USDA Natural Resources Conservation Service

Ecological site F025XY073NV
Limber Pine Colluvium

Last updated: 4/24/2024
Accessed: 05/13/2025

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): 025X–Owyhee High Plateau

MLRA Notes 25—Owyhee High Plateau
This area is in Nevada (56 percent), Idaho (30 percent), Oregon (12 percent), and Utah (2 percent). It makes up about 27,443 square miles. MLRA 25 is characteristically cooler and wetter than the neighboring MLRAs of the Great Basin. The western boundary is marked by a gradual transition to the lower and warmer basins of MLRA 24. The boundary to the south-southeast, with MLRA 28B, is marked by gradual changes in geology marked by an increased dominance of singleleaf pinyon and Utah juniper and a reduced presence of Idaho fescue. The boundary to the north, with MLRA 11, is a rapid transition from the lava plateau topography to the lower elevation Snake River Plain.
Physiography:
All of this area lies within the Intermontane Plateaus. The southern half is in the Great Basin section of the Basin and Range province. This part of the MLRA is characterized by isolated, uplifted fault-block mountain ranges separated by narrow, aggraded desert plains. This geologically older terrain has been dissected by numerous streams draining to the Humboldt River.
The northern half of the area lies within the Columbia Plateaus province. This part of the MLRA forms the southern boundary of the extensive Columbia Plateau basalt flows. Most of the northern half is in the Payette section, but the northeast corner is in the Snake River Plain section. Deep, narrow canyons draining into the Snake River have been incised into this broad basalt plain. Elevation ranges from 3,000 to 7,550 feet on rolling plateaus and in gently sloping basins. It is more than 9,840 feet on some steep mountains. The Humboldt River crosses the southern half of this area
Geology:
The dominant rock types in this MLRA are volcanic. They include andesite, basalt, tuff, and rhyolite. In the north and west parts of the area, Cretaceous granitic rocks are exposed among Miocene volcanic rocks in mountains. A Mesozoic igneous and metamorphic rock complex dominates the south and east parts of the area. Upper and Lower Paleozoic calcareous sediments, including oceanic deposits, are exposed with limited extent in the mountains. Alluvial fan and basin fill sediments occur in the valleys.
Climate:
The average annual precipitation in most of this area is typically 11 to 22 inches. It increases to as much as 49 inches at the higher elevations. Rainfall occurs in spring and sporadically in summer. Precipitation occurs mainly as snow in winter. The precipitation is distributed fairly evenly throughout fall, winter, and spring. The amount of precipitation is lowest from midsummer to early autumn. The average annual temperature is 33 to 51 degrees F. The freeze-free period averages 130 days and ranges from 65 to 190 days, decreasing in length with elevation. It is typically less than 70 days in the mountains.
Water:
The supply of water from precipitation and streamflow is small and unreliable, except along the Owyhee, Bruneau, and Humboldt Rivers. Streamflow depends largely on accumulated snow in the mountains. Surface water from mountain runoff is generally of excellent quality and suitable for all uses. The basin fill sediments in the narrow alluvial valleys between the mountain ranges provide some ground water for irrigation. The alluvial deposits along the large streams have the most ground water. Based on measurements of water quality in similar deposits in

adjacent areas, the basin fill deposits probably contain moderately hard water. The water is suitable for almost all uses. The carbonate rocks in this area are considered aquifers, but they are little used. Springs are common along the edges of the limestone outcrops.
Soils:
The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic or frigid temperature regime and an aridic, aridic bordering on xeric, or xeric moisture regime. Soils with aquic moisture regimes are limited to drainage or spring areas, where moisture originates or runs on and through. These soils are of a very limited extent throughout the MLRA. They generally are well drained, clayey or loamy, and shallow or moderately deep. Most of the soils formed in mixed parent material. Volcanic ash and loess mantle the landscape. Surface soil textures are loam and silt loam with ashy texture modifiers in some areas. Argillic horizons occur on the more stable landforms. They are exposed nearer the soil surface on convex landforms, where ash and loess deposits are more likely to erode. Soils that formed in carbonatic parent material in areas that receive less than 12 inches of precipitation are characterized by calcic horizons throughout the profile, while soils in areas that receive more than 12 inches of precipitation do not have calcic horizons in the upper part of the profile. Soils that formed on stable landforms at the lower elevations are dominated by ochric horizons. Soils that formed at the middle and upper elevations are characterized by mollic epipedons. Soils in drainage areas at all elevations that receive moisture running on or through them are characterized by thicker mollic epipedons.
Biological Resources:
This MLRA supports shrub-grass vegetation. Lower elevations are characterized by Wyoming big sagebrush associated with bluebunch wheatgrass, western wheatgrass, and Thurber's needlegrass. Other important plants include bluegrass, squirreltail, penstemon, phlox, milkvetch, lupine, Indian paintbrush, aster, and rabbitbrush. Black sagebrush occurs but is less extensive. Singleleaf pinyon and Utah juniper occur in limited areas. With increasing elevation and precipitation, vast areas characterized by mountain big sagebrush or low sagebrush/early sagebrush in association with Idaho fescue, bluebunch wheatgrass, needlegrasses, and bluegrass become common. Snowberry, curl-leaf mountain mahogany, ceanothus, and juniper also occur. Mountains at the highest elevations support whitebark pine, Douglas-fir, limber pine, Engelmann spruce, subalpine fir, aspen, and curl-leaf mountain mahogany.
Major wildlife species include mule deer, bighorn sheep, pronghorn, mountain lion, coyote, bobcat, badger, river otter, mink, weasel, golden eagle, red-tailed hawk, ferruginous hawk, Swainson's hawk, northern harrier, prairie falcon, kestrel, great horned owl, short-eared owl, long-eared owl, burrowing owl, pheasant, sage grouse, chukar, gray partridge, and California quail. Reptiles and amphibians include western racer, gopher snake, western rattlesnake, side-blotched lizard, western toad, and spotted frog. Fish species include bull, red band, and rainbow trout.

Ecological site concept

This site is on linear to concave mountain side slopes. Slopes range from 30 to over 75 percent. Elevations are typically 7500 feet to over 10,500 feet.

The soils associated with this site formed in residuum and colluvium derived from volcanic parent material. Soils are characterized by a skeletal particle size with greater than 35 percent rock fragments distributed throughout the soil profile.

The reference plant community is dominated by limber pine. Overstory tree canopy composition is 100 percent limber pine. A variety of upland browse species are common in the understory although mountain snowberry and snowbush ceanothus are the principal understory shrubs. Spike fescue, dunhead and Ross' sedges, and Letterman's and Columbia needlegrasses, are the most prevalent understory grasses or grass-like plants. An overstory canopy of about 20 to 35 percent is assumed to be representative of tree dominance on this site in the pristine environment.

This site used to be named: PIFL2/SYOR/LEKI2-ACLE9-CAREX

Associated sites

F025XY078NV	**High Mountain Loam** is found on soils with paralithic bedrock. Dominant species are ABLA/RIMO2/POA-ACLE9-CAREX.

R025XY004NV	**LOAMY SLOPE 16+ P.Z.** is found on soils with paralithic bedrock. Dominant species are ARTRV-SYMPH/BRMA4-ELTR7.

Similar sites

F025XY078NV	**High Mountain Loam** is found on soils with paralithic bedrock. Dominant species are ABLA/RIMO2/POA-ACLE9-CAREX.

Table 1. Dominant plant species

Tree	(1) *Pinus flexilis*
Shrub	(1) *Symphoricarpos oreophilus*
Herbaceous	(1) *Leucopoa kingii* (2) *Achnatherum lettermanii*

Physiographic features

The Limber Pine Colluvium site is on linear to concave mountain side slopes. The site is generally found on northerly aspects at lower elevations and on all aspects at higher elevations. Slopes range from 30 to over 75 percent. Elevations are about 7500 feet to over 10,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	2,286–3,200 m
Slope	30–75%
Water table depth	152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The climate associated with this site is semiarid, characterized by cold, moist winters and warm, dry summers. Mean annual air temperature is 40 to 43 degrees F. Mean annual precipitation across the range of this ecological site is 16 inches.

Monthly mean precipitation: January 1.65”; February 1.68”; March 1.98”; April 2.43”; May 2.41”; June 1.62”; July 0.61”; August 0.63”; September 0.84”; October 1.41”; November 1.51”; December 1.79”.

*The above data is averaged from the Jarbridge 4N and Lamoille PH WRCC climate stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	50-85 days
Freeze-free period (characteristic range)	70-100 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	50-85 days
Freeze-free period (actual range)	70-100 days
Precipitation total (actual range)	330-508 mm
Frost-free period (average)	60 days

Freeze-free period (average)	92 days
Precipitation total (average)	406 mm

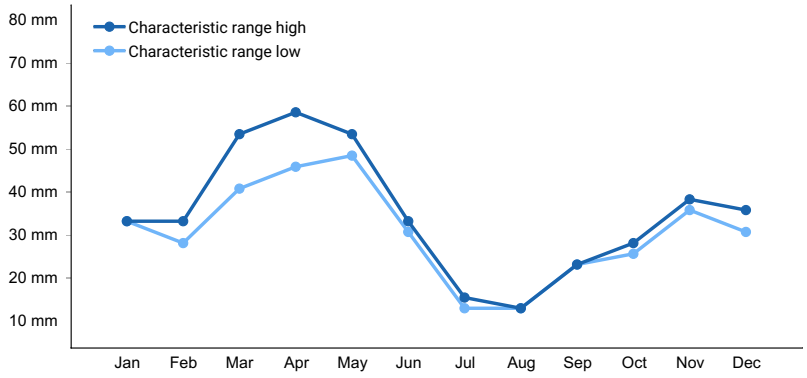


Figure 1. Monthly precipitation range

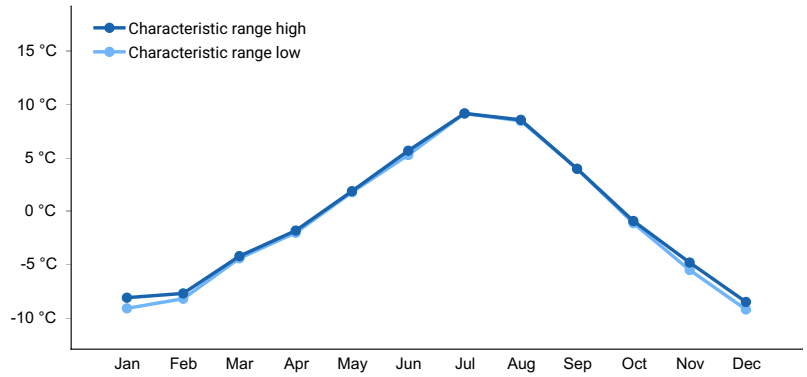


Figure 2. Monthly minimum temperature range

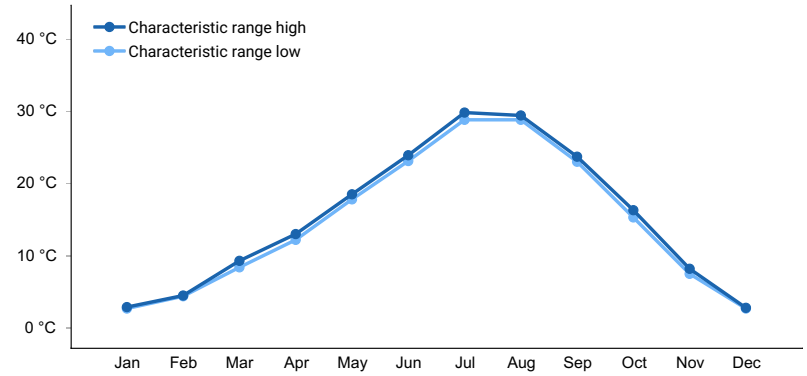


Figure 3. Monthly maximum temperature range

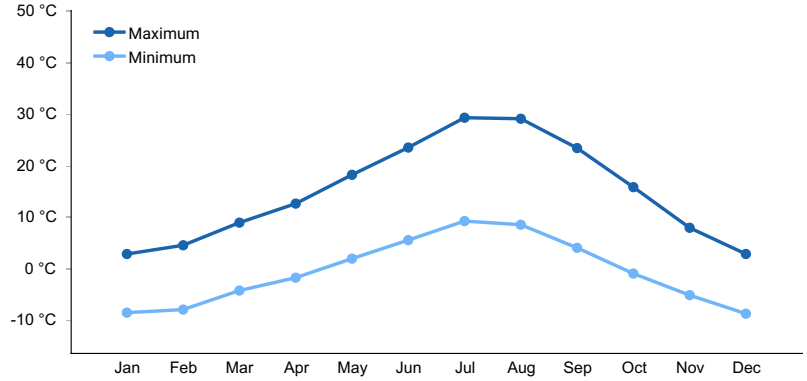


Figure 4. Monthly average minimum and maximum temperature

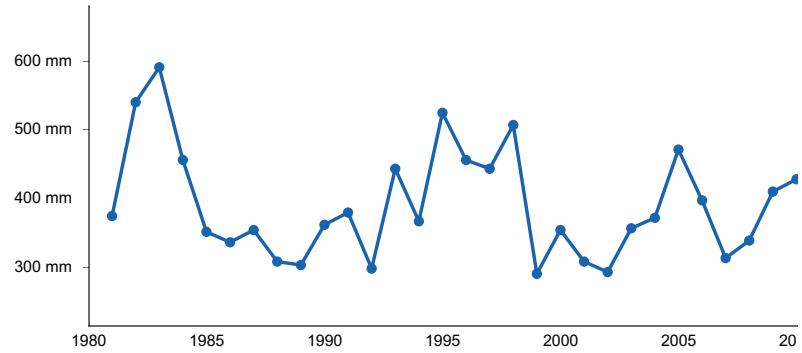


Figure 5. Annual precipitation pattern

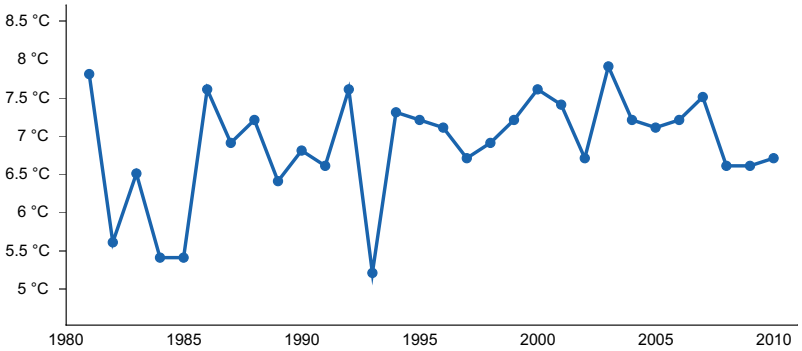


Figure 6. Annual average temperature pattern

Climate stations used

- (1) LAMOILLE YOST [USC00264394], Spring Creek, NV
- (2) JARBIDGE 7 N [USC00264039], Jackpot, NV

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils have skeletal particle size class and typically have 35 to 50 percent gravels, cobbles, or stones distributed throughout the soil profile. Available water capacity is moderate to high and the soils are well to somewhat excessively drained. Runoff is very high and the potential for sheet and rill erosion is moderate to severe depending on steepness of slope and amount of rock fragments on the soil surface.

The soil series correlated with this site include: Jarbidge, Piar, Underdown and Toquima.

Table 4. Representative soil features

Parent material	(1) Colluvium (2) Residuum
Surface texture	(1) Extremely stony silt loam (2) Very stony loam (3) Very cobbly loam (4) Extremely bouldery sandy loam
Family particle size	(1) Loamy-skeletal (2) Sandy-skeletal
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow to slow

Depth to restrictive layer	36–102 cm
Soil depth	36–102 cm
Surface fragment cover <=3"	15–40%
Surface fragment cover >3"	5–60%
Available water capacity (0-101.6cm)	2.29–9.4 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	5–60%
Subsurface fragment volume >3" (Depth not specified)	5–50%

Ecological dynamics

Major Successional Stages of Forestland Development

HERBACEOUS: Vegetation is dominated by grasses and forbs under full sunlight. This stage is experienced after a major disturbance such as wildfire. Skeleton forest (dead trees) remaining after fire or other disturbances has little or no affect on the composition and production of the herbaceous vegetation.

TREE SEEDLING-HERBACEOUS: Herbaceous vegetation and quaking aspen saplings dominate the site. Various amounts of limber pine seedlings (less than 20 inches in height) are present up to the point where they are obviously a component of the vegetal structure.

SAPLING: In the absence of disturbance, limber pine seedlings develop into saplings (20 inches to 4½ feet in height) with a canopy cover generally less than 10 percent. Vegetation consists of grasses and forbs in association with tree saplings.

IMMATURE FORESTLAND: Limber pine greater than 4½ feet in height form a major constituent of the visual aspect and vegetal structure of the plant community. Seedlings and sapling of limber pine are prevalent in the understory. Understory vegetation is moderately influenced by a tree overstory canopy of about 15 to 30 percent.

MATURE FORESTLAND: The visual aspect and vegetal structure are dominated by limber pine that have reached or are near maximal heights for the site. Dominant trees average greater than ten inches in diameter at breast height. Tree canopy cover is typically about 20 to 35 percent. Understory vegetation is moderately influenced by tree competition. Infrequent, yet periodic wildfire is a natural factor influencing the development and maintenance of these mature forestlands. This stage of forestland development is assumed to be representative of this forestland site in the natural environment.

OVER-MATURE FORESTLAND: This stage is dominated by limber pine that have reached maximal heights for the site. Dominant and codominant trees average greater than ten inches in diameter at breast height (DBH). Understory vegetation is sparse due to tree competition, overstory shading, duff accumulation, etc. Tree canopy cover is commonly greater than 40 percent.

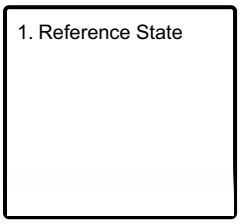
The amount and nature of the understory vegetation in a forestland is highly responsive to the amount and duration of shade provided by the overstory canopy. Significant changes in kinds and abundance of plants occur as the canopy changes. Some changes occur slowly and gradually as a result of normal changes in tree size and spacing.

Other changes occur dramatically and quickly, following intensive harvest, thinning, or fire.

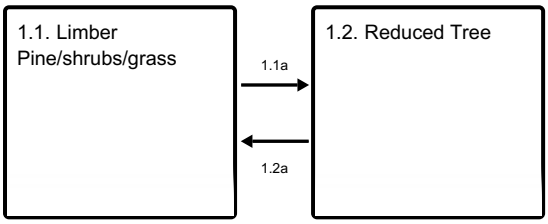
Fire Ecology:
Limber pine is often killed by fire because of it’s relatively think bark. Mature trees with thicker bark can survive low-severity fires. Terminal buds are protected from the heat associated with crown scorch by the tight clusters of needles around them. The vulnerability of this species to fire is reduced by open stand structure, sparse fuels, and sparse undergrowth of limber pine communities. Fires top-kill mountain snowberry. Although plant survival may be variable, mountain snowberry root crowns usually survive even severe fires. Mountain snowberry sprouts from basal buds at the root crown following fire. Little specific information is available on adaptations of Letterman's needlegrass to fire. It is morphologically similar to Columbia needlegrass, which is only slightly to moderately damaged by fire. Season of burn affects the plant's ability to survive a fire. Needle grass tends to be more susceptible to fire when burned during mid-summer. Post fire regeneration is through seeding and tillering.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

The Reference State is representative of the natural range of variability under pristine conditions. This Reference State has two general community phases: a dominant tree/shrub phase and a dominant tree/grass phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Community 1.1
Limber Pine/shrubs/grass

The reference plant community is dominated by limber pine. Overstory tree canopy composition is 100 percent limber pine. A variety of upland browse species are common in the understory although mountain snowberry and snowbush ceanothus are the principal understory shrubs. Spike fescue, dunhead and Ross’ sedges, and Letterman’s and Columbia needlegrasses, are the most prevalent understory grasses or grass-like plants. An overstory canopy of about 20 to 35 percent is assumed to be representative of tree dominance on this site in the pristine environment.

Forest overstory. MATURE FORESTLAND: The visual aspect and vegetal structure are dominated by limber pine that have reached or are near maximal heights for the site. Dominant trees average greater than ten inches in diameter at breast height. Tree canopy cover is typically about 20 to 35 percent. Understory vegetation is moderately influenced by tree competition. Infrequent, yet periodic wildfire is a natural factor influencing the development and maintenance of these mature forestlands. This stage of forestland development is assumed to be representative of this forestland site in the natural environment.

Forest understory. Understory vegetative composition is about 70 percent grasses, 5 percent forbs and 25 percent shrubs and young trees when the average overstory canopy is medium (20 to 35 percent). Average understory production ranges from 200 to 500 pounds per acre with a medium canopy cover. Understory production includes the total annual production of all species within 4½ feet of the ground surface.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	157	275	392
Shrub/Vine	29	52	73
Tree	27	47	67
Forb	11	19	28
Total	**224**	**393**	**560**

Community 1.2
Reduced Tree

Limber pine may be reduced but remain a major component of the overstory. Sprouting shrubs such as currant and creeping barberry may be sprouting or increasing in the understory. Perennial bunchgrasses may be reduced the first season after fire but will likely increase in cover and density due to the reduced competition from shrubs and trees.

Pathway 1.1a
Community 1.1 to 1.2

A low severity, lightning strike would reduce a few trees and the shrubs in the understory and allow the perennial bunchgrasses to increase.

Pathway 1.2a
Community 1.2 to 1.1

Time without disturbance such as fire, drought or disease will allow for the trees and shrubs to increase in height and density.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses/Grasslikes**			195–448	
	dunhead sedge	CAPH2	*Carex phaeocephala*	39–94	–
	Ross' sedge	CARO5	*Carex rossii*	39–94	–
	spike fescue	LEKI2	*Leucopoa kingii*	39–94	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	39–94	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	19–36	–
	bluegrass	POA	*Poa*	19–36	–
2	**Secondary Perennial Grasses**			3–19	
	big squirreltail	ELMU3	*Elymus multisetus*	3–19	–
Forb					
3	**Perennial**			3–19	
	ragwort	SENEC	*Senecio*	3–19	–
Shrub/Vine					
4	**Primary Shrubs**			19–36	
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	19–36	–
5	**Secondary Shrubs**			8–41	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	3–19	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	3–19	–
	buckwheat	ERIOG	*Eriogonum*	1–3	–
Tree					
6	**Evergreen**			19–36	
	limber pine	PIFL2	*Pinus flexilis*	19–36	–
7	**Deciduous**			7–38	
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	3–19	–
	quaking aspen	POTR5	*Populus tremuloides*	3–19	–

Animal community

Livestock Interpretations:
This site is poorly suited to cattle and sheep grazing due to steep slopes and lack of adequate water. Where terrain permits livestock use, grazing management should be keyed to perennial grass production. Spike fescue is nutritious and remains palatable throughout the grazing season. This grass provides palatable, quality, feed during the summer. Spike fescue withstands grazing well, but new plants are established from seed and grazing practices should allow for ample seed production and seedling establishment. Livestock will often concentrate on this site taking advantage of the shade and shelter offered by the tree overstory.

The forage value rating is not an ecological evaluation of the understory as is the range condition rating for rangeland. The forage value rating is a utilitarian rating of the existing understory plants for use by specific kinds of grazing animals.

The amount and nature of the understory vegetation in a forestland is highly responsive to the amount and duration of shade provided by the overstory canopy. Significant changes in kinds and abundance of plants occur as the canopy changes, often regardless of grazing use.

Wildlife Interpretations:
This site has high value for mule deer during the summer and fall. The pine trees provide protection from summer heat. Upland game species including blue grouse use this site. It is also used by various song birds, rodents, reptiles and associated predators natural to the area.

Hydrological functions

The hydrologic cover condition of this site is fair in a representative stand. The average runoff curve is about 90 for group D soils.

Recreational uses

The trees on this site provide a beautiful contrast to the adjacent quaking aspen communities. Steep slopes inhibit many forms of recreation.

Wood products

PRODUCTIVE CAPACITY

Very low quality site for tree production. At present, site productivity and site index information is not available for limber pine.

MANAGEMENT GUIDES AND INTERPRETATIONS

1. LIMITATIONS AND CONSIDERATIONS
a. Moderate to severe equipment limitations due to surface stoniness.
b. Severe equipment limitations due to steep slopes.
c. Potential for sheet and rill erosion is severe.

2. ESSENTIAL REQUIREMENTS
a. Protect soils from accelerated erosion.
b. Adequately protect from uncontrolled fire.

3. SILVICULTURAL PRACTICES
Silvicultural treatments are not feasible on this site due to poor site quality and severe limitations for equipment and tree harvest.

Other products

Limber pine is used in the nursery trade for landscaping.

Other information

Mountain snowberry is useful for establishing cover on bare sites and has done well when planted onto roadbanks.

Inventory data references

Physiographic and Soils features were gathered from NASIS database.

Type locality

Location 1: Humboldt County, NV	
General legal description	About 2 miles south of Windy Gap, Santa Rosa Range, Humboldt-Toiyabe National Forest, Humboldt County, Nevada.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

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Contributors

GKB

Approval

Kendra Moseley, 4/24/2024

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	05/13/2025
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):**

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:**
