Ecological site F028BY107NV
Deep North Facing Mountain Sideslopes

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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): 028B–Central Nevada Basin and Range

MLRA 28B occurs entirely in Nevada and comprises about 23,555 square miles (61,035 square kilometers). More than nine-tenths of this MLRA is federally owned. This area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by long, gently sloping to strongly sloping alluvial fans. The mountains are uplifted fault blocks with steep sideslopes. Many of the valleys are closed basins containing sinks or playas. Elevation ranges from 4,900 to 6,550 feet (1,495 to 1,995 meters) in the valleys and basins and from 6,550 to 11,900 feet (1,995 to 3,630 meters) in the mountains.
The mountains in the southern half are dominated by andesite and basalt rocks that were formed in the Miocene and Oligocene. Paleozoic and older carbonate rocks are prominent in the mountains to the north. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments are throughout this area. The valleys consist mostly of alluvial fill, but lake deposits are at the lowest elevations in the closed basins. The alluvial valley fill consists of cobbles, gravel, and coarse sand near the mountains in the apex of the alluvial fans. Sands, silts, and clays are on the distal ends of the fans.
The average annual precipitation ranges from 4 to 12 inches (100 to 305 millimeters) in most areas on the valley floors. Average annual precipitation in the mountains ranges from 8 to 36 inches (205 to 915 millimeters) depending on elevation. The driest period is from midsummer to midautumn. The average annual temperature is 34 to 52 degrees F (1 to 11 degrees C). The freeze-free period averages 125 days and ranges from 80 to 170 days, decreasing in length with elevation.
The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an aridic or xeric soil moisture regime, and mixed or carbonatic mineralogy. They generally are well drained, loamy or loamyskeletal, and shallow to very deep.
Nevada’s climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms and heavy snowfall in the higher mountains. Three basic geographical factors largely influence Nevada’s climate: continentality, latitude, and elevation. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, as a result the lowlands of Nevada are largely desert or steppes.
The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating. Nevada lies within the midlatitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs.
To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with

occasional thundershowers. The eastern portion of the state receives noteworthy summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Ecological site concept

The Deep North Facing Mountain Sideslopes occurs on smooth, north facing mountain sideslopes. Slopes range from 30 to 75 percent. Elevations are 8,700 to over 10,300 feet.
The soils associated with this site are deep and well drained. These soils have formed in residuum and colluvium from limestone and calcareous shale.
The reference state is dominated by Great Basin bristlecone pine (*Pinus longaeva*) and limber pine (*Pinus flexilis*). Muttongrass, bottlebrush squirreltail, currant, whitestem goldenbush, and mountain snowberry are common in the understory.

The Deep North Facing Mountain Sideslopes site was formerly named PILO-PIFL2/RIBES.

Associated sites

F028BY072NV	**Concave Mountain Slopes** Occurs on slightly shallower soil with a deeper organic horizon.

Similar sites

F028AY082NV	**PILO-PIFL2/RIBES-JUCO6/CARO5-POA** This site occurs on inset fans and fan remnants. Slopes range from 2 to 15 percent, but slope gradients of 2 to 4 percent are most typical. Elevations are 6200 to 7000 feet. The soils associated with this site have formed in silty alluvium from mixed rock sources. These soils are very deep and are well drained. Surface textures are generally silt loams to sandy loams. They have a moderate to high available water capacity. Runoff is low to high and permeability is moderately slow to moderate.
F028AY081NV	**PILO-PIFL2/RIBES-JUCO6/CARO5-POA** This site occurs on flood plains and stream terrace. Slope gradients range from 0 to 15 percent, but slopes of 0 to 4 percent are most typical. Elevations are 4000 to 6800 feet.

Table 1. Dominant plant species

Tree	(1) *Pinus longaeva* (2) *Pinus flexilis*
Shrub	(1) *Ribes*
Herbaceous	Not specified

Physiographic features

The Deep North Facing Mountain Sideslopes site occurs on smooth, north facing mountain sideslopes. Slopes range from 30 to 75 percent. Elevations are 8,700 to over 10,300 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain
Runoff class	High
Elevation	2,652–3,139 m
Slope	30–75%
Water table depth	183 cm
Aspect	NW, N, NE

Climatic features

The climate is semi-arid. In general it is characterized by cold, moist winters and warm, dry summers. There are no available climate stations.

Table 3. Representative climatic features

Frost-free period (characteristic range)	30-50 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	
Frost-free period (average)	
Freeze-free period (average)	40 days
Precipitation total (average)	635 mm

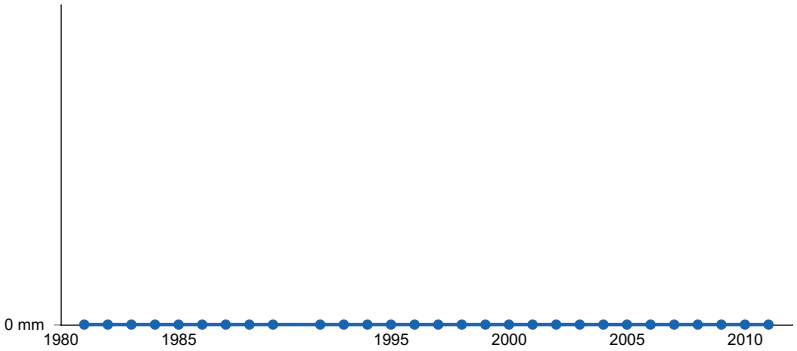


Figure 1. Annual precipitation pattern

Influencing water features

Influencing water features are not associated with this site.

Soil features

The soils are deep, well drained, and formed in colluvium and residuum from limestone and calcareous shale. These soils are slightly to moderately alkaline increasing with depth and are effervescent throughout. Soils are characterized by an ochric epipedon, a cambic horizon and a calcic horizon. The soil surface is covered with approximately 60 percent rock fragments, consisting mostly of gravels and cobbles. The soil profile is skeletal with over 60 percent gravel. Available water holding capacity is low. Runoff is high and permeability is moderate.
The soil series correlated to this ecological site is Piar, Loamy-skeletal, carbonatic Xeric Calcicryepts.
Representative map unit: NV778 4323

Table 4. Representative soil features

Parent material	(1) Residuum–limestone and shale (2) Colluvium–limestone and shale
Surface texture	(1) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	99–150 cm
Surface fragment cover <=3"	35–50%
Surface fragment cover >3"	1–10%

Available water capacity (0-101.6cm)	6.1–6.35 cm
Calcium carbonate equivalent (0-101.6cm)	5–35%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–80%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and it has a set of key characteristics that influence a site's resilience to disturbance and resistance to invasives. Key characteristics include 1) climate (precipitation, temperature), 2) topography (aspect, slope, elevation, and landform), 3) hydrology (infiltration, runoff), 4) soils (depth, texture, structure, organic matter), 5) plant communities (functional groups, productivity), and 6) natural disturbance regime (fire, herbivory, etc.) (Caudle et al. 2013). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

Great Basin bristlecone pine is found in Nevada, Utah and California usually on dry, rocky mountain slopes in the transition zone between subalpine forests and alpine tundra (Beasley 1972). Great Basin bristlecone pine ranges in elevations from 6760 to 11,600 feet. It is one of the most widely distributed high-elevation pines in Nevada, second to the limber pine. It has been found in 20 of Nevada's mountain ranges in eight counties (Charlet 1996). These pines grow in harsh climates characterized by strong winds, intense solar radiation, and limited soil moisture. In the White Mountains of California, the Great Basin bristlecone withstands temperatures well below freezing, to only 50 degrees F in the summer. Precipitation averages 18 inches annually. Most trees reach a height of 30 feet, but pines in the White Mountains have been measured as tall as 60 feet with five foot diameter trunks. Bristlecone pine needles can live up to 40 years of age, and are functional throughout (Lanner 2002).

Great Basin bristlecone pine is an extremely long-lived, native conifer of highly variable growth form. Low-elevation trees are tall and upright in dense stands, while at high-elevations they become twisted and contorted in open communities (Fryer 2004, Lanner 2007). The current elevational zone ranges from 7200 to 12000 feet, but has varied over time in response to natural variations in the climate. In geologic time, it has shown the greatest population expansion with cool temperatures. During the Pleistocene, Great Basin bristlecone pine forests extended far down mountain slopes toward the shoreline of ancient Lake Bonneville.

Great Basin bristlecone pine is highly drought tolerant and can subsist throughout the successional process. While these trees have low requirements for nutrients and moisture they are intolerant of shady conditions and prefer exposed slopes and ridges. High light requirements preclude the establishment of bristlecone pine under dense canopies (Beasley 1972). Great Basin bristlecone pine has a highly branched, shallow root system. Few large branching roots provide structural support and maximize water absorption. Tolerance of dry conditions is increased by waxy needles and thick needle cuticles, which help regulate water loss (Fryer 2004). Bristlecone pine is also able to withstand relatively high internal water stress, plant-water potential values as low as -32 bars have been measured (Beasley 1972).

A common insect pest of the Great Basin bristlecone pine is mountain pine beetle (Dendroctonus ponderosae) (Lanner 2007). Heavy infestations are often fatal and affect many trees over large areas. White pine blister rust (WPBR) is of great concern to Great Basin bristlecone pines. It is caused by the fungus Cronartium ribicola and spreads to five-needled white pines from its host plant, Ribes. White pine blister rust has not yet been discovered in Great Basin bristlecone pine (Schoettle and Sniezko 2007). However, WPBR was not discovered in Rocky

Mountain bristlecone pine until almost 100 years after its first detection in North America and there is no biological or environmental reason to expect Great Basin bristlecone pine is resistant to infection. Life history traits of Great Basin bristlecone pine promote susceptibility to WPBR. All North American five-needle pines have some resistance to WPBR, although frequency of resistance is low in all species. High elevation white pines have adaptive traits that allow them to persist for hundreds to thousands of years on harsh sites. This longevity is also contributed to a lack of stand-replacing disturbances. As a result, even where trees with rust-resistance are present, without regeneration opportunities the number of individuals with this resistance will not increase (Schottle and Sniezko 2007). Management options to protect uninfected populations or increase resistance may include managing forest composition, increasing host vigor, introduction of resistant container stock and diversifying age class structure.

Limber pine ranges from 6000 to 11,500 ft. in elevation, it has been found in 51 mountain ranges in Nevada and 11 counties. These trees often exhibit a stunted growth form also known as krummholz where they exceed 10,800 ft. in elevation (Lanner 2002).
Primary natural disturbance mechanisms affecting this ecological site are periodic drought, infrequent wildfire, disease and insect attack. This site experiences an extended fire return interval due to lack of herbaceous understory and widely spaced trees. High-elevation Great Basin bristlecone pine forests are largely influenced by climate and seed dispersal instead of fire. The plant community phases of this state can last for extended periods of time. Great Basin bristlecone pine are slow growing, tolerant of harsh environmental conditions and can attain extremely old ages. Non-native plant species have not been found in these sites, therefore this STM consists of one state; the reference state.

Fire Ecology:
Fire is very infrequent in high elevation forests dominated by Great Basin bristlecone pine forests, due to low herbaceous production and widely spaced trees. Fires in these zones are more likely related to El Nino events and higher production years (Sherriff et al. 2001). In the more productive sites bristlecone pine and limber pine may be dependent on infrequent stand replacing fires which reduce competition by other tree species and create open areas that promote regeneration (Coop and Schoettle 2009). Fire increases limber pine and bristlecone pine seedling establishment but the regeneration of these species is slow (Coop and Schoettle 2009).

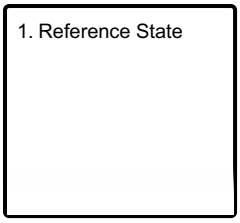
The spread of wildfire from lightning is unlikely, but individual trees may ignite. As a thin-barked pine Great Basin bristlecone pine is only able to survive low–severity fires. Stand dynamics are more heavily influenced by climate and seed dispersal patterns than fire. Muttongrass is tolerant of low severity fire, but may be killed by more severe fires. Post-fire regeneration occurs from surviving root crowns and from seed. Ross' sedge survives fire through buried seed with long term viability. These seeds germinate after heat treatment.
Limber pine has been noted to be the first to colonize areas after burn. This is in part due to the seed dispersal mechanism; which is mainly by Clark’s nutcracker which prefers to cache in open burn sites (Lanner and Vander Wall 1980, Rebertus et al. 1991). Limber pine decreases in later succession with the increase in other more shade tolerant species (Donnegan and Rebertus 1999).

Logging and other ground disturbance can cause an increase in Ribes species such as gooseberry. This is in part due to the exposure of mineral soil, the removal of forest canopy which increases sunlight, and alterations in the soil moisture (Benedict and Harris 1931).

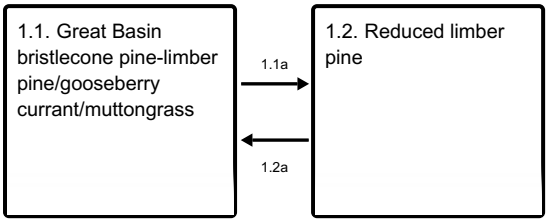
Management Interpretations:
Climate change may be hindering regeneration of Great Basin bristlecone pines on sites in the interior Great Basin; however these changes are difficult to predict. In many places, populations shift occur upslope of existing populations, indicating a potential to accommodate a warming climate. Concern grows over the susceptibility of Great Basin bristlecone pine to White Pine Blister Rust. Great Basin bristlecone pine is one of the five-needle pines susceptible to the exotic pathogen and populations in the White and Inyo Mountains occur close to moderately high infection centers in the Sierra Nevada. However, the Great Basin bristlecone pine has shown high resistance to blister rust in laboratory tests, in part due to wax-occluded stomata. Great Basin bristlecone pine is susceptible to mountain pine beetle (Dendroctonus ponderosae), dwarf mistletoe, wood-rot basidiomycetes and wood decay fungi. The dry high-elevation sites of most Great Basin Bristlecone Pine currently serve to slow fungal growth and wood decay (Stritch et al. 2011).

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

The Reference State 1.0 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
Great Basin bristlecone pine-limber pine/gooseberry currant/muttongrass

The reference plant community is dominated by Great Basin bristlecone pine (*Pinus longaeva*) and limber pine (*Pinus flexilis*). Muttongrass and bottlebrush squirreltail are the principal understory grasses. Gooseberry currant, wax currant, whitestem goldenbush, and mountain snowberry are the principal understory shrubs. An overstory canopy cover of 30 to 40 percent is assumed to be representative of tree dominance on this site in the pristine environment. The overstory canopy is about 75 to 80 percent bristlecone pine, 20 to 25 percent limber pine, and 5 percent, or less, other conifers such as white fir and Engelmann's spruce.

Forest overstory. MATURE FOREST: In the absence of wildfire or other naturally occurring disturbances, the bristlecone trees on this site can become very old. This stage is dominated by ancient bristlecone pine trees and standing snags of dead bristlecone trees.

Forest understory. Understory vegetative composition is about 25 percent grasses, 25 percent forbs and 50 percent shrubs and young trees when the average overstory canopy is medium (30 to 40 percent). Average understory production ranges from 75 to 150 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)
Shrub/Vine	34	45	67
Grass/Grasslike	21	28	43
Forb	21	28	41
Tree	8	11	17
Total	**84**	**112**	**168**

Community 1.2

Reduced limber pine

Bristlecone pine trees may show some fire damage but will most likely survive a low intensity fire. Limber pine may be reduced but remain a major component of the overstory. Juniper is killed by fire and may take many years to reestablish. Sprouting shrubs such as currant and creeping barberry may be sprouting or increasing in the understory. Sedges and 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.

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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 sedges and 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**			22–47	
	muttongrass	POFE	*Poa fendleriana*	11–27	–
	pine needlegrass	ACPI2	*Achnatherum pinetorum*	6–10	–
	squirreltail	ELELE	*Elymus elymoides ssp. elymoides*	6–10	–
2	**Secondary Perennial Grasses**			2–11	
	Ross' sedge	CARO5	*Carex rossii*	1–6	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	1–6	–
Forb					
3	**Perennial**			15–37	
	lupine	LUPIN	*Lupinus*	6–10	–
	Watson's penstemon	PEWA	*Penstemon watsonii*	6–10	–
	mock goldenweed	STENO7	*Stenotus*	1–6	–
	thistle	CIRSI	*Cirsium*	1–6	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	1–6	–
Shrub/Vine					
4	**Primary Shrubs**			39–84	
	wax currant	RICE	*Ribes cereum*	11–27	–
	gooseberry currant	RIMO2	*Ribes montigenum*	11–27	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	6–10	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–10	–
	whitestem goldenbush	ERDI14	*Ericameria discoidea*	6–10	–
5	**Secondary Shrubs**			1–6	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	1–6	–
Tree					
6	**Evergreen**			4–22	
	Engelmann spruce	PIEN	*Picea engelmannii*	1–6	–
	limber pine	PIFL2	*Pinus flexilis*	1–6	–
	Great Basin bristlecone pine	PILO	*Pinus longaeva*	1–6	–

Animal community

Livestock Interpretations:
This site is not well suited to cattle or sheep grazing although grazing animals may use this site during the hot summer months. Herbaceous forage production is quite low and the site is not easily accessed because of steep slopes and lack of adequate water.

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

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.

Wildlife Interpretations:
This area has moderate value for big game during the summer, fall, and early winter, especially in areas with gooseberry or other browse species in the understory. It is used by various song birds, rodents and associated predators natural to the area.

Wildlife Interpretations:
Great Basin bristlecone pines and a wide array of other plants, provide shelter and forage for numerous wildlife (Fryer 2004). Bristlecone pine acts as a major source of cover for animals in high-elevation ecosystems (Logan and Powell 2001). Ground squirrels (Otospermophilus beecheyi) that occur in subalpine habitat will use Great Basin bristlecone pines for shelter (Lanner 1984, Fryer 2004). Several other mammals, although do not actively use the tree for food or shelter, inhabit the same ecosystems (subalpine, montane, timberline and limberpine) in which Great Basin bristlecone pines occur in Nevada. Yellow bellied marmot (Marmota flaviventris) found in meadows, valleys, and foothills, where forests and meadows form a mosaic will also inhabit subalpine communities above 6500 feet (Great Basin National Park, Listing Sensitive and Extirpated Species 2006, Linzey and Hammerson 2008). The water shrew (Sorex palustris) although restricted to riparian environments occurs in montane communities where Great Basin bristlecone pines are known to grow (Great Basin National park, Listing Sensitive and Extirpated Species 2006). Inyo shrew (Sorex tennellus) is confirmed to occur in subalpine communities at 9900 feet. The ringtail (Bassaricus atutus), ermine (Mustela ermine), long-tailed weasel (Mustela frenata), and striped skunk (Mephitis mephitis) all have a wide ranging habitat including high-elevation, forested subalpine uplands and are documented as occurring above 9,000 feet (Gold berg 2003, Great Basin National Park, Listing Sensitive and Extirpated Species 2006, Zevit 2012, Kiiskila 2014).
Several bat species occur within Great Basin bristlecone pine habitat, adding to the community's diversity. The fringed myotis (Myotis thysanodes), long-eared myotis (Myotis evotis), long-legged myotis (Myotis volans), silver-haired bat (Lasionycteris noctivagans), Townsend's big-eared bat (Corynorhinus townsendii), all are documented as occurring in coniferous, subalpine forests above 9000 feet (Keinath 2003, Arroyo-Calbrales and Alvares-Castneda 2008, Warner and Czaplewski 1984, Armstrong 2007, Sullivan 2009, Great Basin National Park, Listing Sensitive and Extirpated Species 2006).
Many species of birds also use the Great Basin bristlecone pine habitat for shelter and food. Censuses determined the broad-tailed hummingbird (Selasphorus platycereus), northern flicker (Colaptes auratus), dusky flycatcher (Empidonax oberholseri), mountain chickadee (Parus gambeli), White-breasted nuthatch (Sitta carolinensis), rock wren (Salpinctes obsoletus), American robin (Turdus migratorius), hermit thrush (Catharus guttatus), mountain bluebird (Sialia currucoides), Townsend's solitaire (Myadestes townsendi), yellow-rumped warbler (Dendroica coronata), Cassin's finch (Carpodacus cassinii), pine siskin (Carduelis pinus) and dark-eyed junco (Junco hyemalis) use the Great Basin bristlecone pine for nesting. (Medin, 1984, Fryer 2004). The Clark's nutcracker (Nucifraga columbiana) is believed to help with seedling establishment and dispersal (Lanner 1984). The small winged seeds of Great Basin bristlecone pine are not favored by the Clark's nutcracker, but when limber pines and singleleaf pinyons do not bear seeds, the Clark's nutcracker will forage on the Great Basin bristlecone (Lanner 1984). The seeds provide food for the Clark's nutcracker; they remove the seeds of pines from their cones, eat some, and store others in shallow subsurface caches (Lanner 1988). In a study by Lanner (1988), it was indicated that Great Basin bristlecone pine regeneration was dependent on these birds in harsh sites.
Habitat distribution of reptiles and amphibians is not as widely studied as other animals and few reptiles and amphibians are found at such high elevations where Great Basin bristlecone pines occur. However; the Sonoran mountain kingsnake (Lampropeltis pyromelana), a highly secretive reptile, which prefers ponderosa pine habitat has been captured at elevations upwards of 9000 feet; suggesting that this snake could occur in habitats shared with Great Basin bristlecone pine (Brennan 2008, Great Basin National Park, Listing Sensitive and Extirpated Species 2006). Also, the western toad (Anaxyrus boreos) has a very wide ranging habitat throughout Nevada, and, if it is near vernal pools the western toad's habitat could also overlap with Great Basin bristlecone pine habitat. In fact, it has been trapped at elevations of 9000 feet (Lindsdale 1940). The distribution of most of herpetafuana present in these high-elevation woodlands is poorly understood and more research and management are needed.
Great Basin bristlecone pines are host for two species of bark beetles (Scolytus dentatus, and Carphoborus declivis) that have only been collected in the White Mountains (Bright 1964).

Hydrological functions

Runoff is high. Permeability is moderate. Hydrologic soil group is B.

Recreational uses

This site has high aesthetic value and provides a variety of recreational opportunities such as hiking, camping and deer and upland game bird hunting. Steep slopes and the fragile soil-vegetation complex, however, inhibit many other forms of recreation such as the use of off-road vehicles.

Wood products

PRODUCTIVE CAPACITY

Although site productivity and site index information is not available, this is a relatively poor quality site for tree production.

Productivity class: 1.01

CMAI**: 14 to 22 cu ft/ac/yr1;
1.0 to 1.5 cu m/ha/yr1
**CMAI: is the culmination of mean annual increment highest average growth rate of the stand in the units specified.

Basal Area: 150 to 200 sq ft/ac*

*Based on three forest transects

MANAGEMENT GUIDES AND INTERPRETATIONS

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

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

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

Other information

Great Basin bristlecone pine is of unique biological and dendrological interest because of the great age attained by some individuals. Trees over 4900 years old have been found on Wheeler Peak in the Snake Range of Nevada. Limber pine has been used for mine props, railroad ties, and fuelwood. As the limbs of limber pine cling to the trunk for many years, the lumber cut from this tree is characteristically knotty. This tree has little commercial value at present.

Inventory data references

NASIS soil component data.

Type locality

Location 1: White Pine County, NV	
Township/Range/Section	T15N R66E S19
UTM zone	N
UTM northing	707132
UTM easting	4335854

Latitude	39° 8′ 50″
Longitude	114° 36′ 11″
General legal description	Approximately 1 mile southeast of Cave Mountain, Schell Creek Range, White Pine County, Nevada.

Other references

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Approval

Kendra Moseley, 2/19/2025

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	05/13/2025
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):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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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:**