USDA Natural Resources Conservation Service

Ecological site R047XA418UT
Mountain Loam (bigtooth maple)

Last updated: 2/05/2025
Accessed: 05/10/2025

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.

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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

Major Land Resource Unit 47A is located in the northern half of the Middle Rocky Mountains Province of the Rocky Mountain System. This MLRA includes the Wasatch Mountains which tend to run north and south. These steeply sloping, precipitous mountains have narrow crests and deep valleys. They are primarily fault blocks that have been tilted up. The alluvial fans located at the base of these mountains are important recharge zones for valley aquifers.

Classification relationships

Modal Soil: Bertag Silt Loam, 10 to 50 percent – fine, montmorillonitic, frigid, pachic Ultic Argixerolls

Ecological site concept

These soils formed primarily in colluvium derived from sandstone and limestone. Shale and quartzite are less common soil parent materials for this site. These soils are deep, well-drained,and have dark surface layers up to several feet in depth. Rock fragments may or may not be present on the soil surface. Some gravels and cobbles are usually present in the soil profile, but make up less than 35 percent of the soil volume. Some soils may have lime layers below about 36 inches but the overlying soil is usually noncalcareous and slightly acidic. Permeability is moderate to moderately rapid. Water holding capacity ranges from 3.9 to 7.5 inches of water in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is frigid.

Associated sites

R047XA406UT	**Mountain Gravelly Loam (mountain big sagebrush)**
R047XA430UT	**Mountain Loam (mountain big sagebrush)**
R047XA473UT	**Mountain Very Steep Stony Loam (browse)**

Similar sites

R047XA432UT	**Mountain Loam (oak)** This site is dominated by Gambel oak, a clonal tall shrub species adapted to slightly drier and warmer sites than Canyon maple. Gambel oak do not occur in Cache valley where this site is most common.
R047XA510UT	**High Mountain Loam (bigtooth maple)** This site occurs in a higher ecological zone with a shorter growing season and higher annual precipitation. The annual forb production is much greater on the high mountain loam site.

Table 1. Dominant plant species

Tree	(1) *Acer grandidentatum*
Shrub	(1) *Artemisia tridentata ssp. vaseyana*

Herbaceous	Not specified

Physiographic features

This site occurs on mountain slopes and alluvial fans between 5,000 and 9,000 feet in elevation. It is most commonly found on east and northeast aspects, but may occur on other aspects as well. Slopes are gentle to very steep ranging from 10 to 70 percent. Runoff is medium and flooding and ponding do not occur on the site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Alluvial fan (3) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	5,000–9,000 ft
Slope	10–70%
Aspect	NE, E

Climatic features

The climate of this site is characterized by cold, snowy winters and cool dry summers. The average annual precipitation ranges from 15 to 22 inches with an average of around 19. Distribution is 55 to 60 percent during the plant dormant period (October to March). Winter snow and spring rain provide the most dependable supply of moisture for plant growth.

Table 3. Representative climatic features

Frost-free period (average)	121 days
Freeze-free period (average)	147 days
Precipitation total (average)	19 in

Influencing water features

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

Wetland description

N/A

Soil features

These soils formed primarily in colluvium derived from sandstone and limestone. Shale and quartzite are less common soil parent materials for this site. These soils are deep, well-drained,and have dark surface layers up to several feet in depth. Rock fragments may or may not be present on the soil surface. Some gravels and cobbles are usually present in the soil profile, but make up less than 35 percent of the soil volume. Some soils may have lime layers below about 36 inches but the overlying soil is usually noncalcareous and slightly acidic. Permeability is moderate to moderately rapid. Water holding capacity ranges from 3.9 to 7.5 inches of water in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is frigid.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Gravelly silt loam (3) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	60 in
Surface fragment cover <=3"	0–21%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	3.9–7.5 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	11–26%
Subsurface fragment volume >3" (Depth not specified)	8–20%

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 and horses as the proportion of browse increased.

Below is a State and Transition Model diagram that illustrates 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 grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, fuel wood harvest, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

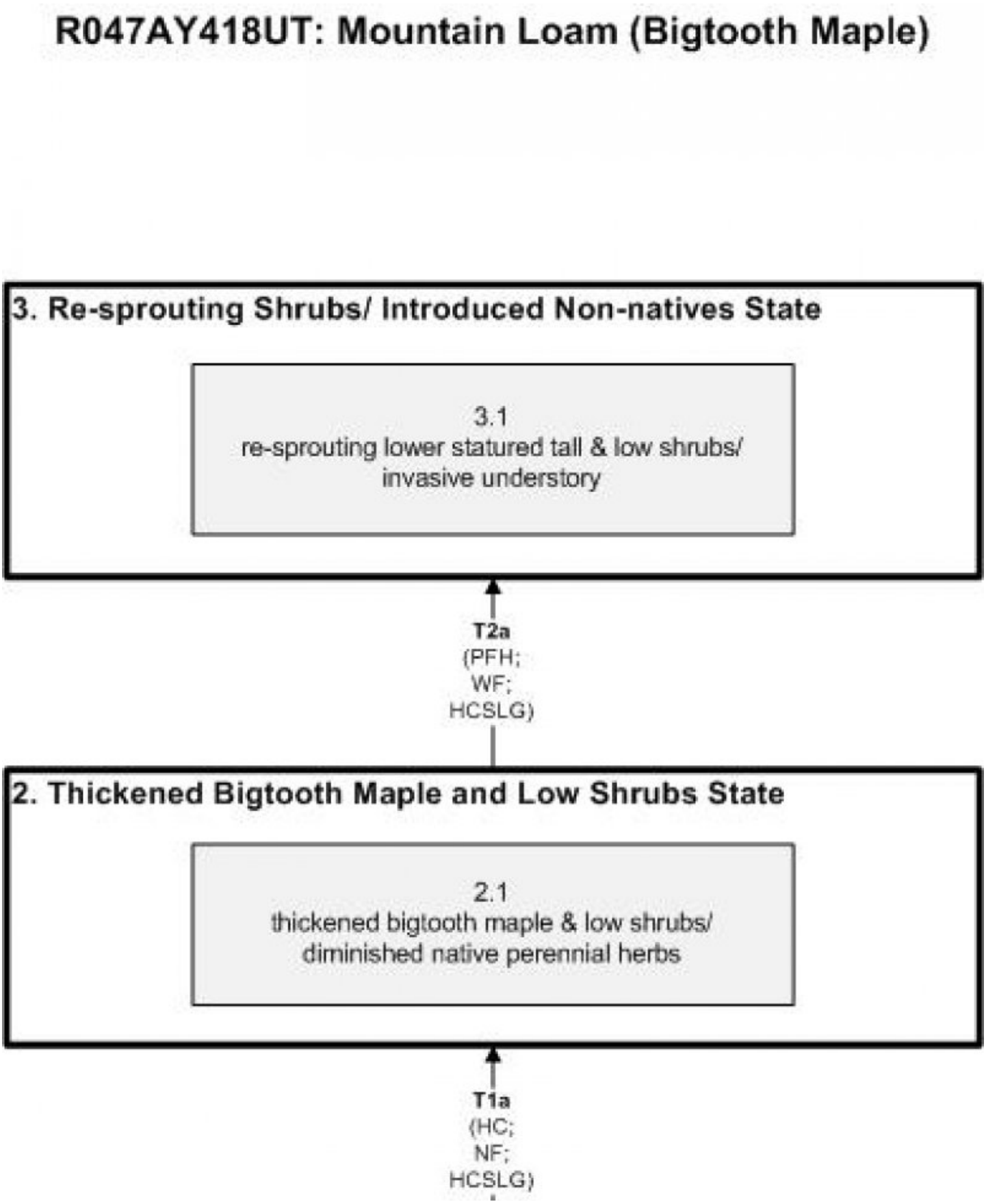
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the 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



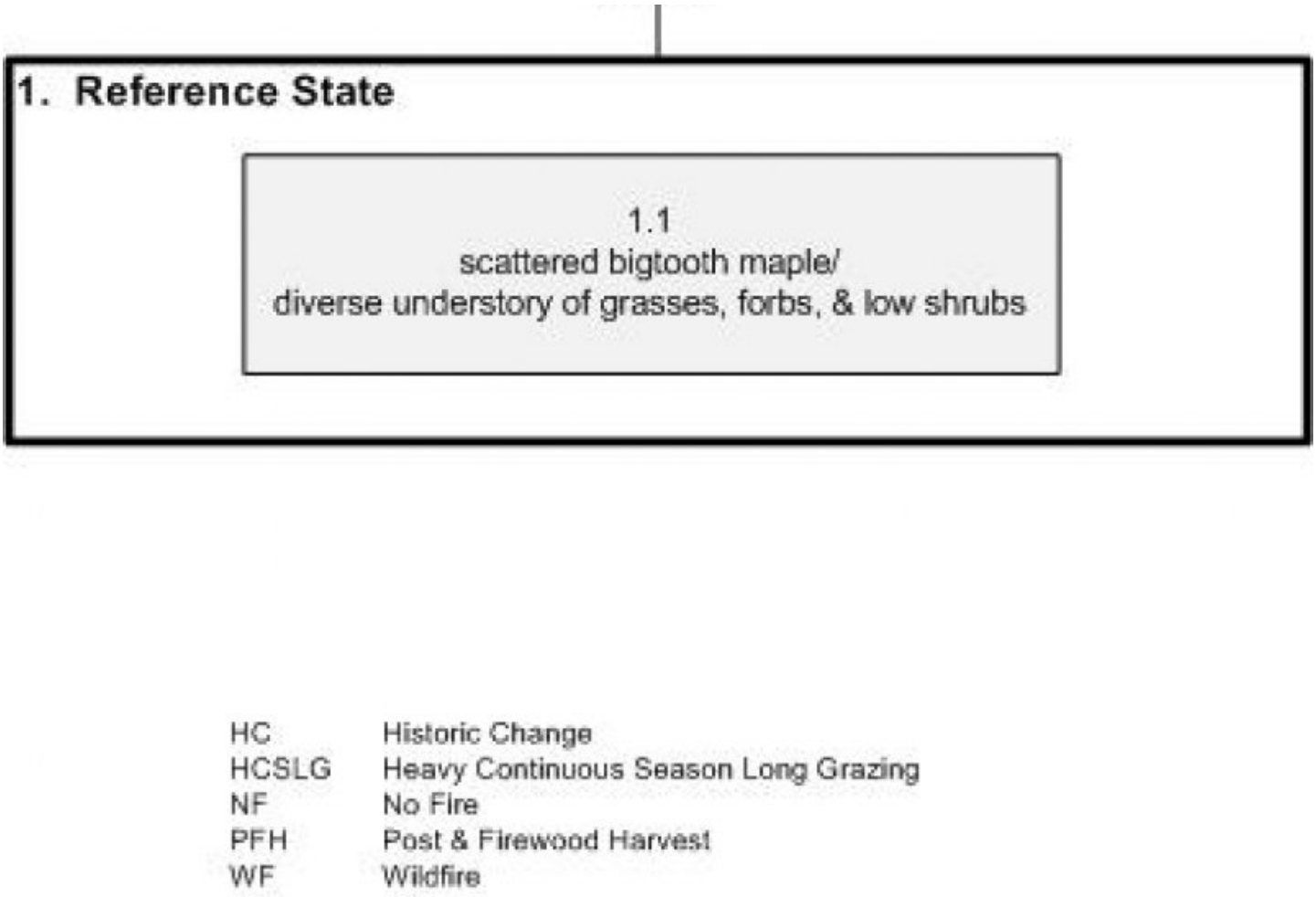


Figure 6. State and Transition Model

State 1
Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and the familiarity of rangeland relict areas where they exist. The least modified plant community would have been dominated by bigtooth maple (*Acer grandidentatum*). Rocky Mountain juniper (*Juniperus scopulorum*) may also have been a common associate. The understory shrubs would have included mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana), antelope bitterbrush (*Purshia tridentata*), and chokecherry (*Prunus virginiana*). Forbs would have included common yarrow (*Achillea millefolium*), arrowleaf balsamroot (*Balsamorhiza sagittata*), sticky purple geranium (*Geranium viscosissimum*), milkvetch (Astragalus spp.), and buckwheats (Eriogonum spp.), among others. Bluebunch wheatgrass (*Pseudoroegneria spicata*), basin wildrye (*Leymus cinereus*), and muttongrass (*Poa fendleriana*) would have been the dominant grasses (1.1). A more complete list of species by lifeform for the Reference State is available in accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document.

Community 1.1
scattered bigtooth maple/ diverse understory of grasses, forbs, & low shrubs

This community is characterized by scattered bigtooth maple with a diverse understory of grasses, forbs and low shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	660	740	820
Grass/Grasslike	495	555	615
Forb	330	370	410
Tree	165	185	205
Total	**1650**	**1850**	**2050**

Table 6. Ground cover

Tree foliar cover	24-26%
Shrub/vine/liana foliar cover	14-16%
Grass/grasslike foliar cover	14-16%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	4-6%
>1 <= 2	–	–	14-16%	–
>2 <= 4.5	–	14-16%	–	–
>4.5 <= 13	24-26%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2
Thickened Bigtooth Maple and Low Shrubs State

State 2 is a description of the ecological site shortly following Euro-American settlement, which has been influenced by the introduction of several non-native plants and animals, possible extinctions of native species, and a different climate. The plant community will be very similar to State 1 with the exception that some introduced species are likely to be present. The herbaceous species still left in the understory are those more tolerant of grazing pressure and/or are relatively unpalatable to livestock such as Woods' rose (*Rosa woodsii*) and mule-ears (*Wyethia amplexicaulis*). This state has potential of accelerated soil erosion. Where accelerated soil erosion has not yet occurred, the potential for stability in this state is high.

Community 2.1
thickened bigtooth maple & low shrubs/ diminished native perennial herbs

This community is characterized by thickened bigtooth maple and low shrubs, such as mountain big sagebrush, antelope bitterbrush, Woods' rose, and chokecherry. While native perennial herbs have diminished, some, including arrowleaf balsamroot, common yarrow, and mules-ear are present.

State 3
Re-sprouting Shrubs/ Introduced Non-natives State

This state occurs following heavy, sustained grazing in conjunction with tree removal for firewood and fence-posts.

Community 3.1
re-sprouting lower statured tall & low shrubs/ invasive understory

This state is characterized by re-sprouting lower statured tall and low shrubs, such as yellow rabbitbrush (*Chrysothamnus viscidiflorus*), rubber rabbitbrush (*Ericameria nauseosa*), and broom snakeweed (*Gutierrezia sarothrae*). Among the few native grasses are an abundance of non-native grasses such as cheatgrass.

Transition T1A
State 1 to 2

The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and climate change has caused State 1 to transition to State 2. The advent of heavy continuous season-long grazing by livestock and fire prevention also contributed to this transition. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

Transition T2A
State 2 to 3

Firewood harvest and/or wildfire will remove the trees while continued heavy livestock grazing during the growing season will further reduce the understory and open it up to introduced non-native species such as cheatgrass (*Bromus tectorum*) and bulbous bluegrass (*Poa bulbosa*). A key indicator of the approach to this transition is the reduction of desirable forage and a loss of larger stems of maple. Sustained heavy grazing is the trigger for this transition.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Tree					
0	**Dominant Trees**			90–180	
	bigtooth maple	ACGRG	*Acer grandidentatum var. grandidentatum*	90–180	–
4	**Sub-dominant Tree**			0–90	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	0–90	–
Shrub/Vine					
0	**Dominant Shrubs**			198–360	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	90–180	–
	chokecherry	PRVI	*Prunus virginiana*	54–90	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	54–90	–
3	**Sub-Dominant Shrubs**			198–504	

	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	90–180	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	18–54	–
	yellow rabbitbrush	CHVIV4	*Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus*	18–54	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	18–54	–
	creeping barberry	MARE11	*Mahonia repens*	18–54	–
	Woods' rose	ROWO	*Rosa woodsii*	18–54	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	18–54	–
Grass/Grasslike					
0	**Dominant Grasses**			252–540	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	90–180	–
	basin wildrye	LECI4	*Leymus cinereus*	90–180	–
	muttongrass	POFE	*Poa fendleriana*	54–90	–
	California brome	BRCA5	*Bromus carinatus*	18–90	–
1	**Sub-Dominant Grasses**			324–792	
	Grass, annual	2GA	*Grass, annual*	90–180	–
	Grass, perennial	2GP	*Grass, perennial*	90–180	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	18–54	–
	Geyer's sedge	CAGE2	*Carex geyeri*	18–54	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	18–54	–
	oniongrass	MEBU	*Melica bulbosa*	18–54	–
	western wheatgrass	PASM	*Pascopyrum smithii*	18–54	–
	Kentucky bluegrass	POPR	*Poa pratensis*	18–54	–
	Sandberg bluegrass	POSE	*Poa secunda*	18–54	–
Forb					
2	**Sub-Dominant Forbs**			450–1170	
	Forb, annual	2FA	*Forb, annual*	90–180	–
	Forb, perennial	2FP	*Forb, perennial*	90–180	–
	common yarrow	ACMI2	*Achillea millefolium*	18–54	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	18–54	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	18–54	–
	lesser rushy milkvetch	ASCO12	*Astragalus convallarius*	18–54	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	18–54	–
	gypsyflower	CYOF	*Cynoglossum officinale*	18–54	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	18–54	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	18–54	–
	common motherwort	LECA2	*Leonurus cardiaca*	18–54	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	18–54	–
	western coneflower	RUOC2	*Rudbeckia occidentalis*	18–54	–
	yellow salsify	TRDU	*Tragopogon dubius*	18–54	–
	stinging nettle	URDI	*Urtica dioica*	18–54	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	18–54	–

Animal community

This site has a fair amount of grass, a small amount of forbs, and an exceptionally high amount of shrubs. There is a large variety of species. This site is especially valuable to sheep but can also be used by cattle and horses. This combination of plants provides balanced nutrition for grazing animals. It should be grazed in spring, summer, and fall.

This site is good for woodland and rangeland habitat.

It provides good to fair habitat for songbirds, chukars, quail, forest grouse, squirrels, snowshoe hares, coyotes, mule deer and elk, especially in areas where oak brush is interspersed with grassy openings.

Hydrological functions

Soil series in this site are grouped into b and c hydrologic groups. They have moderately low to moderately high runoff potential. When the vegetation is in climax (potential), the hydrologic curves for the soils in b hydrologic group are 45 to 40 and those in c hydrologic group are 55 to 50. When range condition has declined from climax, field investigation is needed in order to determine hydrologic curve numbers.

Recreational uses

This site has values for open space and aesthetics. It has a large number of forbs and shrubs which have flowers in bloom from early spring throughout the summer and into the fall. Gently sloping areas provide good camping and picnicking areas. Hunting for elk and mule deer is good on this site.

Wood products

No values exist for lumber. Some values exist for fuel for campfires and fireplace wood from Bigtooth maple. This species also provides fence posts and fence stays, though they tend to rot more quickly than wood from other native plants.

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

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Contributors

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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.

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Date	10/24/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to Rare. Some minor rill development may occur on steeper slopes (> 20%) or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Where these rills are present, they should be fairly short (3-6 feet), < 1 inch deep and somewhat widely spaced (4-8 feet). Minor rill development may be observed on all slopes following major thunderstorm or spring runoff events but should heal during the next growing season.

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2. **Presence of water flow patterns:** Rare. Some very minor evidence of water flow patterns may be found winding around perennial plant bases. They show little evidence of current erosion. They are expected to be short (3-6 feet), stable, sinuous and normally not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat in slopes > 20%.

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3. **Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (1 to 2% of individual plants). Plant roots are covered and most litter remains in place around plant crowns. Terracettes should be absent or, if present, stable. A slight increase in both pedestal and terracette development may occur with increasing slope.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 10% - 20%. Soil surface may be covered by 0 to 35% coarse fragments. Bare ground openings should not be greater than 1 foot in diameter and should normally not be connected.

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5. **Number of gullies and erosion associated with gullies:** None to Very Rare at site level. Scattered landscape level gully channels, however, are a normal component of basin/range environments. Where landscape gullies are present,

they should be stable, partially vegetated on their sides and bottoms, with no evidence of head-cutting. Some slight increase in disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is present. Wind caused blowouts and deposition are not present.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement. Minor litter removal may occur in flow channels with deposition occurring within 1 to 2 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move. However, some litter movement is expected (up to 6 feet) with increases in slopes >20% and/or increased runoff resulting from heavy thunderstorms.

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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):** This site should have a soil stability rating of 5 or 6 under the plant canopies, and a rating of 4 to 5 in the interspaces. The average rating should be a 5. Soil surface textures are typically loams, very fine sandy loams and silt loams.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Elzinga) Soil surface 0-22 inches. Surface texture is a silt loam which may have an organic mat of partially decomposed leaves and twigs 1 inch deep on the surface; color is very dark gray (10YR 3/1); and structure weak fine and medium granular. Mollic epipedon ranges from 20 to 36 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface also protects soil from splash erosion and encourages a higher rate of infiltration. Plant spatial distribution should slow runoff, allowing additional time for infiltration. Bare spaces are expected to be small and irregular in shape and are usually not connected. Vegetative structure is usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing maximum time for infiltration, and reducing runoff and erosion in all but the most extreme storm events. When perennial grasses and shrubs decrease due to natural events including drought, insect damage, etc., which reduce ground cover and increase bare ground, runoff is expected to increase and associated infiltration reduced.

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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):** None. Some soils may have natural textural variability within their profiles, these should not be mistaken for a compaction pan.

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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: Trees (canyon maple, Rocky Mountain juniper) >> Perennial bunchgrasses (bluebunch wheatgrass, basin

wildrye), = > Non-sprouting shrub (mountain big sagebrush, bitterbrush)

Sub-dominant: Rhizomatous grasses (slender wheatgrass, western wheatgrass) > Sprouting shrubs (green rabbitbrush, mountain snowberry) > Perennial forbs (arrowleaf balsamroot).

Other: A wide variety of other perennial grasses and both perennial and annual forbs can be expected to occur in the plant community.

Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 40 to 60+ years. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference. Following a disturbance such as fire, drought, rodents or insects that remove woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a period of time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase. These conditions would reflect different functional community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued during periods of extended drought. Slight decadence in the principle shrubs could occur near the end of the fire cycle or during periods of extended drought, or insect infestations. In general, a mix of age classes should be expected with some dead and decadent plants present.

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14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1 to 3 inches would be considered normal. Perennial vegetation should be well distributed on the site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 1800 - 1900 #/acre on an average year but could range from 1700 - 2000 #/acre during periods of prolonged drought or above average precipitation.

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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:** Cheatgrass, Allysum, mustard species, Canada thistle, black medic, Rocky Mountain juniper.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. Green rabbitbrush sprouts vigorously following fire. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is present during average and above average growing years.
