Ecological site F030XC290NV
SOUTH-FACING LIMESTONE SLOPES

Last updated: 4/26/2024
Accessed: 06/30/2024

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.

Ecological site concept

This forest site occurs on south-facing mountain backslopes. Slopes range from 30 to 75 percent. Elevations are 8,500 to over 9,700 feet. The soils associated with this site are moderately deep and well drained. These soils formed in residuum and colluvium derived from limestone.

This site is part of group concept F030XC287NV.

Associated sites

F030XC251NV	**QUARTZITE SLOPES**
F030XC291NV	**NORTH-FACING LIMESTONE SLOPES**
R030XC030NV	**MOUNTAIN RIDGE**

Similar sites

F030XC291NV	**NORTH-FACING LIMESTONE SLOPES** PILO/RICE[RICE dominant shrub]

Table 1. Dominant plant species

Tree	(1) *Pinus longaeva*
Shrub	(1) *Artemisia nova*
Herbaceous	(1) *Elymus elymoides*

Physiographic features

This forest site occurs on south-facing mountain backslopes. Slopes range from 30 to 75 percent. Elevations are 8,500 to over 9,700 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	2,591–2,957 m
Slope	30–75%
Aspect	SE, S, SW

Climatic features

The climate is semi-arid with warm, dry summers and cold, moist winters. Precipitation is greatest in the winter with a lesser secondary peak in the summer, typical of the Mojave Desert. Average annual precipitation is 14 to 17 inches. Mean annual air temperature is 40 to 45 degrees F. The average frost free season is 50 to 90 days.

Table 3. Representative climatic features

Frost-free period (average)	90 days
Freeze-free period (average)	
Precipitation total (average)	432 mm

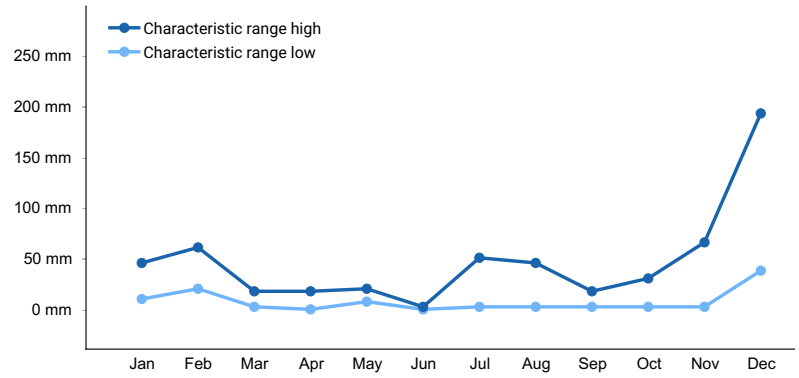


Figure 1. Monthly precipitation range

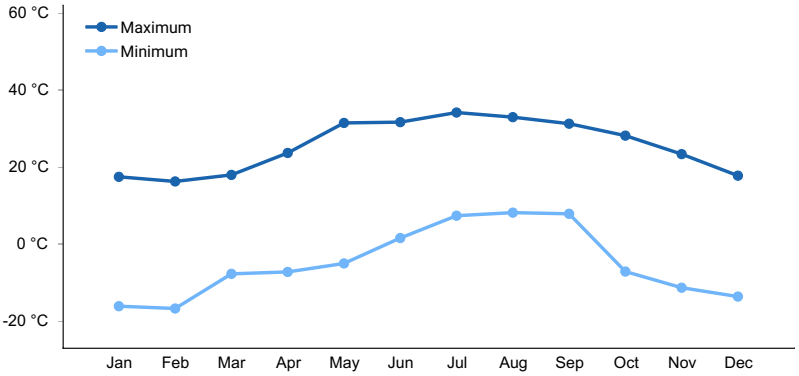


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this ecological site.

Soil features

The soils associated with this site are moderately deep and well drained. These soils formed in residuum and colluvium derived from limestone. The soils have a mollic epipedon from 0 to 23 inches and a calcic horizon from 2 to 23 inches. Lithic contact typically occurs at 23 inches. Soil surface is covered by 60 to 70 percent rock fragments (gravels, cobbels and stones) and runoff is high. The official soil series correlated to this ecological site includes Kitgram a loamy-skeletal, carbonatic, frigid Pachic Calciustoll.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone (2) Colluvium–limestone
Surface texture	(1) Very gravelly loam

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	51–99 cm
Surface fragment cover <=3"	60–70%
Surface fragment cover >3"	10–15%
Available water capacity (0-101.6cm)	4.19–8.79 cm
Calcium carbonate equivalent (0-101.6cm)	30–70%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	35–60%
Subsurface fragment volume >3" (Depth not specified)	10–25%

Ecological dynamics

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 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). 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 pines are generally on thin, rocky substrates, derived from limestone or dolomite. The longevity and harsh growing conditions of Great Basin bristlecone pine often make the trees sensitive to climatic fluctuations (Beasley and Klemmedson 1973).Year-to-year fluctuations are reflected in the widths of annual growth rings. Narrow rings reflect unusually dry years and the widest rings are formed during unusually moist years (Beasley and Klemmedson 1973). This species 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.

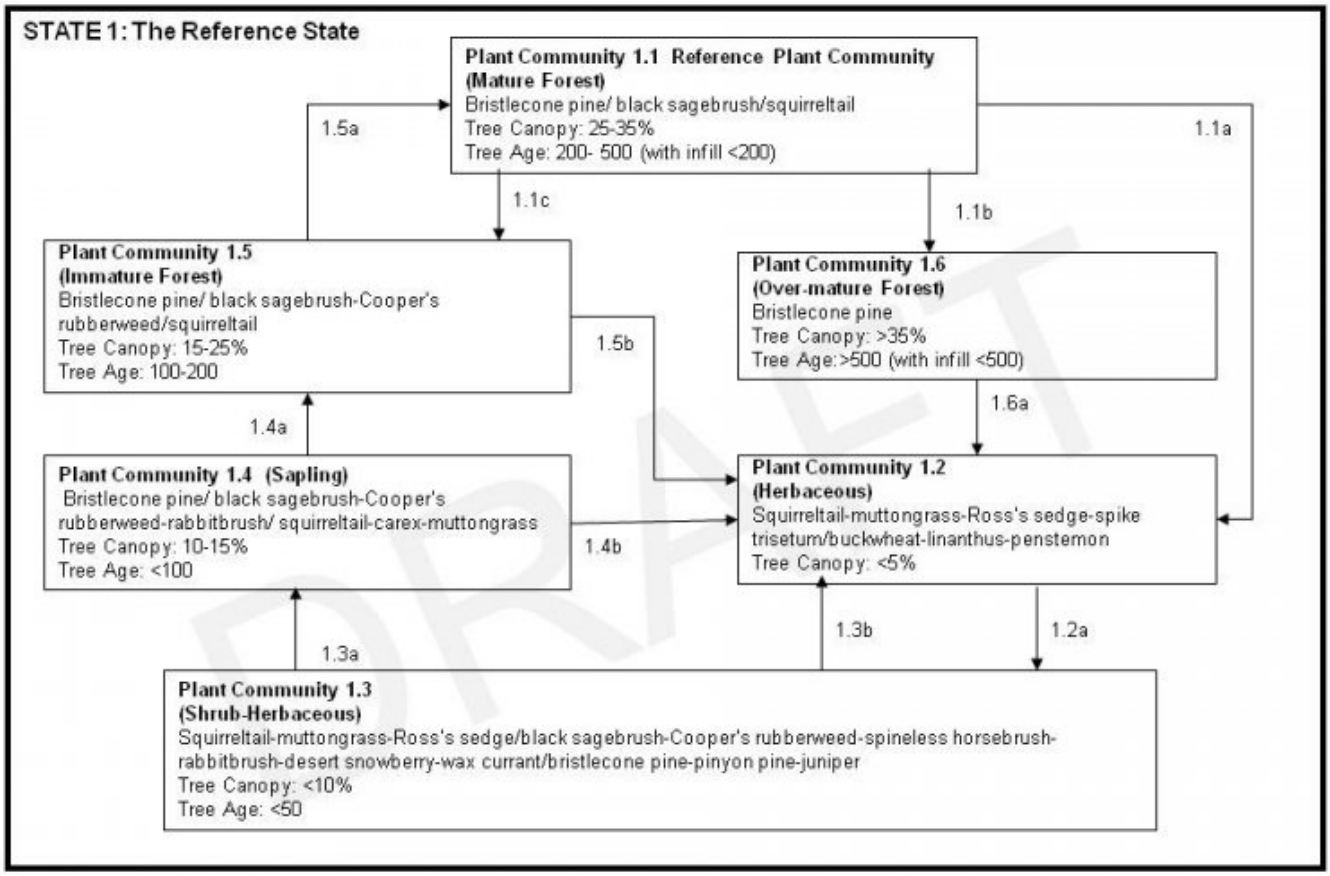
Great Basin bristlecone pine is highly drought tolerant and can subsist throughout the successional process. While these trees have low requirements for nutrients and moisture they are intolerant of shady conditions and prefer exposed slopes and ridges. High light requirements preclude the establishment 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). 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.

Fire Ecology: Fire is infrequent in high elevation forests dominated by Great Basin bristlecone pine forests, due to low herbaceous production and widely spaced trees. 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. Squirreltail is tolerant of 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. Black sagebrush is highly susceptible to fires of all intensities. Regeneration occurs solely from seed. Horsebrush is top killed by fire and sprouts from the root crown. Purple sage is tolerant of fire and easily resprouts. Rabbitbrush is top killed and regenerates after fire by sprouting and establishing from seed.

State and transition model



F30XC290NV Pinus longaeva/Artemisia nova/Elymus elymoides

State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. It is dominated by Great Basin bristlecone pine, with small amounts of other conifers in the overstory. 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. Currently this plant community is described by a one state model, because additional states have not been identified on the landscape. If in the future additional stable states are found this model will be revised to reflect additional states.

Community 1.1
Reference Plant Community

Figure 3. Reference Plant Community

This plant community is dominated by Great Basin bristlecone pine (*Pinus longaeva*). Bottlebrush squirreltail (*Elymus elymoides*) and muttongrass (*Poa fendleriana*) are the principal understory grasses. Black sagebrush (*Artemisia nova*) is the principal understory shrub. An overstory canopy cover of 25 to 35 percent is assumed to be representative of tree dominance on this site in the pristine environment. The overstory canopy is about 95 percent bristlecone pine and 5 percent other conifers such as Rocky Mountain juniper (*Juniperus scopulorum*), singleleaf pinyon (*Pinus monophylla*) and white fir (*Abies concolor*). Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. This stage of forest development is assumed to be representative of this ecological site in a pristine environment.

Forest overstory. The visual aspect and vegetal structure are dominated by Great Basin bristlecone pine that have reached or are near maximum heights for the site, 30 to 40 feet. Stand density is largely dependent on site severity; trees on the harshest sites tend to have the most open canopies.

Forest understory. Understory vegetative composition is about 30 percent grasses, 15 percent forbs and 55 percent shrubs and young trees when the average overstory canopy is medium (25 to 35 percent). Average understory production ranges from 75 to 200 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	40	67	118
Grass/Grasslike	25	39	56
Forb	13	22	34
Tree	6	11	17
Total	**84**	**139**	**225**

Community 1.2
Herbaceous

This plant community is representative of an early-seral plant community phase. Vegetation is dominated by grasses and forbs under full sunlight. Standing dead trees have little or no effect on the composition or production of the herbaceous vegetation, but can provide valuable wildlife habitat. This plant community is at-risk of invasion by non-natives. Non-native species can take advantage of the increased availability of critical resources following a fire or other disturbance.

Community 1.3
Shrub-Herbaceous

This site is dominated by woody-shrubs and herbaceous vegetation. Various amounts of tree seedlings (less than 20 inches in height) may be present up to the point where they are obviously a major component of the vegetal structure. Sprouting shrubs quickly recover and provide favorable sites for the germination and establishment of other shrub seedlings. Fast moving, low intensity fires result in the incomplete removal of sagebrush and allow for direct reestablishment through on-site seed.

Community 1.4
Sapling

This plant community is characterized by increasing woody perennials. In the absence of disturbance, the tree seedlings develop into saplings (20 inches to 4.5 feet in height) with a canopy cover between 10 and 15 percent. Open canopy allows understory to be dominated by shrubs, grasses and forbs in association with tree saplings. Sufficient time has passed for the complete recovery of sagebrush.

Community 1.5
Immature Forest

The visual aspect of the plant community is dominated by Great Basin bristlecone pine and other conifers greater than 4½ feet in height. The dominant and co-dominant tress are of variable growth form, but most are cone- or pyramidal- shaped. Seedlings and saplings of bristlecone pine are prevalent in the understory, especially at lower elevation sites. Understory vegetation is moderately influenced by tree overstory canopy of about 15 to 25 percent. Sagebrush and other dominant shrubs serve as nurse plant for tree seedlings.

Community 1.6
Over-mature Forest

This plant community phase is dominated by ancient bristlecone pine trees and standing snags of dead bristlecone trees. In the absence of wildfire or other naturally occurring disturbances, the bristlecone trees on this site can become very old. Upper crowns of most trees are irregular or flat-topped. Trees at this stage of forest development may have stopped increasing in height, but will continue to increase in diameter through-out its life. Understory vegetation is sparse or absent, due to tree competition. Tree canopy is commonly greater than 35 percent. This plant community experiences increased runoff and decreased infiltration during precipitation events and is at-risk of soil loss to surface erosion. Loss of perennial herbaceous vegetation in the understory reduced water storage, soil stability and inputs of organic matter.

Pathway 1.1a
Community 1.1 to 1.2

Wildfire, prolonged drought and/or pest/disease attack.

Pathway 1.1c
Community 1.1 to 1.5

Thinning, partial mortality from pest attack, disease, drought or other small scale disturbance.

Pathway 1.1b
Community 1.1 to 1.6

Continued growth, absence from disturbance and fire suppression.

Pathway 1.2a
Community 1.2 to 1.3

Absence from disturbance and natural regeneration over time.

Pathway 1.3b
Community 1.3 to 1.2

Disease, insect attack, prolonged drought or fire.

Pathway 1.3a
Community 1.3 to 1.4

Absence from disturbance and natural regeneration over time.

Pathway 1.4b
Community 1.4 to 1.2

Disease, insect attack, prolonged drought or fire.

Pathway 1.4a
Community 1.4 to 1.5

Absence from disturbance and natural regeneration over time.

Pathway 1.5a
Community 1.5 to 1.1

Absence from disturbance and natural regeneration over time.

Pathway 1.5b
Community 1.5 to 1.2

Disease, insect attack, prolonged drought or fire.

Pathway 1.6a
Community 1.6 to 1.2

Disease, insect attack, prolonged drought or fire.

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**			28–67	
	squirreltail	ELEL5	*Elymus elymoides*	13–34	–
	muttongrass	POFE	*Poa fendleriana*	7–12	–
	Ross' sedge	CARO5	*Carex rossii*	7–12	–
2	**Secondary perennial grasses**			1–11	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–7	–
	spike trisetum	TRSP2	*Trisetum spicatum*	1–7	–
Forb					
3	**Primary perennial forbs**			12–34	
	Indian paintbrush	CASTI2	*Castilleja*	1–7	–
	Walker's suncup	CAWAT	*Camissonia walkeri ssp. tortilis*	1–7	–
	crescent buckwheat	ERME10	*Eriogonum mensicola*	1–7	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	1–7	–
	Cooper's rubberweed	HYCO2	*Hymenoxys cooperi*	1–7	–
	Nuttall's linanthus	LENUP	*Leptosiphon nuttallii ssp. pubescens*	1–7	–
	Thompson's beardtongue	PETH2	*Penstemon thompsoniae*	0–1	–
	lone fleabane	ERUN2	*Erigeron uncialis*	0–1	–
Shrub/Vine					
4	**Primary shrubs**			34–106	
	black sagebrush	ARNO4	*Artemisia nova*	13–34	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	7–12	–
	purple sage	SADO4	*Salvia dorrii*	7–12	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	7–12	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	1–7	–
	wax currant	RICE	*Ribes cereum*	1–7	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	1–6	–
Tree					
5	**Evergreen**			4–16	
	Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	1–7	–
	Great Basin bristlecone pine	PILO	*Pinus longaeva*	1–7	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	0–1	–
	white fir	ABCO	*Abies concolor*	0–1	–

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
Great Basin bristlecone pine	PILO	*Pinus longaeva*	Native	–	90–95	–	–
Rocky Mountain juniper	JUSC2	*Juniperus scopulorum*	Native	–	1–3	–	–
singleleaf pinyon	PIMO	*Pinus monophylla*	Native	–	1–3	–	–
white fir	ABCO	*Abies concolor*	Native	–	1–3	–	–

Animal community

Livestock Interpretations: This site is not well suited to livestock grazing. Herbaceous forage production is low and the site is not easily accessed due to steep slopes and lack of adequate water sources. 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. The amount and nature of the understory vegetation in a forestland is highly dependent on the amount and duration of shade provided by the overstory canopy. Significant changes in kinds and abundances of plants occur as the canopy changes, often regardless of grazing use. Bottlebrush squirreltail is palatable to domestic livestock. Winter months show greatest use and it generally increases under heavy grazing. Muttongrass is a valuable forage resource. It has been rated excellent forage for domestic cattle and horses. Ross’s sedge value as a forage plant varies depending on the site. It has been rated fair for domestic sheep, horses and cattle. Dominant shrubs provide additional foraging resources on this ecological site. Black sagebrush is used by domestic livestock, it is considered to be highly palatable to domestic sheep. Cattle and domestic goats browse black sagebrush to a lesser degree. Purple sage as medium to low palatability for livestock. Rabbitbrush is tolerant of grazing and may experience increased vigor with grazing, but is only moderately palatable to livestock.

Wildlife Interpretations: This area is high-use habitat for small birds and mammals, including nuthatches, flycatchers, finches, bluebirds and deer mice. It also 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. Many wildlife species find valuable foraging and habitat resources on this ecological site. Several wildlife species utilized bottlebrush squirreltail. It provides important forage for ground squirrels, cottontails and black-tailed jackrabbits and less important forage for mule deer. Muttongrass provides good forage for sheep, elk and deer. The seeds and leaves are also used by a variety of birds. Ross’s sedge provides occasional forage for mule deer. Dominant shrubs provide additional foraging resources on this site. Black sagebrush provides important foraging resource for wild ungulates. In some areas it is the most important winter forage resource for mule deer. Purple sage is low to moderately palatable to wildlife. Rabbitbrush provides important fall and winter browse for wildlife. Blacktailed jackrabbits heavily use rabbitbrush during the winter and early spring. Rocky Mountain juniper provides forage and shelter for wildlife, small mammals and nongame and game birds, alike. White fir seeds are commonly eaten by squirrels and other rodents and seedlings can be heavily browsed by deer.

Hydrological functions

Runoff is high and permeability is moderate. The potential for erosion is severe depending on slope and amount of surface rock fragments.

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, as well as, nature study and bird watching. 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

Historically, bristlecone pine has been used locally for mine timbers. The wood of bristlecone pine is denser and harder than that of most conifers.
Singleleaf pinyon has been an important source of fuelwood, mine props, and wood for charcoal used in ore smelting.
The wood of Rocky Mountain juniper is aromatic and durable; it is commonly used for furniture, interior paneling, and other novelties. It is particularly well suited for fencing because it is rot resistant, even when in contact with the ground. White fir is a valuable timber species, used for lumber, doors and pulpwood. White fir is commonly used as Christmas trees, it is known for retaining its needles and its agreeable smell. Although site productivity and site index curves information are not available, this is a relatively poor quality site for tree production.

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 products

Singleleaf pinyon seeds serve as a food source, as well as providing medicinal, cultural, and spiritual values for Native Americans. Native Americans have long used the seeds and foliage of Rocky Mountain. juniper for incense, teas, or salves (Scher 2002). Today juniper berries are used to make gin.

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. A common insect pest of the Great bristlecone pine is mountain pine beetle (Dendroctonus ponderosae). White pine blister rust can also spread to five-needled white pines from its host plant (Ribes). It has not yet been discovered on Great Basin bristlecone pine.

Type locality

Location 1: Clark County, NV	
UTM zone	N
UTM northing	4057883
UTM easting	660992
Latitude	36° 39′ 10″
Longitude	115° 11′ 55″
General legal description	Approximately .3 miles from Hayford Peak and less than .5 miles from the head of Spring Canyon in the Desert National Wildlife Refuge, Clark County, Nevada.

Other references

Beasely, R.S. 1972. Bristlecone pine (*Pinus longaeva*) in a relationship to environmental factors and soil properties in east-central Nevada. Ph.D. Dissertation, Univ. of Arizona, Tucson. 151 pp.
Beasley, R.S. and J.O. Klemmedson. 1973. Recognizing site adversity and drougth-sensitive trees in stands of bristlecone pine. Economic Botany. 27:141-146`.
Eyre, F.H., editor. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington, D.C.
Fryer, J.L. 2004. *Pinus longaeva*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory(Producer).http://www.fs.fed.us/database/feis/
Lanner, R.M. 2007. The Bristlecone Book, A natural history of the world's oldest trees. Mountain Press Publishing Co., Missoula MT.
Lanner, R.M. 1984. Trees of the Great Basin. University of Nevada Press. Reno, NV.
Scher, Janette S. 2002. *Juniperus scopulorum*. In: Fire Effects Information System, [Online]. U.S. Department of

Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/
Schoettle A.W. and R.A. Sniezko. 2007. Proactive intervention to sustain high-elevation pine ecosystems threatened by white pine blister rust. J for Res. 12:327-336.
USDA-NRCS. 2000 National Forestry Manual – Part 537. Washington, D.C.
USDA-NRCS. 2004 National Forestry Handbook, Title 190. Washington, D.C.
USDA-NRCS Plants Database (Online; http://plants.usda.gov)

Contributors

P NOVAK-ECHENIQUE

Approval

Kendra Moseley, 4/26/2024

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	06/30/2024
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:**

17. **Perennial plant reproductive capability:**