USDA Natural Resources
Conservation Service

Ecological site F047XC531UT
High Mountain Stony Loam (quaking aspen)

Last updated: 2/05/2025
Accessed: 05/11/2025

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.

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.

LRU notes

This LRU is the Uinta Mountains portion of MLRA 47 that run east and west which includes the Uinta Wilderness and The Flaming Gorge National Recreation Area and towns such as Evanston, Wyoming, Hanna and Tabiona, Utah. Structurally these mountains consist of a broadly folded anticline that has an erosion resistance quartzite core. The Duchesne River and many other tributaries to the Green River run through this range, as well as the headwaters of the Bear River. 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 derived from sandstone, conglomerate, or quartzite. Surface soils are very dark and very cobbly loams and sandy loams in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up more than 50 percent of the soil volume. These soils are deep to very deep, moderately well to well-drained, and have moderately slow to moderate permeability. pH is slightly acidic to slightly alkaline. Available water-holding capacity ranges from 2.8 to 4.8 inches of water in the upper 60 inches of soil. The soil moisture regime is udic and the soil temperature regime is cryic. Precipitation ranges from 22 to 38 inches annually.

Associated sites

F047XC508UT	**High Mountain Loam (quaking aspen)**

Similar sites

F047XC508UT	**High Mountain Loam (quaking aspen)**

Table 1. Dominant plant species

Tree	(1) *Populus tremuloides*
Shrub	(1) *Thalictrum fendleri*
Herbaceous	(1) *Bromus carinatus*

Physiographic features

This ecological site typically occurs on mountain slopes and mountains. Slopes normally range from 20 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 7,200 to 10,300 feet in elevation. Runoff is high.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Mountain
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	7,200–10,300 ft
Slope	20–60%
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	6,860–10,330 ft
Slope	Not specified

Climatic features

The climate of this site characterized by cold, snowy winters and cool summers. The average annual precipitation ranges from 22 to 38 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)	50-70 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	22-38 in
Frost-free period (average)	

Freeze-free period (average)	
Precipitation total (average)	30 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 derived from sandstone, conglomerate, or quartzite. Surface soils are very dark and very cobbly loams and sandy loams in texture. Rock fragments may be present on the soil surface and throughout the profile, but make up more than 50 percent of the soil volume. These soils are deep to very deep, moderately well to well-drained, and have moderately slow to moderate permeability. The pH is slightly acidic to slightly alkaline. Available water-holding capacity ranges from 2.8 to 4.8 inches of water in the upper 60 inches of soil. The soil moisture regime is udic and the soil temperature regime is cryic. Precipitation ranges from 22 to 38 inches annually.

Table 5. Representative soil features

Parent material	(1) Colluvium–quartzite (2) Colluvium–sandstone (3) Colluvium–conglomerate
Surface texture	(1) Very cobbly loam (2) Very cobbly sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Moderately well drained to excessively drained
Permeability class	Moderately slow to moderate
Surface fragment cover <=3"	0–20%
Surface fragment cover >3"	0–10%
Available water capacity (0-60in)	3–5 in
Calcium carbonate equivalent (0-60in)	0–1%
Electrical conductivity (0-60in)	0–1 mmhos/cm
Sodium adsorption ratio (0-60in)	0
Soil reaction (1:1 water) (0-60in)	6.5–7.5
Subsurface fragment volume <=3" (0-60in)	10–40%
Subsurface fragment volume >3" (0-60in)	10–30%

Table 6. Representative soil features (actual values)

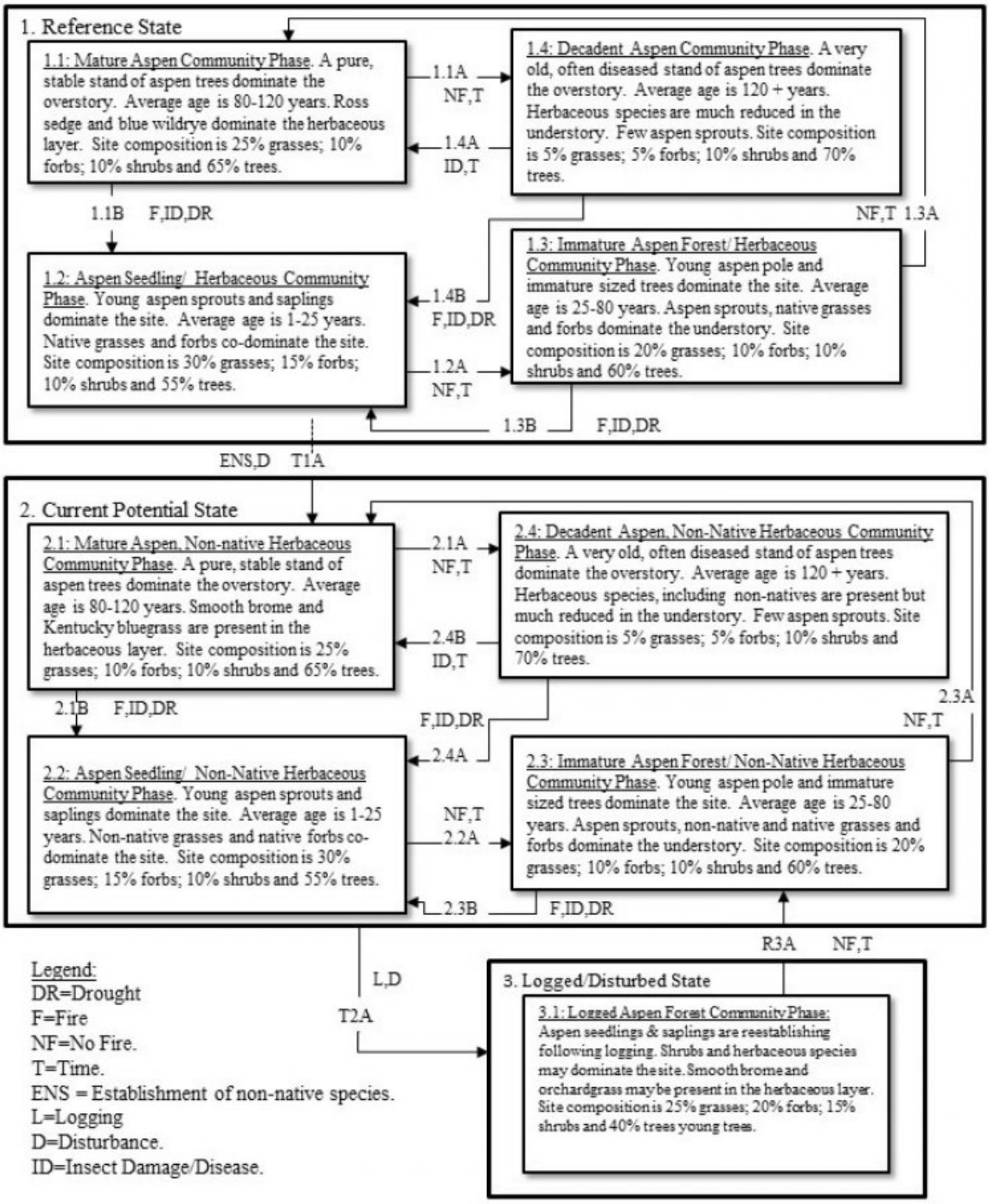
Drainage class	Not specified
Permeability class	Moderately slow to moderately rapid

Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-60in)	1.7–7.1 in
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)	6.4–7.8
Subsurface fragment volume <=3" (0-60in)	Not specified
Subsurface fragment volume >3" (0-60in)	8–34%

Ecological dynamics

The following State and Transition diagram depicts the most common plant communities found on this ecological site. It does not necessarily depict all the plant communities that can occur, but does show the most prevalent and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones added. These descriptions capture the current knowledge and experience at the time of this revision.

State and transition model



State 1
Reference State

This Reference State describes the biotic communities that may become established on this ecological site if all successional sequences are completed under natural disturbance conditions. Species composition is generally dominated by mature or seral aspen community types. Several seral communities are described in this Reference State including those of open canopy, seedling, sapling, pole, immature forest, mature forest, and eventually to an old or over-mature forest type if fire is excluded for very long periods of time. The primary disturbance mechanisms in this state are overstory canopy density, weather fluctuations, and fire, or lack of fire. The Reference State is self-sustaining and resistant to change beyond it's normal seral community types due to a good adaptation to natural disturbances and a high resilience following those disturbances. When natural disturbances such as fire do occur, the rate of recovery can be quite variable.

Characteristics and indicators. Feedbacks: Natural fluctuations in weather patterns that allow for a self-sustaining mix of a aspen, shrubs and native grass and grasslike community. Insect herbivory, more frequent fires, or other disturbances that may allow for the establishment of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for non-native plants to establish. Trigger: The establishment of non-native plant species.

Community 1.1
Mature Aspen Community

This community is dominated by an overstory canopy of mature aspen that have reached or are near maximal heights for the site. Average age is 80 to 120 years. Trees have developed tall, straight, clear stems with short, high rounded crowns. Tree canopy cover ranges from 20 to 40 percent. Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. A few seedlings and/or saplings of quaking aspen occur in the understory. Shade tolerant plants dominate the understory.

Community 1.2
Aspen Seedling/ Herbaceous Community

This community is dominated by aspen sprouts and seedlings, and by perennial grasses and forbs under nearly full sunlight. This stage is experienced after a major disturbance such as crown fire, insect damage or disease. Any skeleton forest (dead trees) remaining have little or no affect on the composition and production of the herbaceous vegetation. Various amounts of tree seedlings 1 to 25 years old are present up to the point where they are obviously a major component of the vegetal structure. Air dry composition of this site is approximately 30 percent grasses, 15 percent forbs, 10 percent shrubs and and 55 aspen reproduction. Thick duff layers are present on some sites.

Community 1.3
Immature Aspen Forest/ Herbaceous Community

This community phase is characterized by a growing canopy of pole sized and/or immature aspen. Trees are developing tall, straight, clear stems with narrow pointed crowns. Average age is 25 to 80 years. Tree canopy cover ranges from 10 to 20 percent. Understory vegetation is somewhat influenced by tree competition, overstory shading, duff accumulation, etc. Seedlings and/or saplings of quaking aspen are common in the understory. Shade tolerant plants dominate the understory. Air dry composition of this site is approximately 20 percent grasses, 10 percent forbs, 10 percent shrubs and and 60 mature aspen. Thick duff layers are present on some sites.

Community 1.4
Decadent Aspen Community

This community is dominated by an overstory canopy of very mature and decadent aspen that have reached maximal heights for the site. Average age is 120 plus years. Trees have developed tall, straight, clear stems with high, very rounded crowns. This phase typically develops in the absence of wildfire or other naturally occurring disturbances including disease and insect damage. Tree canopy cover is at a maximum for the site and is commonly greater than 50 percent. Very old trees often show signs of disease and/or insect damage. Understory vegetation is somewhat sparse due to tree competition, overstory shading, duff accumulation, etc.

Pathway 1.1B

Community 1.1 to 1.2

This community pathway occurs when wildfire removes the aspen overstory. This event can be exacerbated by drought, insect damage or disease.

Pathway 1.1A
Community 1.1 to 1.4

This community pathway occurs when fire is excluded from the plant community for long periods of time.

Pathway 1.2A
Community 1.2 to 1.3

This community pathway occurs when fire is excluded from the plant community for long periods of time.

Pathway 1.3A
Community 1.3 to 1.1

This community pathway occurs when fire is excluded from the plant community for long periods of time.

Pathway 1.3B
Community 1.3 to 1.2

This community pathway occurs when wildfire removes the growing aspen overstory. This event can be exacerbated by drought, insect damage and/or disease.

Pathway 1.4A
Community 1.4 to 1.1

This community pathway occurs when insect damage or disease kills old trees and allows the community to return to a community phase 1.1 type with snags present.

Pathway 1.4B
Community 1.4 to 1.2

This community pathway occurs when wildfire removes the aspen overstory. This event can be exacerbated by drought, insect damage or disease.

State 2
Current Potential State

The Current Potential State is similar to the Reference State, however minor amounts of non-native species may now be present in all community phases. This condition has not been well documented and so community phases in this state are based on possible community dynamics and not documented facts. This state describes the biotic communities that may become established on this ecological site if all successional sequences are completed under natural disturbance conditions. Species composition is generally dominated by mature or seral aspen community types. Shrubs are of minor importance in this state. Several seral communities are described in this Reference State including those of open canopy, seedling, sapling, pole, immature forest, mature forest, and eventually to an old or over-mature forest type if fire is excluded for very long periods of time. The primary disturbance mechanisms in this state are overstory disturbance, canopy density, weather fluctuations, and fire, or lack of fire. The current potential state is still self-sustaining and resistant to change beyond it's normal seral community types due to a good adaptation to natural disturbances and a high resilience following those disturbances. When disturbances such as fire do occur, the rate of recovery can be quite variable.

Characteristics and indicators. Feedbacks: Natural fluctuations in weather patterns that allow for a self-sustaining mix of a aspen, shrubs and native grass and grass-like community. Insect herbivory, more frequent fires, or other disturbances that may allow for the increase of non-native species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for non-native plants to increase. Trigger:

The increase of non-native plant species.

Community 2.1
Mature Aspen, Non-Native Herbaceous Community

This community phase is dominated by an overstory canopy of mature aspen that have reached or are near maximal heights for the site. Trees have developed tall, straight, clear stems with short, high rounded crowns. Tree canopy cover ranges from 20 to 40 percent. Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. A few seedlings and saplings of quaking aspen occur in the understory. Shade tolerant plants dominate understory species. Non-native species including smooth brome, orchardgrass, and Kentucky bluegrass may now be present in the community. Air dry composition of this site is approximately 25 percent grasses, 10 percent forbs, 10 percent shrubs and aspen reproduction and 65 mature aspen. Thick duff layers are present on some sites.

Community 2.2
Aspen Seedling/ Non-Native Herbaceous Community

This community is dominated by aspen sprouts and seedlings, and by perennial grasses and forbs under nearly full sunlight. This stage is experienced after a major disturbance such as crown fire, insect damage or disease. Any skeleton forest (dead trees) remaining have little or no affect on the composition and production of the herbaceous vegetation. Various amounts of tree seedlings 1 to 25 years old are present up to the point where they are obviously a major component of the vegetal structure. Non-native including smooth brome, orchardgrass, and Kentucky bluegrass may also occur on the site. Air dry composition of this site is approximately 30 percent grasses, 15 percent forbs, 10 percent shrubs and and 55 aspen reproduction. Thick duff layers are present on some sites.

Community 2.3
Immature Aspen Forest/Non-Native Herbaceous Community

This community is characterized by a growing canopy of pole-sized and immature aspen. Trees are developing tall, straight, clear stems with narrow pointed crowns. Average age is 25 to 80 years. Tree canopy cover ranges from 10 to 20 percent. Understory vegetation is somewhat influenced by tree competition, overstory shading, duff accumulation, etc. Seedlings and saplings of quaking aspen are common in the understory. Shade tolerant plants dominate understory. Non-native species including smooth brome. orchardgrass and Kentucky bluegrass are present in the community Air dry composition of this site is approximately 20 percent grasses, 10 percent forbs, 10 percent shrubs and and 60 mature aspen. Thick duff layers are present on some sites.

Community 2.4
Decadent Aspen, Non-Native Herbaceous Community

This community phase is dominated by an overstory canopy of very mature and decadent aspen that have reached maximal heights for the site. Average age is 120 plus years. Trees have developed tall, straight, clear stems with high, very rounded crowns. This phase typically develops in the absence of wildfire or other naturally occurring disturbances including disease and insect damage. Tree canopy cover is at a maximum for the site and is commonly greater than 50 percent. Very old trees often show signs of disease and insect damage. Understory vegetation is somewhat sparse due to tree competition, overstory shading, duff accumulation, etc. Minor amounts of non-native species including smooth brome, orchardgrass and Kentucky bluegrass may be present on the community. Air dry composition of this site is approximately 5 percent grasses, 5 percent forbs, 10 percent shrubs and 70 aspen. Bare ground is variable (5 to 30 percent) depending on litter and biological crust cover, which are also variable (10 to 40 percent) and surface rock fragments (0 to 50 percent). Thick duff layers are often present.

Pathway 2.1B
Community 2.1 to 2.2

This community pathway occurs when wildfire removes the growing aspen overstory. This event can be exacerbated by drought, insect damage and disease.

Pathway 2.1A

Community 2.1 to 2.4

This community pathway occurs when fire is excluded from the plant community for long periods of time.

Pathway 2.2A
Community 2.2 to 2.3

This community pathway occurs when fire is excluded from the plant community for long periods of time.

Pathway 2.3A
Community 2.3 to 2.1

This community pathway occurs when fire is excluded from the plant community for long periods of time.

Pathway 2.3B
Community 2.3 to 2.2

This community pathway occurs when wildfire removes the growing aspen overstory. This event can be exacerbated by drought, insect damage and/or disease.

Pathway 2.4B
Community 2.4 to 2.1

This community pathway occurs when insect damage or disease kills old trees and allows the community to return to a community phase 2.1 type with snags present.

Pathway 2.4A
Community 2.4 to 2.2

This community pathway occurs when wildfire removes the growing aspen overstory. This event can be exacerbated by drought, insect damage and/or disease.

State 3
Logged/Disturbed State

The Logged or Disturbed State is similar to the Current Potential State, however merchantable timber composed mostly of mature and old aspen have been removed. Various amounts of invasive species may also now be present in all community phases. This condition has not been well documented and so community phases in this state are based on possible community dynamics and not documented facts. Species composition is generally dominated by an immature canopy of aspen. Shrubs are of minor importance in the understory. A wide diversity of perennial forbs and grasses are also present. Non-native species including orchard grass, Kentucky bluegrass and smooth brome may also be present. These species could have been seeded as part of the site rehabilitation following the logging process. Logging will release younger aspen trees and will give the site the look of an immature forest. Site will return to a mature, and finally an old or over-mature forest type if fire is excluded for very long periods of time. The primary disturbance mechanisms are logging, road building or other man caused activities, weather fluctuations and fire or lack of fire. The logged state is still self sustaining but has a lower resistant to change due to a reduced resistance to disturbances. When disturbances do occur, the rate of recovery can be highly variable.

Characteristics and indicators. Indicators: A community dominated by immature aspen with an understory of aspen reproduction, shrubs, grasses and forbs. The density of the overstory canopy determines the amount and composition of the other native perennial grasses, grass-likes and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow for a self-sustaining mix of a aspen, shrubs and native grass and grass-like community. Insect herbivory, more frequent fires, or other disturbances that may allow for the increase of non-native species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for non-native plants to increase. Trigger: The increase of non-native plant species.

Community 3.1

Logged Aspen Forest Community

This community phase is typically found following logging or other man caused activity such as road building or pipeline construction. It is characterized by a partial canopy of aspen. Pole and/or immature sized trees are present and are beginning to once again dominant the community. Shrubs are a minor component in the understory as well as native perennial grasses and forbs. Non-native species including orchard grass, Kentucky bluegrass and smooth brome may potentially also be found on the site. Understory vegetation is somewhat influenced by tree competition, overstory shading, duff accumulation, etc. Seedlings and/or saplings of quaking aspen are common in the understory. Air dry composition of this site is approximately 25 percent grasses, 20 percent forbs, 15 percent shrubs and and 40 mature aspen. Thick duff layers are present on some sites.

Transition T1a
State 1 to 2

This transitional pathway occurs when various disturbances such as road building, pipeline construction or fence-line clearing provides and opportunity for non-native species to become established. Seeding of these species could be a normal part of these activities. Once non-native species are established, a threshold has been crossed.

Transition T2a
State 2 to 3

This transition occurs when timber logging and its associated activities, including road building and skid trail development, removes mature and over-mature aspen trees from the site and provides an opportunity for non-native species to increase. Seeding species such as orchardgrass and smooth brome would often be a normal part of these activities. Once the site is logged, a threshold has been crossed.

Restoration pathway R3a
State 3 to 2

This restoration pathway occurs following logging activities when the site is allowed to recover naturally. Pole sized and immature aspen trees are increasing in dominance. Seeded, non-native herbaceous species where present, are will established.

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.

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 for fuelwood.

2. Harvest cutting– selectively harvest surplus trees to achieve desired spacing. Harvest stands in small blocks of 1/5 to ½ acre with slash left in place to shelter emerging aspen suckers from browsing.

3. Spacing guide: A spacing of about 15 X 15 feet is considered desirable for multiple use management during period of stand maturity.

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

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 wet soils during critical times of the year.

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

5. Essential Requirements

a. Adequately protect from high intensity wildfire.

b. Protect soils from accelerated erosion.

c. Apply proper grazing management practices

Table 7. 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
quaking aspen	*POTR5*	40	50	16	21	–	–	–	

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

Mueggler, Walter F., 1988 Aspen Community Types of the Intermountain Region, General Technical Report, INT-250, page 42, POTR/SYOR/BRCA

Nevada Soil Conservation Service Forest Suitability Group Description 028BY067NV

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.

Author(s)/participant(s)	

Contact for lead author	
Date	05/11/2025
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:

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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:**
