

Ecological site F047XA610UT

Subalpine Gravelly Loam

(subalpine fir/Engelmann spruce)

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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 foot slopes 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 F (-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 minerology is generally mixed and the soils are very shallow to very deep, generally well-drained, and loamy or loamy-skeletal.

Ecological site concept

The soils of this site are typically deep and well-drained. They formed in colluvium, alluvium and till derived mainly from limestone, sandstone, shale, and quartzite. This site is correlated to rocky soils, therefore rock fragments may occur on the soil surface and throughout the soil profile in some cases. pH is slightly acidic to neutral and available water-holding capacity ranges from 2.8 to 4.6 inches of water in the upper 40 inches of soil. The soil moisture regime for this site have been mapped as udic and the soil temperature regimes is cryic

Associated sites

R047XA614UT	Subalpine Loam (cranesbill)
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R047XA620UT	Subalpine Meadow (alpine timothy)
R047XA630UT	Subalpine Stony Loam (snowfield sagebrush)

Similar sites

F047XA512UT	High Mountain Loam (Douglas-fir)
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Table 1. Dominant plant species

Tree	(1) <i>Abies lasiocarpa</i> (2) <i>Picea engelmannii</i>
Shrub	(1) <i>Vaccinium scoparium</i>
Herbaceous	(1) <i>Carex rossii</i>

Physiographic features

Mountain Sideslopes, Glacial Till, and Moraine

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Canyon (3) Moraine
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	2,290 – 2,740 m
Slope	30 – 70 %
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site characterized by cold, snowy winters and cool summers. The average annual precipitation ranges from 30 to 45 inches. October thru April, are typically the wettest months with June thru August 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 3 Representative climatic features

Frost-free period (average)	60 days
Freeze-free period (average)	
Precipitation total (average)	1,020 mm

Influencing water features

No water features associated with this upland site.

Wetland description

N/A

Soil features

The soils of this site formed mostly in colluvium, slope alluvium over residuum weathered from shale, or till. Surface soils are very channery loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, and make up greater than 35 percent of the soil volume. These soils are moderately deep, well-drained, and have moderately slow to moderate permeability. Available water-holding capacity ranges from 0.7 to 3.5 inches of water in the upper 40 inches of soil.

Table 4. Representative soil features

Parent material	(1) Colluvium – metamorphic and sedimentary rock (2) Residuum – metamorphic and sedimentary rock (3) Till – metamorphic rock
Surface texture	(1) Gravelly loam (2) Gravelly silt loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	100 – 150 cm

Soil depth	100 – 150 cm
Surface fragment cover <=3"	10 – 30 %
Surface fragment cover >3"	10 – 20 %
Available water capacity (0-101.6cm)	7.62 – 10.16 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.1 – 10
Subsurface fragment volume <=3" (0-101.6cm)	20 – 50 %
Subsurface fragment volume >3" (0-101.6cm)	10 – 20 %

Ecological dynamics

It is impossible to determine in any quantitative detail the Historic Climax Plant Community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include tree harvest, grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, and kinds and times of timber harvest, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, or new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State and transition model

Figure 1. State and Transition Model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Shrub/Vine					
0	Shrub			168-303	
Grass/Grasslike					
0	Grasses			140-252	
Forb					
0	Forbs			252-454	

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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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

6. 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. Install firebreaks or firelines as necessary.

Other information

4. 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. 5. Essential Requirements a. Adequately protect from uncontrolled burning. b. Protect soils from accelerated erosion. c. Apply proper grazing management practices (see management guides)

Table 9. 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
subalpine fir	ABLA	28	33	34	39	–	–	–	

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 44, ABLA/VASC/VASC

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Reese G. A. 1981. Diversity and production of herbaceous vegetation in a Northern Utah subalpine chrono-sequence. M. S. Thesis. Utah State University.

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Approval

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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	08/29/2026
Approved by	
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:
