Ecological site R028BY114NV
Volcanic Mountain Savanna

Last updated: 2/19/2025
Accessed: 05/10/2025

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): 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

This ecological sites is found on mountain sideslopes. Slopes gradients great than 30 percent are typical and elevation ranges from 6500 to 9000 feet.
Soils associated with this site are shallow to moderately deep, well drained and formed in residuum and colluvium derived from volcanic parent material. Soils are characterized by a mollic epipedon, an argillic horizon and have greater than 35 percent rock fragments in the particle site control section. Soil temperature regime is frigid and the soil moisture regime is xeric bordering on aridic.
The plant community overstory is dominated by singleleaf pinyon, total canopy cover in the reference state is less than 15 percent. Common species in the understory include mountain big sagebrush, bluegrass and Idaho fescue.

Associated sites

F028BY058NV	**PIMO-CELE3/ARTRV/PSSPS-POFE** This site occurs on mountain sideslopes of mostly northerly aspects at lower elevations (<7500'), and on all aspects at higher elevations (>7500'). Slopes are typically 30 to 50 percent. Elevations are 7000 to 8500 feet. Soils are shallow to bedrock, well drained and formed in residuum and colluvium derived from andesite, welded tuff and rhyolite. Soils are characterized by a 18cm thick mollic epipedon and a horizon of clay accumulation. The reference state is dominated by singleleaf pinyon in association with curlleaf mountain mahogany. An overstory canopy of 20 to 35 percent is assumed to be representative.
R028BY015NV	**LOAMY SLOPE 12-16 P.Z.** This site occurs on concave mountain sideslopes. Slopes gradients of 15 to 50 percent are typical and elevations range from 6500 to 8200 feet. Soils associated with this site are very deep, well drained, and formed in residuum/colluvium derived from volcanic sources. The profile is characterized by a mollic epipedon, an argillic horizon and greater than 35 percent rock fragments. The reference state is dominated by a dense stand of perennial grasses an d shrubs with a few scattered trees. Dominant plant species include mountain big sagebrush, snowberry, Utah serviceberry, antelope bitterbrush, bluebunch wheatgrass, Thurber's needlegrass, and western needlegrass. Production ranges from 700 to 1500 pounds per acre.

Table 1. Dominant plant species

Tree	(1) *Pinus monophylla*
Shrub	(1) *Artemisia tridentata subsp. vaseyana*
Herbaceous	(1) *Festuca idahoensis* (2) *Poa*

Physiographic features

This ecological site is found on mountain sideslopes. Slopes range from 15-75%, but slope gradients of greater than 30% are typical. Elevations range from 6500-9000 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Mountain slope
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	6,500–9,000 ft
Slope	30–75%

Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid, characterized by cold, moist winters and warm, dry summers. The average annual precipitation ranges from 10 to 14 inches. Mean annual air temperature is about 45 to 50 degrees F. The average growing season is 100 to 120 days. Mean annual precipitation across the range in which this ES occurs is 11.9 inches: Jan. 0.99; Feb. 1.05; Mar. 1.15; Apr. 1.37; May 1.3; Jun. 0.95; Jul. 0.78; Aug. 0.86; Sept. 0.80; Oct. 0.96; Nov. 0.8; Dec. 0.92.
*The above data is averaged from the Ruth and Eureka WRCC climate stations.

Table 3. Representative climatic features

Frost-free period (average)	100 days
Freeze-free period (average)	120 days
Precipitation total (average)	12 in

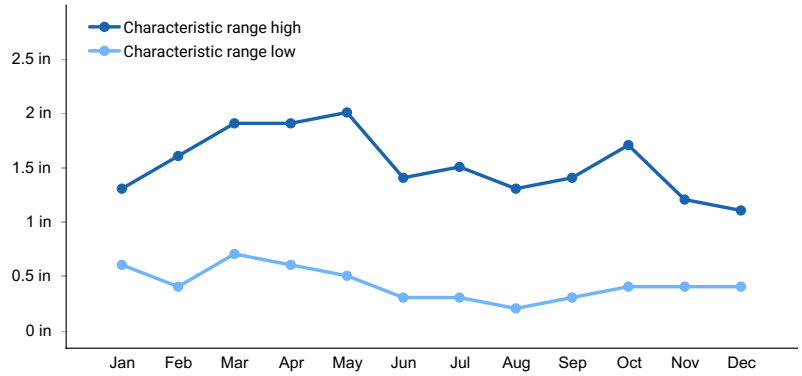


Figure 1. Monthly precipitation range

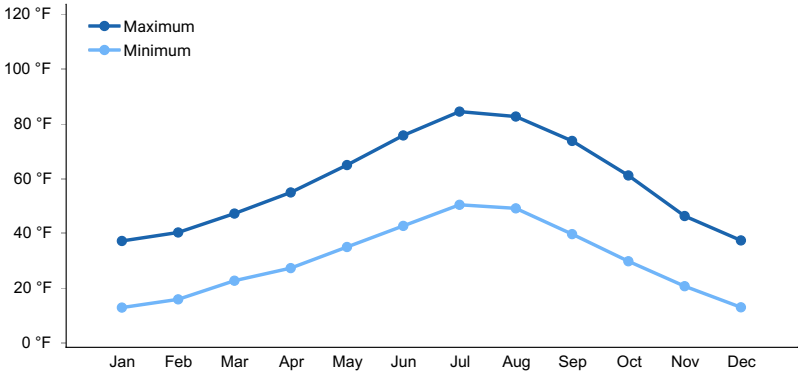


Figure 2. Monthly average minimum and maximum temperature

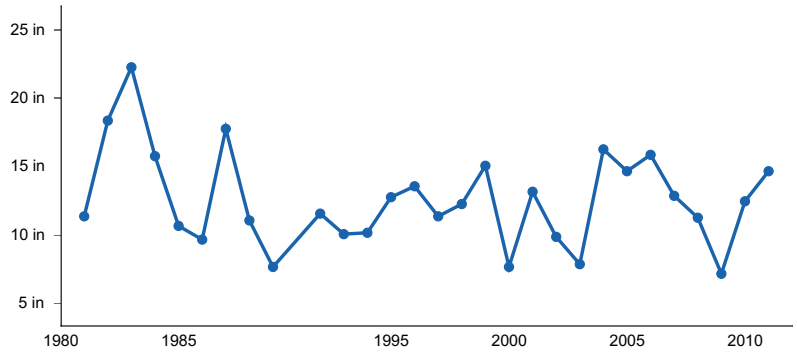


Figure 3. Annual precipitation pattern

Climate stations used

- (1) EUREKA [USC00262708], Eureka, NV
- (2) RUTH [USC00267175], Ely, NV

Influencing water features

Influencing water features are not associated with this site.

Soil features

These soils associated with this site are shallow to moderately deep, well drained and formed in residuum/colluvium derived from volcanic parent material. The soil profile is characterized by a mollic epipedon <36cm thick and an argillic horizon. The soils are skeletal with >35% percent rock fragments distributed throughout the soil profile, dominantly gravels and cobbles. Runoff is high to very high and the potential for sheet and rill erosion is moderate to high depending on steepness of slope and amount of rock fragments on the soil surface. Soil temperature regime is frigid and the soil moisture regime is xeric bordering on aridic. The soil series associated with this site include: Clanalpine, Itca, and Nayfan.

The representative soil series is Clanapline, a loamy-skeletal, mixed, superactive, frigid Typic Argixeroll. Diagonstic horizons include mollic epipedon from the soil surface to 25cm, an argillic horizon from 25-99cm and weathered bedrock at 99cm. Clay content averages 25-35% in the particle size control section and rock fragments ranges from 35-60%. Soil reaction is neutral or slightly alkaline and are non-effervescent. Soils are derived from rhyolitic tuff. There may be high amounts of gravels, cobbles or stones at the soil surface which occupy plant growing space yet help to reduce evaporation and conserve soil moisture. Coarse fragments on the soil surface provide a stabilizing affect on surface erosion conditions.

Table 4. Representative soil features

Parent material	(1) Residuum–rhyolite (2) Colluvium–andesite
Surface texture	(1) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderate
Soil depth	20–40 in
Surface fragment cover <=3"	20–30%
Surface fragment cover >3"	2–15%
Available water capacity (0-40in)	1–1.7 in

Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7–7.3
Subsurface fragment volume <=3" (Depth not specified)	20–30%
Subsurface fragment volume >3" (Depth not specified)	20–30%

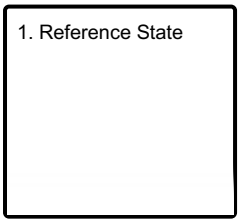
Ecological dynamics

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 2013). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

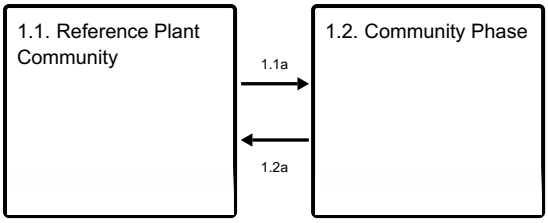
Fire Ecology:
On high-productivity sites where sufficient fine fuels existed, singleleaf pinyon communities burn every 15 to 20 years, and on less productive sites with patchy fuels, fire return intervals may be in the range of 50 to 100 years or longer.
Thin bark and lack of self pruning make singleleaf pinyon very susceptible to intense fire. Mature singleleaf pinyon can survive low-severity surface fires but is killed by more severe fires. Most tree seedlings are killed by fire, but cached seeds may survive.
The pinyon-juniper woodland is generally a climax vegetation type throughout its range, reaching climax about 300 years after disturbance, with an ongoing trend toward increased tree density and canopy cover and a decline in understory species over time. Singleleaf pinyon seedling establishment is episodic. Population age structure is affected by drought, which reduces seedling and sapling recruitment more than other age classes. The ecotones between singleleaf pinyon woodlands and adjacent shrublands and grasslands provide favorable microhabitats for singleleaf pinyon seedling establishment since they are active zones for seed dispersal, nurse plants are available, and singleleaf pinyon seedlings are only affected by competition from grass and other herbaceous vegetation for a couple of years.
Several natural and anthropogenic processes can lead to changes in the spatial distribution of pinyon-juniper woodlands over time. These include 1) tree seedling establishment during favorable climatic periods, 2) tree mortality (especially seedlings and saplings) during periods of drought, 3) expansion of trees into adjacent grassland in response to overgrazing and/or fire suppression, and 4) removal of trees by humans, fire, or other disturbance episodes. Specific successional pathways after disturbance in singleleaf pinyon stands are dependent on a number of variables such as plant species present at the time of disturbance and their individual responses to disturbance, past management, type and size of disturbance, available seed sources in the soil or adjacent areas, and site and climatic conditions throughout the successional process.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

The reference state is characterized by singleleaf pinyon with an understory of mountain big sagebrush and bluegrass. Common understory grasses include Idaho fescue and bluebunch wheatgrass. Bluebunch wheatgrass is more common on the east side of MLRA 28B, while Idaho fescue is more common in the western portion of MLRA 28B. Wildfire, insect or disease attack and period drought are considered to be natural disturbances that strongly influence the structure and composition this ecological site.

Community 1.1
Reference Plant Community

The reference plant community is dominated by singleleaf pinyon, total canopy cover is typically less than 15%. Mountain big sagebrush is the principal understory shrub. Currant or gooseberry and bush oceanspray are other important understory shrubs. Bluegrass, Idaho fescue and/or bluebunch wheatgrass are the most prevalent understory grasses. Tapertip hawksbeard, arrowleaf balsamroot, phlox, and lupine are common understory forbs. Overstory tree canopy composition is dominated by singleleaf pinyon, Utah juniper and mountain mahogany may occur in trace amounts. The visual aspect and vegetal structure are dominated by singleleaf pinyon that have reached or are near maximal heights for the site. Dominant trees average greater than five inches in diameter at one-foot stump. Upper crowns are typically either irregularly or smoothly flat-topped or rounded. Tree canopy cover averages about 10%, approximately 5% of the mature trees are 150 years old or older. Understory vegetation is influenced by tree competition, overstory shading, duff accumulation, etc. This stage of community development is assumed to be representative of this ecological site under pre Euro-American settlement. Understory vegetative composition is about 40% grasses, 5% forbs and 55% shrubs and young trees (<5m). Average understory production ranges from 200 to 600 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	100	200	300
Grass/Grasslike	80	160	240
Tree	10	20	30
Forb	10	20	30
Total	**200**	**400**	**600**

Community 1.2
Community Phase

This community phase is characteristic of a post disturbance plant community. Tree canopy has been removed or drastically decreased following wildfire. Infrequent, yet periodic, wildfire is presumed to be a natural factor influencing this ecological site.

Pathway 1.1a
Community 1.1 to 1.2

Low severity fire removes individual trees and reduces total tree cover.

Pathway 1.2a
Community 1.2 to 1.1

Time, favorable climate, and lack of disturbance

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**			100–204	
	Idaho fescue	FEID	*Festuca idahoensis*	20–36	–
	muttongrass	POFE	*Poa fendleriana*	20–36	–
	Sandberg bluegrass	POSE	*Poa secunda*	20–36	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	20–36	–
2	**Secondary Perennial Grasses**			4–20	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	4–20	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	4–20	–
Forb					
3	**Perennial Forbs**			20–100	
	rockcress	ARABI2	*Arabis*	4–20	–
	milkvetch	ASTRA	*Astragalus*	4–20	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	4–20	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	4–20	–
	silvery lupine	LUAR3	*Lupinus argenteus*	4–20	–
4	**Annual forbs**			1–10	
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	1–10	–
	Forb, annual	2FA	*Forb, annual*	1–10	–
Shrub/Vine					
5	**Primary Shrubs**			40–96	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	40–96	–
6	**Secondary Shrubs**			12–60	
	currant	RIBES	*Ribes*	4–20	–
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	4–20	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4–20	–
	rockspirea	HODU	*Holodiscus dumosus*	1–10	–
	granite prickly phlox	LIPU11	*Linanthus pungens*	1–10	–
Tree					
7	**Evergreen**			8–40	
	Utah juniper	JUOS	*Juniperus osteosperma*	4–20	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	4–20	–

Animal community

Livestock Interpretations:
This site is suited to cattle and sheep grazing during the summer and fall. Grazing management should be keyed to Idaho fescue production. This grass provides palatable, nutritious feed during the late spring and summer. New plants are established entirely from seed and grazing practices should allow for ample seed production and seedling establishment.
Thurber's needlegrass species begin growth early in the year and remain green throughout a relatively long growing season. This pattern of development enables animals to use Thurber's needlegrass when many other grasses are unavailable. Cattle prefer Thurber's needlegrass in early spring before fruits have developed as it becomes less palatable when mature. Thurber's needlegrasses are grazed in the fall only if the fruits are softened by rain.
Muttongrass is excellent forage for domestic livestock especially in the early spring. Muttongrass begins growth in late winter and early spring, which makes it available before many other forage plants.
Sandberg bluegrass is a widespread forage grass. It is one of the earliest grasses in the spring and is sought by domestic livestock and several wildlife species. Sandberg bluegrass is a palatable species, but its production is closely tied to weather conditions. It produces little forage in drought years, making it a less dependable food source than other perennial bunchgrasses.
Mountain big sagebrush is eaten by domestic livestock but has long been considered to be of low palatability, and a competitor to more desirable species.
Mountain big sagebrush is highly preferred and nutritious winter forage for mule deer.
Livestock may concentrate on this site taking advantage of the shade and shelter offered by the tree overstory. Many areas are not used because of steep slopes or lack of adequate water. Attentive grazing management is required due to steep slopes and erosion hazards.
Harvesting trees under a sound management program for fuelwood, posts or other products can open up the tree canopy to allow increased production of understory species desirable for grazing.

Initial stocking rate:
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, a determination of the degree to which the sites have been grazed, and an evaluation of trend in site condition offer the most reliable basis for developing initial stocking rates.
Selection of initial stocking rates for given grazing units is a planning decision. This decision should be made ONLY after careful consideration of the total resources available, evaluation of alternatives for use and treatment, and establishment of objectives by the decisionmaker.

Forage Value Rating:
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, fall and winter. Pinyon trees provide shelter from winter storms. Sites where water is available offer good quail habitat and are visited seasonally by mourning dove. It is also used by various song birds, rodents, reptiles and associated predators natural to the area.

Hydrological functions

Runoff is high to very high. Permeability is moderately slow to moderate.

Recreational uses

The trees on this site provide a welcome break in an otherwise open landscape. It has potential for hiking, cross-country skiing, camping, and deer and upland game hunting.

Wood products

PRODUCTIVE CAPACITY

This woodland community is of moderate site quality for tree production. Site index ranges from 65 to 90 (Howell, 1940).
Productivity Class: 0.5 to 0.9
CMAI*: 6.7 to 12.3 ft3/ac/yr;
0.47 to 0.86 m3/ha/yr.
Culmination is estimated to be at 70 years.
*CMAI: is the culmination of mean annual increment or highest average growth rate of the stand in the units specified.
Fuelwood Production: 8 to 13 cords per acre for stands averaging 5 inches in diameter at 1 foot height with a medium canopy cover. There are about 289,000 gross British Thermal Units (BTUs) heat content per cubic foot of pinyon pine wood and about 274,000 gross BTUs heat content per cubic foot of Utah juniper. Solid wood volume in a cord varies but usually ranges from 65 to 90 cubic feet. Assuming an average of 75 cubic feet of solid wood per cord, there are about 21 million BTUs of heat value in a cord of mixed pinyon pine and Utah juniper.

Posts (7 foot): About 30 to 50 posts per acre in stands of medium canopy.

Christmas trees: About 15 trees per acre per year in stands of medium canopy. Thirty-five trees per acre in stands of sapling stage.

MANAGEMENT GUIDES AND INTERPRETATIONS

1. LIMITATIONS AND CONSIDERATIONS

a. Potential for sheet and rill erosion is moderate to severe depending on slope.
b. Moderate to severe equipment limitations on steeper slopes and moderate to severe equipment limitations on sites having extreme surface stoniness.
c. Proper spacing is the key to a well managed, multiple use and multi-product pinyon woodland.

2. ESSENTIAL REQUIREMENTS

a. Adequately protect from wildfire.
b. Protect soils from accelerated erosion.
c. Apply proper grazing management.

3. SILVICULTURAL PRACTICES

a. Harvest cut selectively or in small patches size dependent upon site conditions) to enhance forage production.
1) Thinning and improvement cutting - Removal of poorly formed, diseased and low vigor trees for fuelwood.
2) Harvest cutting - Selectively harvest surplus trees to achieve desired spacing. Save large, healthy, full-crowned singleleaf pinyon trees for nut producers. Do not select only "high grade" trees during harvest.
3) Slash Disposal - broadcasting slash improves reestablishment of native understory herbaceous species and establishment of seeded grasses and forbs after tree harvest.
4) Spacing Guide - D+9 (A higher spacing is required if managing for Christmas trees).
b. Prescription burning program to maintain desired canopy cover and manage site reproduction.
c. Mechanical tree removal (i.e. chaining) is not recommended on this site.
d. Pest control - Porcupines can cause
extensive damage and populations should be controlled.
e. Fire hazard - Fire usually not a problem in well-managed, mature stands.

Singleleaf pinyon wood is rather soft, brittle, heavy with pitch, and yellowish brown in color. Singleleaf pinyon has played an important role as a source of fuelwood and mine props. It has been a source of wood for charcoal used in ore smelting. It still has a promising potential for charcoal production. Other important uses for this tree are for Christmas trees and as a source of nuts for wildlife and human food. Singleleaf pinyon is also used in the manufacture of particle board and specialty products utilizing the distinctive oils and resins of this tree.

Other products

These trees have provided Native Americans with food for centuries. Thousands of pounds of nuts are gathered

each year and sold on commercial markets throughout the United States.
The pitch of singleleaf pinyon was used by Native Americans as an adhesive, caulking material, and a paint binder. It may also be used medicinally and chewed like gum. Pinyon seeds are a valuable food source for humans, and a valuable commercial crop.

Table 7. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
singleleaf pinyon	*PIMO*	65	90	7	12	–	–	–	

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T19N R33E S2
General legal description	Howell, J., 1940. Pinyon and juniper: a preliminary study of volume, growth, and yield. Regional Bulletin 71. Albuquerque, NM: USDA, SCS; 90p.

Other references

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Chambers, J., B. Bradley, C. Brown, C. D'Antonio, M. Germino, J. Grace, S. Hardegree, R. Miller, and D. Pyke. 2013. Resilience to Stress and Disturbance, and Resistance to Bromus tectorum L. Invasion in Cold Desert Shrublands of Western North America. Ecosystems:1-16.

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National Oceanic and Atmospheric Administration. 2004. The North American Monsoon. Reports to the Nation. National Weather Service, Climate Prediction Center. Available online: http://www.weather.gov/

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	05/10/2025
Approved by	Kendra Moseley

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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

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

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
