USDA Natural Resources
Conservation Service

Ecological site F030XC291NV
NORTH-FACING LIMESTONE SLOPES

Last updated: 4/26/2024
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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.

Ecological site concept

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

This site is part of group provisional concept F030XC284NV.

Associated sites

F030XC251NV	**QUARTZITE SLOPES** JUOS-PIMO/ARTRV/POFE
F030XC290NV	**SOUTH-FACING LIMESTONE SLOPES** PILO/ARNO4/POFE

Similar sites

F030XC290NV	**SOUTH-FACING LIMESTONE SLOPES** PILO/ARNO4/POFE [ARNO4 dominant shrub, POFE dominant grass]

Table 1. Dominant plant species

Tree	(1) *Pinus longaeva*
Shrub	(1) *Ribes cereum*
Herbaceous	(1) *Poa fendleriana*

Physiographic features

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

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	8,500–9,700 ft
Slope	30–75%
Aspect	N, NE, NW

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 37 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)	17 in

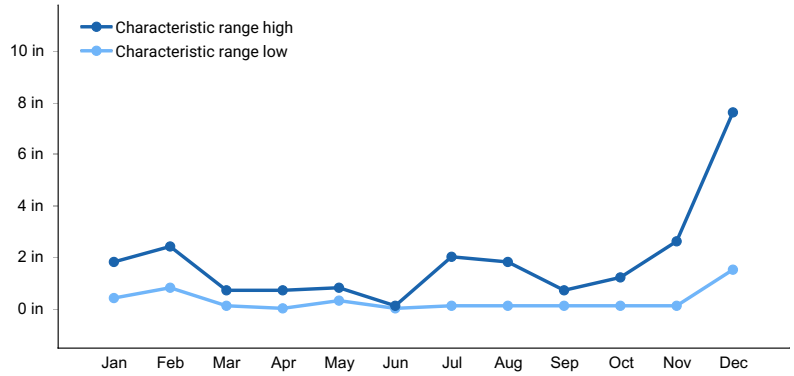


Figure 1. Monthly precipitation range

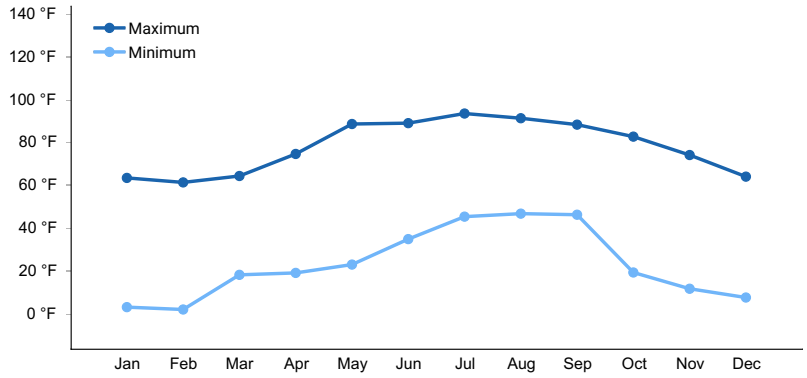


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are moderately deep and well drained. These soils formed in colluvium and residuum weathered from limestone and dolomitic limestone. The soils have an ochric epipedon and an argillic horizon from 7 to 55 centimeters. Soil surface is covered by about 50 percent rock fragments (gravels, cobbles and stones). Soil depth is limited by indurated limestone bedrock at 60 to 100 centimeters. These soils are characterized by high runoff and moderately high saturated hydraulic conductivity. The official soil series correlated to this ecological site includes Haypeak a loamy-skeletal, mixed, superactive, frigid Oxyaquic Haplustalfs.

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone (2) Residuum–dolomite
Surface texture	(1) Very cobbly silt loam

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	20–40 in
Surface fragment cover <=3"	15–25%
Surface fragment cover >3"	30–40%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	2–45%
Electrical conductivity (0-40in)	0–5 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.4–8.2
Subsurface fragment volume <=3" (Depth not specified)	35–50%
Subsurface fragment volume >3" (Depth not specified)	5–15%

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 elevation 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.

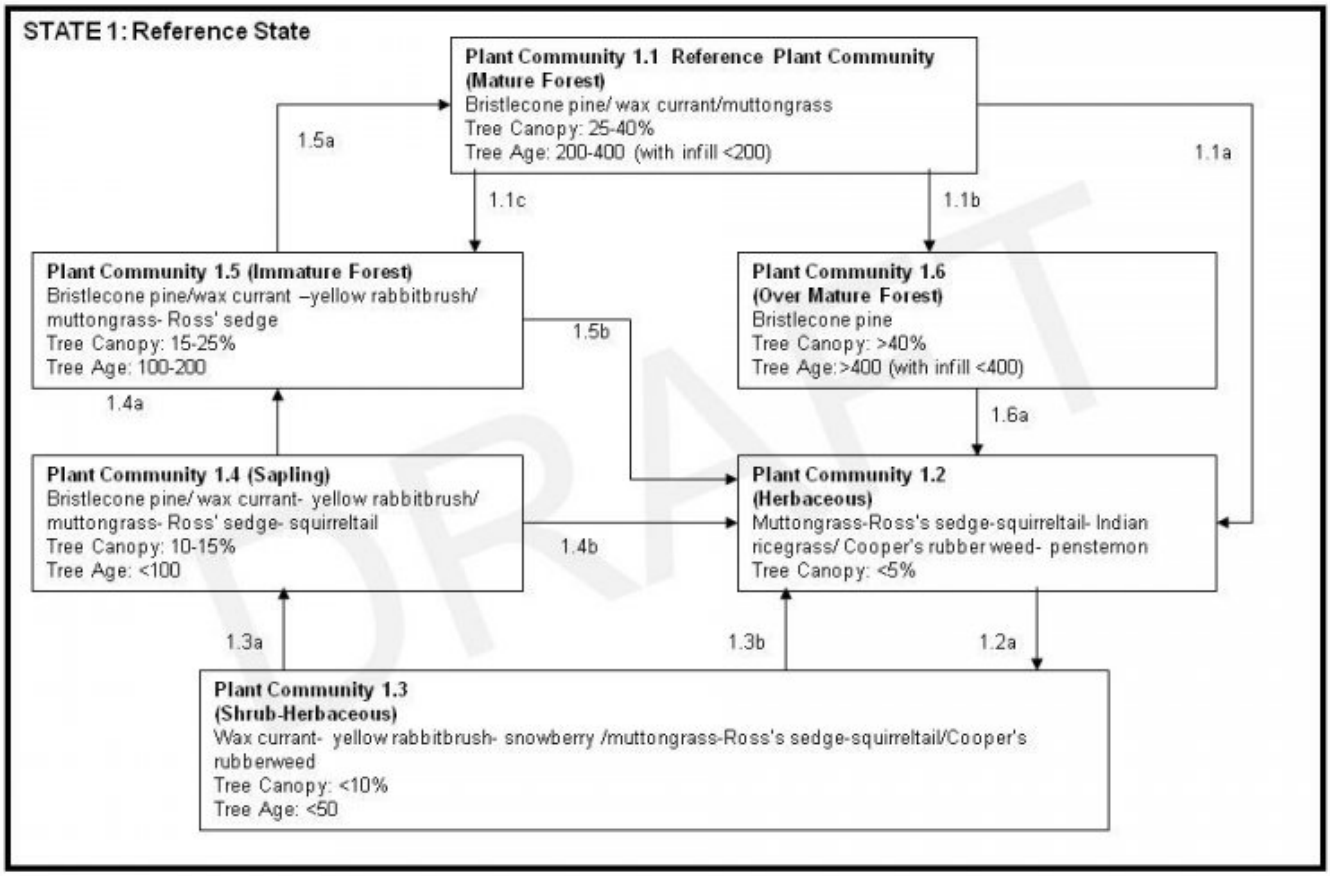
Great Basin bristlecone pines are generally on thin, rocky substrates, derived from limestone or dolomite. The longevity and harsh growing conditions of Great Basin bristlecone pine often make the trees sensitive to climatic fluctuations (Beasley and Klemmedson 1973).Year-to-year fluctuations are reflected 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:
As a thin-barked pine, Great Basin bristlecone pine is only able to survive low–severity fires. 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. Stand dynamics are more heavily influenced by climate and seed dispersal patterns than fire. Small amounts of white fir are present in the plant community. White fir is susceptible to fires of all intensities, due to its thin bark and low hanging branches. White fir is an aggressive pioneer species as well as being able to reproduce abundantly under dense shade conditions.
Muttongrass can survive low intensity fires, but is harmed by severe fires. The rhizomes of Ross' sedge survive low to moderate severity fires. Seeds have long-term viability and generally germinate after heat treatment. Wax currant is favored by short-duration, low severity fire because its soil-stored seed require scarification to germinate. Mature wax currant plants are top killed by fire and the ability to sprout is weak. Rabbitbrush is usually top killed by fire. It is able to regenerate by sprouting from the root crown and establishing from off-site seed. Purple sage is highly tolerant of fire and will typically resprout following fire.

State and transition model



F30XC291NV *Pinus longaeva/Ribes cereum/Poafendleriana*

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 trace 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 and 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 very old ages. This plant community is currently described by one state, the reference state, 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 the findings.

Community 1.1
Reference Plant Community

Figure 3. Mature Forest

Figure 4. Ribes understory

This plant community is dominated by Great Basin bristlecone pine (*Pinus longaeva*). Muttongrass (*Poa fendleriana*) is the principal understory grass and wax currant (*Ribes cereum*) is the principal understory shrub. An overstory canopy cover of 25 to 45 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, 40 to 50 feet. Stand density is largely dependent on site severity; trees on the harshest sites tend to have the most open canopies. 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 understory. Understory vegetative composition is about 20 percent grasses, 20 percent forbs and 60 percent shrubs and young trees when the average overstory canopy is medium (25 to 45 percent). Average understory production ranges from 100 to 300 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	60	120	180
Forb	20	40	60
Grass/Grasslike	20	40	60
Total	**100**	**200**	**300**

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 affect 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 are able to take advantage of the increased availability of critical resources following wildfire or other large scale disturbance.

Community 1.3
Shrub-Herbaceous

This plant community is dominated by herbaceous vegetation and woody shrubs. 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 establishment of other shrub seedlings. Fast moving, low intensity fires result in the incomplete removal of shrubby vegetation and allow for direct reestablishment.

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 wax currant and other dominant shrubs.

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, young Great Basin bristlecone pine are highly susceptible to fire. Understory vegetation is moderately influenced by tree overstory canopy of about 15 to 25 percent. Dominant shrubs serve as nurse plants for pine seedlings.

Community 1.6
Over-mature Forest

This stage 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 severely reduced or even absent, due to tree competition, overstory shading and duff acumulation. Tree canopy is commonly greater than 45 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 reduces water storage, soil stability and inputs of organic matter.

Pathway 1.1a
Community 1.1 to 1.2

Standing replacing fire, prolonged drought, disease and/or insect 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

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

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

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

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

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

Pathway 1.6a
Community 1.6 to 1.2

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

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			15–36	
	Ross' sedge	CARO5	*Carex rossii*	10–18	–
	muttongrass	POFE	*Poa fendleriana*	10–18	–
2	**Secondary Perennial Grasses**			3–15	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–10	–
	pine needlegrass	ACPI2	*Achnatherum pinetorum*	2–10	–
	squirreltail	ELEL5	*Elymus elymoides*	2–10	–
Forb					
3	**Perennial**			15–60	
	rabbit ear rockcress	ARPE	*Arabis pendulina*	2–10	–
	lone fleabane	ERUN2	*Erigeron uncialis*	2–10	–
	pink alumroot	HERU	*Heuchera rubescens*	2–10	–
	Cooper's rubberweed	HYCO2	*Hymenoxys cooperi*	2–10	–
	Charleston lousewort	PESEC	*Pedicularis semibarbata var. charlestonensis*	2–10	–
	Thompson's beardtongue	PETH2	*Penstemon thompsoniae*	2–10	–
	dwarf phlox	PHCO11	*Phlox condensata*	2–10	–
Shrub/Vine					
4	**Primary Shrubs**			60–120	
	wax currant	RICE	*Ribes cereum*	50–100	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–18	–
5	**Secondary Shrubs**			3–30	
	birchleaf mountain mahogany	CEMOG	*Cercocarpus montanus var. glaber*	2–10	–
	purple sage	SADO4	*Salvia dorrii*	2–10	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	2–10	–
	black sagebrush	ARNO4	*Artemisia nova*	2–7	–
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	2–7	–
Tree					
6	**Evergreen**			2–20	
	white fir	ABCO	*Abies concolor*	2–10	–
	Great Basin bristlecone pine	PILO	*Pinus longaeva*	2–10	–

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
Great Basin bristlecone pine	PILO	*Pinus longaeva*	Native	–	90–99	–	–
white fir	ABCO	*Abies concolor*	Native	–	1–5	–	–

Animal community

Livestock Interpretations: This site is not well suited to livestock grazing. Herbaceous forage production is quite low and the site is not easily accessed due to steep slopes and lack of adequate water. 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. 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. Squirreltail is moderately palatable to livestock, but does provide important winter forage. Dominant shrubs provide additional foraging resources on this site. Wax currant is considered fair to poor browse for domestic livestock. Rabbitbrush is tolerant of grazing and may increase in heavily grazed areas. Attentive grazing management is required due to steep slopes and erosive soil surface condition. 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: A variety of wildlife species find valuable foraging and habitat resources on this ecological site. 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. It is used occasionally by various other song birds, rodents and associated predators natural to the area. 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 and pronghorn antelope. Squirreltail is an important dietary component for several wildlife species. Dominant shrubs provide additional foraging resources on this ecological site. Mule deer, small mammals, non-game birds and upland game birds all use wax currant for cover and forage. White fir seeds are commonly eaten by squirrels and other rodents and seedlings can be heavily browsed by deer. Rabbitbrush is tolerant of browsing pressure. It heavily used by black-tailed jackrabbits in the winter and early spring.

Hydrological functions

The soils associated with this ecological site are characterized by high runoff.

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

Bristlecone pine has been used locally for mine timbers. The wood of bristlecone pine is denser and harder than that of most conifers. White fir is a valuable timber species, used for lumber, doors and pulpwood. It is commonly used as Christmas trees and is known for retaining its needles and its agreeable smell.
Although site productivity and site index information is 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

The fruit of wax currant is used for making jam, jelly and pie. Native American tribes used currants for making pemmican and it is currently grown as an ornamental.

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T15S R60E S1
UTM zone	N
UTM northing	4058739
UTM easting	660853
Latitude	36° 39′ 28″
Longitude	115° 21′ 1″
General legal description	Hayford Peak USGS 7.5 minute topographic quadrangle. Approximately ½ mile from the head of Spring Canyon, west of Highway 93 in Desert National Wildlife Refuge.

Other references

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Contributors

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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	05/19/2024
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:

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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:**
