Ecological site F030XC253NV
Pinyon-Juniper (Limestone)

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 forestland site occurs on mountain backslopes on all aspects. Slopes range from 4 to over 75 percent, but slopes are typically 30 to 50 percent. Elevations range from 6500 to 8500 feet. The soils associated with this ecological site are shallow to moderately deep over limestone bedrock.

This site is part of group concept F030XC252NV.

Associated sites

R030XC045NV	**SHALLOW NORTH SLOPE 9-11 P.Z.**

Similar sites

F030XC251NV	**QUARTZITE SLOPES** Juniper dominant in overstory, less productive site.

Table 1. Dominant plant species

Tree	(1) *Pinus monophylla* (2) *Juniperus osteosperma*
Shrub	(1) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Poa fendleriana*

Physiographic features

This forestland site occurs on mountain backslopes on all aspects. Slopes range from 4 to over 75 percent, but slopes are typically 30 to 50 percent. Elevations range from 6500 to 8500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	6,500–8,500 ft
Slope	4–75%
Aspect	Aspect is not a significant factor

Climatic features

The climate is semi-arid with warm, dry summers and cold, moist winters. Precipiation is greatest in the winter with a lesser secondary peak in the summer, typical of the Mojave Desert. Average annual precipitation is about 9 to 14

inches. Mean annual air temperature is about 43 degrees F. The average growing season is 90 to 190 days.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	
Precipitation total (average)	14 in

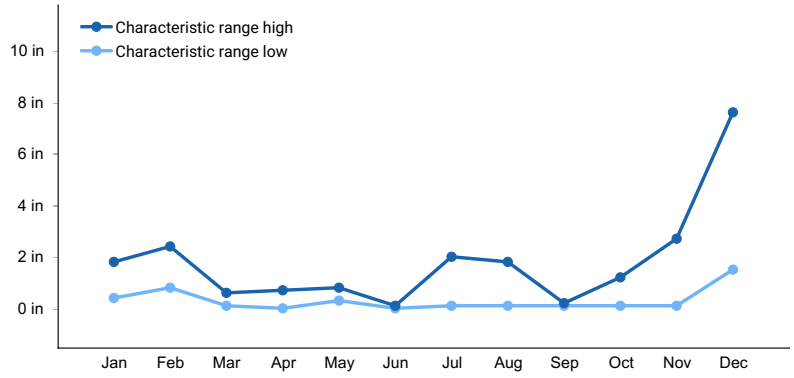


Figure 1. Monthly precipitation range

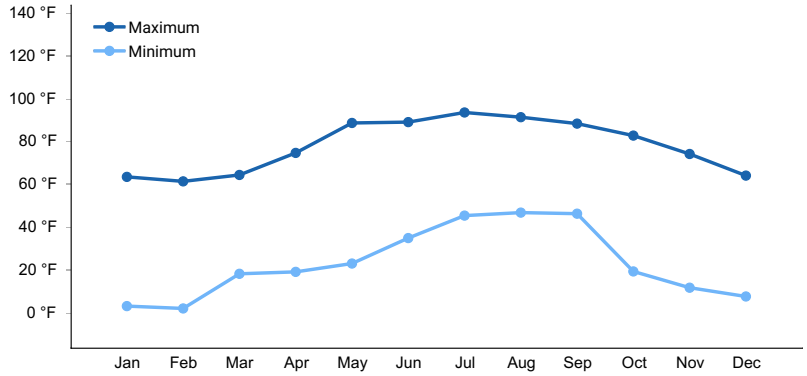


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

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

Soil features

The soils associated with this ecological site are shallow to moderately deep over limestone bedrock. These soils are derived primarily from limestone parent materials. The soil surface is covered by approximately 70 to 80 percent rock fragments (gravels, cobbles, and stones) that provide a stabilizing effect, protecting the surface from wind and water erosion. The soils correlated to this ecological site are classified as a loamy-skeletal, carbonatic, mixed, mesic, Lithic Calciustoll.

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone (2) Residuum–limestone
Surface texture	(1) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Very slow

Soil depth	14–20 in
Surface fragment cover <=3"	70–80%
Surface fragment cover >3"	5–10%
Available water capacity (0-40in)	1–3 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	2–8 mmhos/cm
Sodium adsorption ratio (0-40in)	1–5
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	40–60%
Subsurface fragment volume >3" (Depth not specified)	3–10%

Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. In general, pinyon-juniper forests have an open canopy with a shrubby understory. Fire plays an important role in all forest ecosystems. Important processes regulated by fire include regeneration and reproduction, seedbed preparation, competition reduction and thinning to maintain stand health (Spurr and Barnes 1964). Individual trees on this site are likely greater than 200 years old, indicating that stand replacing disturbances are uncommon. Total vegetative cover is high due to the diverse understory, although the tree cover remains quite low. Pinyon and juniper commonly grow together, but juniper species are considered to exhibit higher drought tolerance. Juniper tends to dominate the lower elevations of their range and community structure shifts to pinyon with increasing elevation (Zouhar 2001).

Soils provide physical support, moisture and nutrients to the forest community. Trees have reciprocating effects on the soil. Since they tend to exist on site for extended periods of time, their roots typically extend deep into the subsoil and even into fractured bedrock influencing the rate of soil development. Considerable amounts of organic material are returned to the soil in the form of fallen litter and decaying roots. Increased organic matter on the soil surface, or litter layer, helps to keep moisture conditions more uniform. Insulation provided the tree canopy and litter layer also reduces the temperature fluctuation from day to night (Fisher and Binkley 2002).

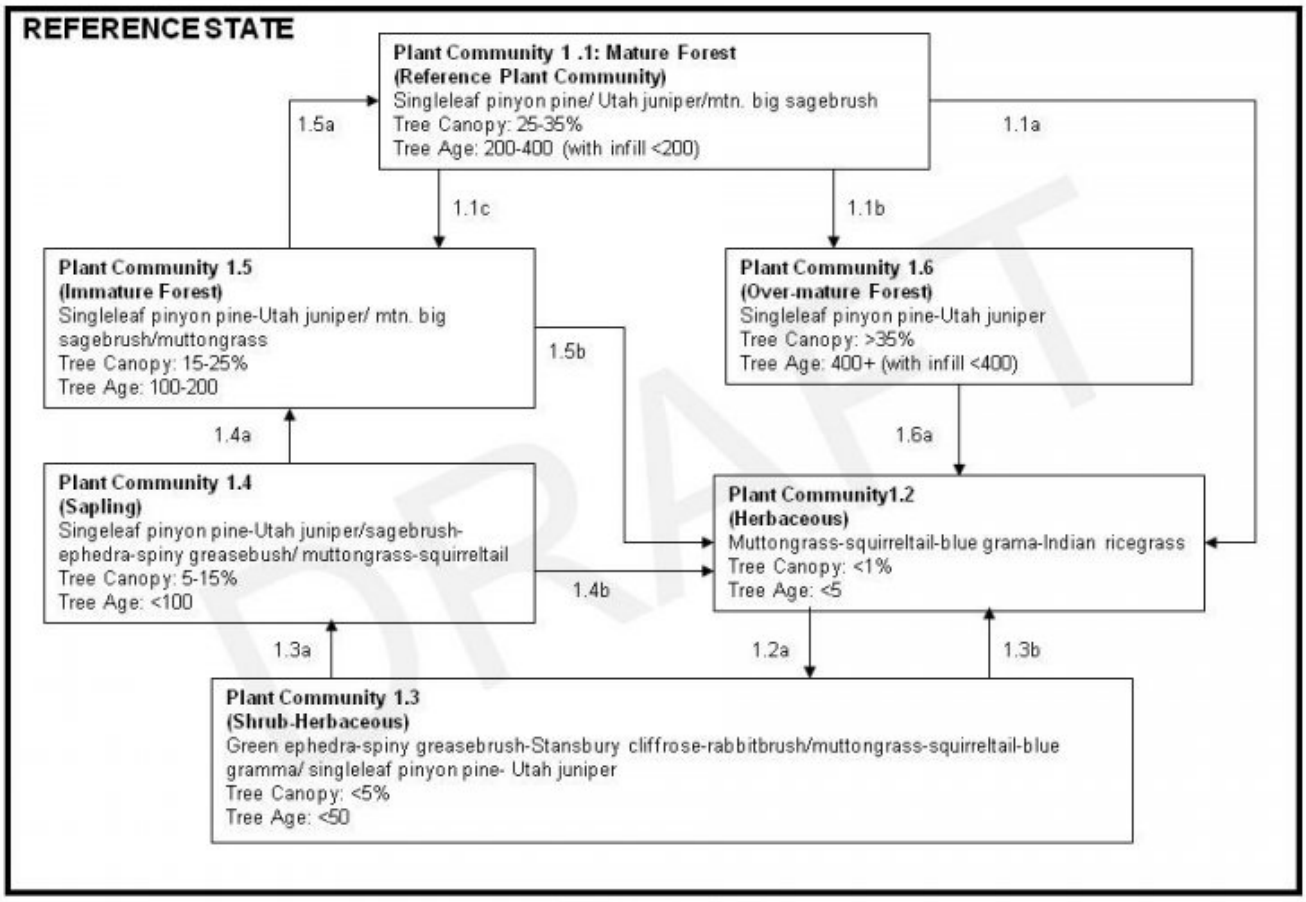
In pinyon and juniper forests, alternating canopy and inter-canopy patches influence soil moisture and temperature variability. Center portions of canopy patches receive less solar radiation than inter-canopy patches, influencing the kinds and proportions of vegetation growing there. Canopy and inter-canopy patches interact with the kind of precipitation event to influence soil moisture. Generally snow cover is greater in inter-canopy patches, indicating greater soil moisture. However, during rainfall events large enough to generate runoff and stem flow, canopy locations are much wetter than the inter-canopy spaces (Breshears et al. 1997). As the overstory becomes more dense, effects on soil moisture and solar radiation influence understory vegetation. Species diversity and understory production decrease with increased shading.

The distributions of pinyon and juniper forests have undergone many changes in prehistoric and historic times and these communities continue to change in modern times. It is also true that any assessment of pinyon and juniper distribution is only a snapshot of a plant community in motion (Zouhar 2001). Expansions in the spatial extent of pinyon-juniper communities in recent times have been contributed to many variables including distribution by birds, centuries of livestock grazing, changes in fire frequency and climate change. Currently pinyon-juniper forests are defined as being dominated by pre-settlement trees, those that established prior to 1860. Trees that established after the rapid settlement of the West in the late 1860’s and 1870’s are defined as post-settlement (Miller et al. 1999). True old-growth pinyon-juniper forests should be defined on the basis of tree age, and stand structure and function (Miller et al. 1999).

Fire Ecology: Singleleaf pinyon and Utah juniper are highly susceptible to fire damage. Both have thin, highly flammable bark that provides little protection to the cambium and lack self-pruning branches. Generally pinyon-juniper forests occur on shallow, rocky soils, where fires are infrequent and unpredictable. Years with exceptional

rainfall lead to increased herbaceous growth and allows for wildfires to spread. Small trees are more susceptible to mortality from wildfire. Reestablishment occurs solely from seed, rodents and birds often store large amounts of seed. Rate of reestablishment largely depends on size, season, intensity of fire, as well as, age of trees when burned. Mature trees produce more seed and therefore build up the seed bank in the soil and increase the rate of return. Reestablishment may take 50 to 100 years to reach pre-fire densities. Mountain big sagebrush is readily killed by fire of all severities and regeneration depends on an offsite seed source. Rabbitbrush is top-killed by fire, but regenerates by sprouting and by establishing from offsite seed source. Ephedra is also top-killed by fire, but the underground reproductive structures generally survive and sprout after the fire. Ephedra may increase in overall vegetative cover following fire. Stansbury cliffrose is considered to be a weak sprouter, able to survive low intensity fires. Muttongrass can survive low severity fires but is harmed and slow to recover from more severe fires. Squirreltail sprouts from the surviving root-crown and established from offsite seed. Blue grama is tolerant of fire, but can be damaged if burned during drought. Blue grama generally increases in production and cover following fire. Indian ricegrass can be killed by fire. Regeneration occurs through seed dispersed from adjacent unburned areas.

State and transition model



030XC253NV

Pinus monophylla-Juniperus osteosperma/Artemisia tridentata ssp. vaseyana/Poa fendleriana

State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. This state is co-dominated by singleleaf pinyon pine and Utah juniper. Primary natural disturbance mechanisms affecting this ecological site are wildfire, drought, disease and insect attack. Interactions between disturbance regimes and weather events determine long term plant community dynamics. Pinyon-juniper habitat is generally arid and species are adapted to receiving limited annual precipitation. Overall, drought related mortality is low in this habitat type. Increased mortality following drought is likely caused by a combination of insect attack and disease (Shaw et al. 2005). Currently this ecological site is described by a one state model, because additional states have not be

identified on the landscape. If in the future additional stable states are found this model will revised to reflect additional states.

Community 1.1
Reference Plant Community: Mature Forest

Figure 3. Mature Forest

This plant community is co-dominated by Utah juniper and singleleaf pinyon. Mountain big sagebrush and green ephedra are the principal understory shrubs. Pinyon and juniper trees have reached or are near maximal heights for the site. Tree canopy cover averages about 25 to 35 percent. Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. This stage of development is assumed to be representative of this ecological site in a pristine environment.

Forest overstory. Plant community composition and structure is dominated by singleleaf pinyon and Utah juniper that have reached or are near maximal heights for the site. Dominant trees average greater than five inches in diameter at one-foot stump height. Co-dominant trees have full crowns, while upper crowns are irregular, smoothly flat topped or rounded. Tree canopy cover averages about 25 to 35 percent. 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 forest site in a pristine environment.

Forest understory. Understory vegetative composition is approximately 10 percent grasses, 10 percent forbs and 80 percent shrubs and young trees when the average overstory canopy is medium (25 to 35 percent). Average understory production ranges from 200 to 400 pounds per acre with medium canopy cover. Understory production includes the total annual production of all species within 4½ feet of the ground surface.

Community 1.2
Herbaceous

This plant community is representative of an early-seral plant community. Vegetation is dominated by grasses and forbs under full sunlight. Standing snags remaining after disturbance have little or no affect on the composition and production of herbaceous vegetation, but can provide important wildlife habitat. This plant community is at-risk of invasion by non-natives. Non-native species are able to take advantage of increased availability of critical resources following fire or other disturbance.

Community 1.3
Shrub-Herbaceous

This community phase is dominated by 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 component of the vegetal structure. Sprouting shrubs, such as ephedra and spiny greasebush, quickly recover and provide favorable sites for germination and establishment of other shrubs. Fast moving, low-intensity fires result in the incomplete removal of sagebrush allowing 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 4½ feet in height) with a canopy cover between 5 and 15 percent. Open canopy allows understory vegetation to be dominated by shrubs, grasses and forbs in association with tree saplings. Sufficient time has past for the complete recovery of sagebrush. Tree seedlings establish under the canopy of shrubs.

Community 1.5
Immature Forestland

The visual aspect of the plant community is dominated by singleleaf pinyon and Utah juniper greater than 4½ feet in height. Seedlings and saplings of singleleaf pinyon and Utah juniper are prevalent in the understory. Understory vegetation is moderately influenced by shading from the overstory canopy of about 15 to 20 percent, reducing the density and production of grasses, forbs and shrubs. Sagebrush and other shrubs serve as nurse plants for pinyon and juniper seedlings.

Community 1.6
Over-Mature Forestland

Dominant and co-dominant trees have reached maximal heights for the site and average greater than eight inches in diameter at one-foot stump height. Upper crowns of most trees are typically irregular, flat-topped or rounded. Understory herbaceous production is greatly reduced or even absent due to tree competition and shading. Tree canopy cover 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 reduces water storage, soil stability and inputs of organic matter.

Pathway 1.1a
Community 1.1 to 1.2

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

Pathway 1.1c
Community 1.1 to 1.5

Triggers: Thinning or partial harvest, partial mortality from pest attack or other small scale disturbance.

Pathway 1.1b
Community 1.1 to 1.6

Absence from disturbance, continued growth 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, seedling and sapling growth 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 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial grasses**			11–30	
	muttongrass	POFE	*Poa fendleriana*	8–14	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–8	–
	blue grama	BOGR2	*Bouteloua gracilis*	2–8	–
	squirreltail	ELEL5	*Elymus elymoides*	2–8	–
Forb					
2	**Perennial forbs**			6–30	
	buckwheat	ERIOG	*Eriogonum*	2–8	–
	Cooper's rubberweed	HYCO2	*Hymenoxys cooperi*	2–8	–
	milkvetch	ASTRA	*Astragalus*	1–5	–
	bird's-beak	CORDY	*Cordylanthus*	1–5	–
Shrub/Vine					
3	**Primary Shrubs**			60–80	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	60–80	–
4	**Secondary Shrubs**			5–50	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	1–7	–
	mormon tea	EPVI	*Ephedra viridis*	1–7	–
	spiny greasebush	GLSP	*Glossopetalon spinescens*	1–7	–
	beavertail pricklypear	OPBA2	*Opuntia basilaris*	1–7	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	1–7	–
Tree					
5	**Evergreen**			10–20	
	Utah juniper	JUOS	*Juniperus osteosperma*	5–10	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	5–10	–

Table 6. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
singleleaf pinyon	PIMO	*Pinus monophylla*	Native	–	50–55	–	–
Utah juniper	JUOS	*Juniperus osteosperma*	Native	–	45–50	–	–

Animal community

Livestock Interpretations: This site has limited suitability for livestock grazing due to stony surface texture and low forage production. Perennial grasses are highly nutritious and remain palatable throughout the grazing season. Grazing management should allow for ample seed production and seedling establishment. Many areas are not used because of steep slopes or 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, 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. 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. Muttongrass is a valuable forage resource. It has been rated excellent forage for domestic cattle and horses. Bottlebrush squirreltail is palatable to domestic livestock. Winter months show greatest use and it generally increases under heavy grazing pressure. Indian ricegrass accounts for a small amount of total production on this site, but is highly palatable to all classes of livestock. Blue grama provides important forage for domestic cattle and sheep. This grass species cures well and provides forage year-round. Dominant shrubs provide additional foraging resources on this ecological site. Mountain big sagebrush is eaten by domestic livestock, but is low in palatability and will increase under heavy grazing pressure. Stansbury cliffrose provides important winter browse for domestic livestock. Moderate utilization has been shown to improve growth and seed production. Livestock will eat rabbitbrush in the late fall and winter when more desirable types of forage have been depleted. Green ephedra is browsed by all classes of livestock. It is heavily browsed during the winter and moderately or lightly used throughout the rest of the year.

Wildlife Interpretations: This site has high value for wildlife habitat year around. The high elevations and trees provide shade and cool environments during the summer and protection from winter storms. Mule deer use this ecological site for shelter and foraging resource. These pinyon-juniper woodlands provide important bird habitat. Species such as bushtit, spotted towhee, broad-tail hummingbird and pinyon jay are common. Several species of owls, flycatchers, wrens and sparrows also depend on this forestland. 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. Blue grama is used by mule deer, bighorn sheep, black-tailed jackrabbits and some song birds. It is primarily used during the growing season, but cures well and can provide forage year-round. Indian ricegrass is a relatively low producer on this site. It is also an important habitat component for black-tailed jackrabbits, other small mammals and many birds. Dominant shrubs provide additional foraging resources. Mountain big sagebrush provides important winter browse for mule deer and other wildlife. Stansbury cliffrose is important browse species for mule deer, game birds and songbirds Rabbitbrush is an important source of browse for wildlife species. It is used by mule deer, jack rabbits, other small mammals, and upland birds. Green ephedra is heavily browsed by wildlife on winter range. It is also important to small mammals like deer mice and squirrels.

Hydrological functions

Available water capacity is low or very low. Runoff is rapid and the potential for sheet and rill erosion can be high depending on steepness of slope and amount of rock fragments on the soil surface.

Recreational uses

Steep slopes and stony surfaces inhibit many forms of recreation. This site has limited potential for hiking, big game hunting, bird watching and nature study.

Wood products

Pinyon wood is rather soft, brittle, heavy with pitch, and yellowish brown in color. Singleleaf pinyon has been an important source of fuelwood, mine props, and wood for charcoal used in ore smelting. Utah juniper wood is highly resistant to decay and has long been used for fence posts, firewood, pencils and Christmas trees in locations where it commonly grows (Zlatnik 1999).

MANAGEMENT GUIDES AND INTERPRETATIONS
1. LIMITATIONS AND CONSIDERATIONS
a. Moderate to severe equipment limitations due to extreme surface stoniness and on sites with steep slopes.
2. ESSENTIAL REQUIREMENTS
a. Protect soils from accelerated erosion.
b. Manage to protect wildlife habitat.
3. SILVICULTURAL PRACTICES
Silvicultural treatments are not reasonably applied on this site due to poor site quality, commercially undesirable species and severe limitations for equipment and tree harvest.

Other products

Singleleaf pinyon trees serve as a food source, as well as providing medicinal, cultural, and spiritual values for Native Americans. Other important uses for this tree include Christmas trees and as a source of nuts for wildlife and human food. Thousands of pounds of nuts are gathered each year and sold throughout the United States. Early inhabitants of the desert region used Utah juniper for construction, collected juniper berries for food and used shredded bark as a tobacco substitute or weaving material (Lanner 1984).

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*	60	80	5	9	92	–	–	
Utah juniper	*JUOS*	10	15	5	9	92	–	–	
singleleaf pinyon	*PIMO*	12	22	5	9	92	–	–	

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T15S R60E S36
UTM zone	N
UTM northing	4050766
UTM easting	660425
Latitude	36° 35′ 20″
Longitude	115° 12′ 24″
General legal description	Sheep Peak USGS 7.5 minute topographic quadrangle. Approximately 2.5 miles east of Sheep Peak, Desert National Wildlife Refuge, Clark County, Nevada.

Other references

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Contributors

EVH/PNE

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	05/11/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

17. **Perennial plant reproductive capability:**