest:

The visual aspect and vegetal structure are dominated by ponderosa pine that have reached or are near maximal heights for the site. Tree diameters of 30 to 50 inches and heights of 90 to 130 feet are common. Tree canopy cover ranges from 35 to 40 percent. Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. Few seedlings and/or saplings of the major overstory tree species occur in the understory.

f. Climax Forest:

In the absence of wildfire or other naturally occurring disturbances, the tree canopy on this site can become very dense. This stage is dominated by trees that have reached maximal heights for the site. Understory vegetation is sparse to absent due to tree competition, overstory shading, duff accumulation, etc. Tree canopy cover is at a maximum for the site and is commonly greater than 50 percent.

State and transition model

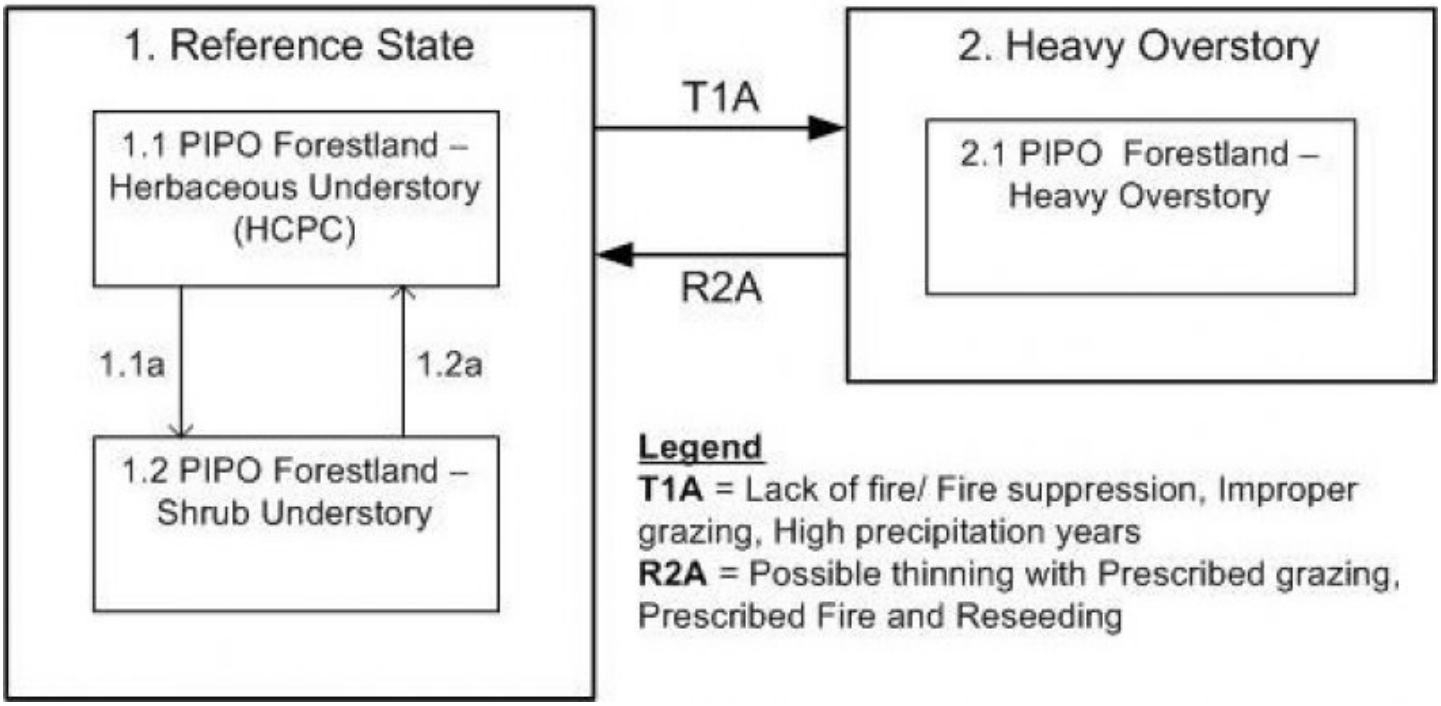

Figure 1. STM

State 1
Reference State

Community 1.1
Reference State

The overstory tree canopy cover is 35 to 40 percent. Common understory plants are sheep fescue, greenleaf manzanita, birchleaf mountain mahogany, and common juniper. Understory composition by air-dry weight is about 25 percent perennial grasses and grass-like plants, 10 percent forbs, and 65 percent shrubs. Understory production ranges from 900 pounds per acre in favorable years to about 300 pounds per acre in unfavorable years. Understory production includes the total annual production of all species within 4.5 feet of the ground surface.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	195	390	585
Grass/Grasslike	75	150	225
Forb	30	60	90
Total	**300**	**600**	**900**

Additional community tables

Animal community

a. Livestock Grazing

This site is suited to cattle and sheep grazing during the summer and fall. Livestock will often concentrate on this site taking advantage of the shade and shelter offered by the tree overstory. Many areas are not used because of steep slopes or lack of adequate water. Attentive grazing management is required due to steep slopes and erosion hazards. Harvesting trees under a sound management program can open up the tree canopy to allow increased production of understory species desirable for grazing.

b. Initial Stocking Rates

Stocking rates vary in accordance with such factors as kind and class of grazing animal, season of use, and fluctuation in climate. Actual use records for individual sites, together with a determination of the degree to which the sites have been grazed and an evaluation of trend in site condition, offer the most reliable basis for developing initial stocking rates.

Selection of initial stocking rates for given grazed units is a planning decision. This decision should be made only after careful consideration of the total resources available, evaluation of alternatives for use and treatment, and establishment of objectives by the decisionmaker.

Wildlife species seeking food and cover in this forest site include moose, elk, mule deer, bear, porcupine, snowshoe hare, owl, and woodpecker.

Wood products

Silvicultural Practices

a. Harvest cut selectively or in small patches (size dependent upon site conditions) to enhance forage production.
1. Thinning and improvement cutting – removal of poorly formed, diseased, and low vigor trees of little.
2. Harvest cutting – selectively harvest surplus trees to achieve desired spacing. Save large, healthy, full-crowned trees. Do not select only “high grade” trees during harvest.

b. Prescription burning program may be used to maintain desired canopy cover and manage site reproduction.

c. Selective tree removal on suitable sites to enhance forage production and manage site reproduction.

d. Pest Control – use necessary and approved control for specific pests or diseases.

e. Fire hazard – fire is usually not a problem in mature grazed stands.

Fuelwood Production:

33 to 44 cords per acre per year for stands averaging 27 to 35 feet in height and 50 years of age. Firewood is commonly measured in cords, or a stacked unit equivalent to 128 cubic feet. Assuming an average of 90 cubic feet of solid volume wood per cord, there are about 211,500 British thermal units (BTU’s) per cubic foot or about 19 million BTU’s of heat value in a cord of ponderosa pine.

Tree volume per acre: 3000 to 4000 cubic feet/acre/year for stands averaging 27 to 35 feet in height and 50 years of age.

Other information

Limitations and Considerations

a. Potential for sheet and rill erosion is moderate to severe depending on slope.

b. Moderate to severe equipment limitations on steeper slopes and on sites having extreme surface stoniness.

c. Proper spacing is the key to a well managed multiple use and multi-product forest.

Essential Requirements

a. Adequately protect from uncontrolled burning.

b. Protect soils from accelerated erosion.

c. Apply proper grazing management practices (see management guides)

Table 8. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
ponderosa pine	*PIPO*	–	–	10	25	–	–	–	

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

"Silvics of North America" Agriculture Handbook 654, Volume 1, Conifers

Mauk, Ronald L., Henderson, Jan A. "Coniferous Forest Habitat Types of Northern Utah," General Technical Report INT 170, July 1884, page 22, PIPO/FEID/ARPA

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Approval

Kendra Moseley, 2/05/2025

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	05/10/2025
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):**

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):**

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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:**
