USDA Natural Resources
Conservation Service

Ecological site F029XY001CA
Shallow Sandy Slope

Last updated: 2/20/2025
Accessed: 05/20/2025

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): 029X–Southern Nevada Basin and Range

The Southern Nevada Basin and Range MLRA (29) represents the transition from the Mojave Desert to the Great Basin. It is cooler and wetter than the Mojave. It is warmer and typically receives more summer precipitation than the Great Basin. This area is in Nevada (73 percent), California (25 percent), and Utah (2 percent). It makes up about 26,295 square miles (68,140 square kilometers). Numerous national forests occur in the area, including the San Bernardino, Angeles, Sequoia, Inyo, Humboldt-Toiyabe, and Dixie National Forests. Portions of Death Valley National Monument, the Nuclear Regulatory Commission's Nevada Test Site, the Hawthorne Ammunition Depot, and the Nellis Air Force Range in Nevada and the China Lake Naval Weapons Center in California also are in this MLRA. The northeast part of the Paiute Indian Reservation and the southern third of the Walker River Indian Reservation are in the part of this MLRA in Nevada, and the Lone Pine, Fort Independence, and Big Pine Indian Reservations are in the part in California.

Physiography:
The entire area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and pluvial lake terraces. The mountains are uplifted fault blocks with steep side slopes and not well dissected due to limited annual precipitation. Most of the valleys in this MLRA are closed basins or bolsons containing sinks or playa lakes.

Geology:
The mountains are dominated by Pliocene and Miocene andesite and basalt rocks,

Paleozoic and Precambrian carbonate rocks prominent in some areas. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments (Pliocene and Miocene) are in the western and eastern thirds of this MLRA. The valleys consist mostly of alluvial fill and playa deposits at the lowest elevations in the closed basins.

Climate:
The average annual precipitation is 3 to 12 inches (75 to 305 millimeters) in most of this area. It may be as high as 29 inches (735 millimeters), on the higher mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Summers are dry, but sporadic storms are common in July and August.
Water Resources:
Water resources are scarce. Ground water and surface water sources are limited. Streams are small and intermittent. Quality of surface water in naturally degraded as streams cross area of valley fill effected by dissolved salts. Irrigation water may raise the levels of dissolved salts and suspended sediments causing contamination.

Soils:
Dominant soil orders include Entisols and Aridisols.

Ecological site concept

The Shallow Sandy Slope is found on slope of greater than 30 percent on mountains. The soil is less than 20 inches to a bedrock restrictive layer.

The Shallow Sandy Slope site was previously known as *Pinus monophylla*/*Artemisia tridentata*-Eriogonum wrightii.

Associated sites

R029XY185CA	**Shallow Granitic Hills 7-9" p.z.** R029XY185CA Shallow Granitic Hills 7-9
R029XY186CA	**Sandy Slope 10-12" p.z.** RO29XY186CA Sandy Slope 10-12
R029XY189CA	**South Sandy Slope 9-11" p.z.** R029XY189CA South Sandy Slope 9-11

Similar sites

F029XF062CA	**Pinus monophylla/Artemisia tridentata** F029XF062CA Pinus monophylla/Artemisia tridentata is located on moderately deep soils. The pinyon overstory may be denser, and the understory is more diverse.

Table 1. Dominant plant species

Tree	(1) *Pinus monophylla*
Shrub	(1) *Artemisia tridentata* (2) *Eriogonum wrightii*
Herbaceous	Not specified

Physiographic features

The Shallow Sandy Slope ecological site is found on the upper backslopes of mountains. It is typically found on cooler, north- and east-facing slopes. Slopes range from 30 to 60 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	4,790–6,820 ft
Slope	30–60%
Water table depth	72 in
Aspect	N, E

Climatic features

The Mojave Desert experiences clear, dry conditions for a majority of the year. Winter temperatures are mild, summer temperatures are hot, and seasonal and diurnal temperature fluctuations are large. Monthly minimum temperature averages range from 30 to 80 degrees F (-1 to 27 degrees C). Monthly maximum temperature averages range from 60 to 110 degrees F (16 to 43 degrees C) (CSU 2002).

Average annual rainfall is between 2 and 8 inches (50 to 205 millimeters) (USDA 2006). Snowfall is more common at elevations above 4000 feet (1220 meters), but it may not occur every year (WRCC 2002). The Mojave Desert receives precipitation from two sources. Precipitation falls primarily in the winter as a result of storms originating in the northern Pacific Ocean. The Sierra Nevada and Transverse Ranges create a rain shadow effect, causing little precipitation to reach the Mojave Desert. Sporadic rainfall occurs during the summer as a result of convection storms formed when moisture from the Gulf of Mexico or Gulf of California moves into the region. Summer rainfall is more common and has a greater influence on soil moisture in the eastern Mojave Desert.

Windy conditions are also common in the Mojave Desert, particularly in the west and

central Mojave Desert. Spring is typically the windiest season, with winds averaging 10-15 miles per hour (WRCC 2002). Winds in excess of 25 miles per hour and gusts in excess of 50 miles per hour are not uncommon (CSU 2002).

Although half of the Jawbone-Butterbredt ACEC Soil Survey is in the Mojave Desert (MLRA 30), the western and northwestern areas of the survey transition into the Southern Nevada Basin and Range (MLRA 29). As the Mojave Desert transitions into the Southern Nevada Basin and Range, the temperature range generally becomes cooler (WRCC 2002). Precipitation as rain and as snow also increases (USDA 2006). This survey area has a wide range of precipitation due to its location. Where the Mojave Desert influences are stronger, average annual precipitation ranges from 5 to 7 inches (127 to 178 millimeters). Where the Southern Nevada Basin and Range influences are stronger, average annual precipitation commonly ranges from 7 to 9 inches (178 to 229 millimeters), and may range up to 12 inches (305 millimeters) annually (WRCC 2002). At elevations above 4000 feet (1370 meters), average annual snowfall may reach 20 inches (WRCC 2002).

"Maximum monthly precipitation" represents average monthly precipitation.

Table 3. Representative climatic features

Frost-free period (characteristic range)	150 days
Freeze-free period (characteristic range)	198 days
Precipitation total (characteristic range)	11 in
Frost-free period (actual range)	150 days
Freeze-free period (actual range)	198 days
Precipitation total (actual range)	11 in
Frost-free period (average)	150 days
Freeze-free period (average)	198 days
Precipitation total (average)	11 in

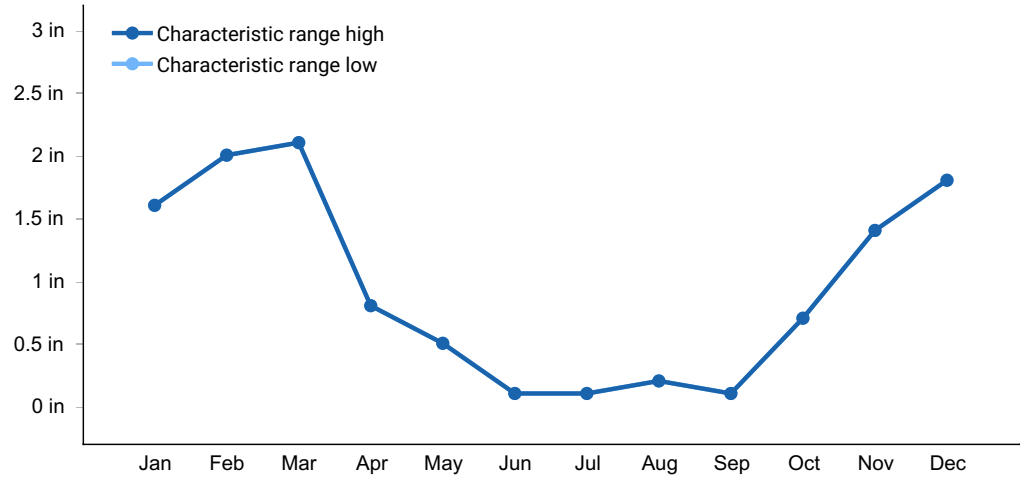


Figure 1. Monthly precipitation range

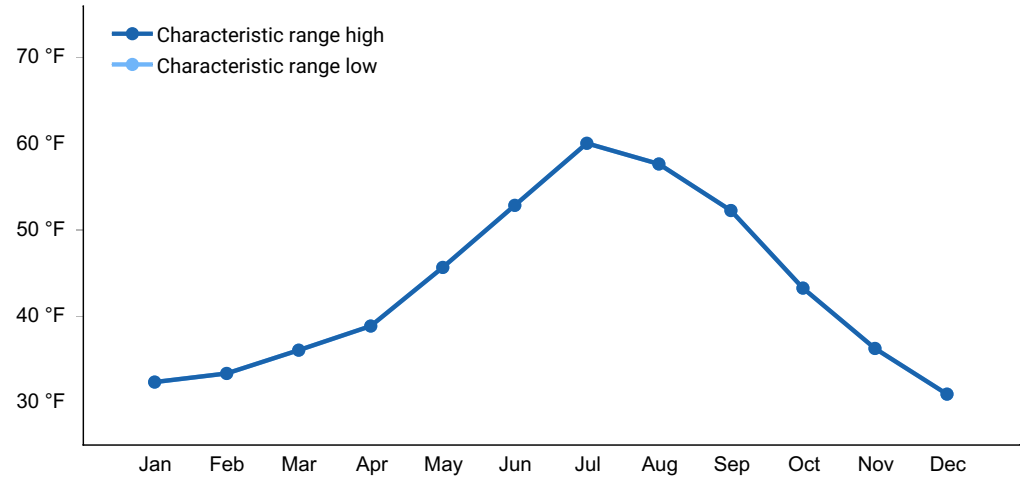


Figure 2. Monthly minimum temperature range

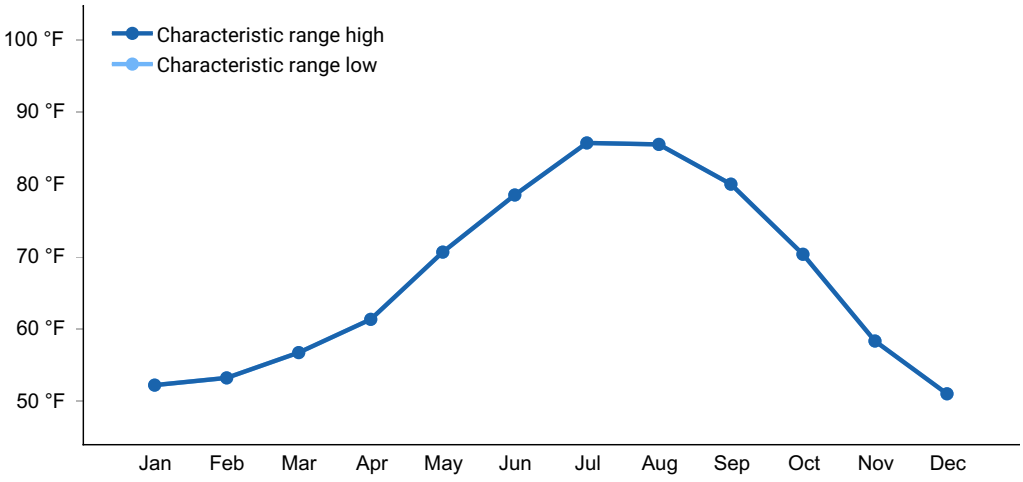


Figure 3. Monthly maximum temperature range

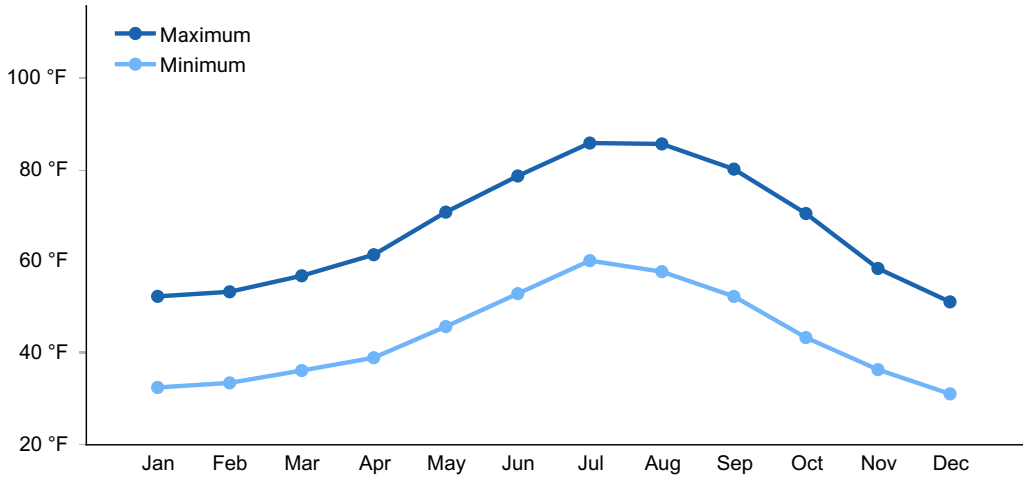


Figure 4. Monthly average minimum and maximum temperature

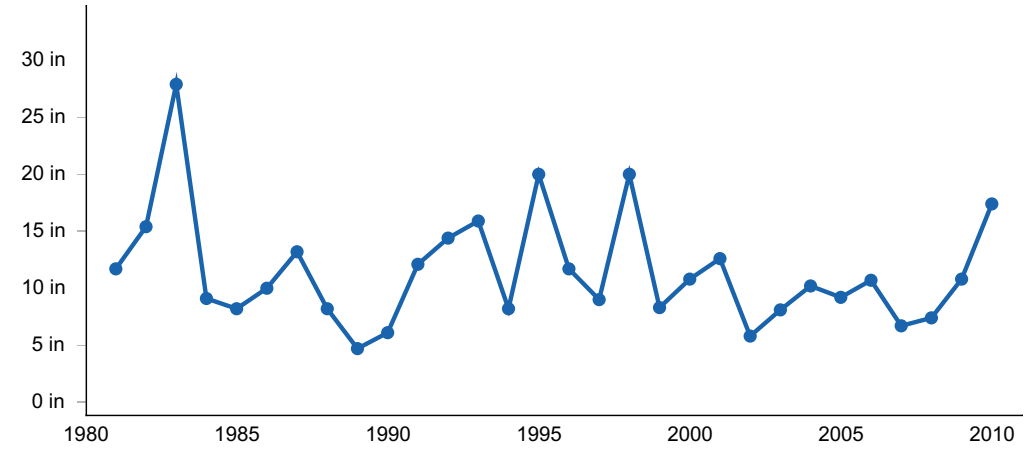


Figure 5. Annual precipitation pattern

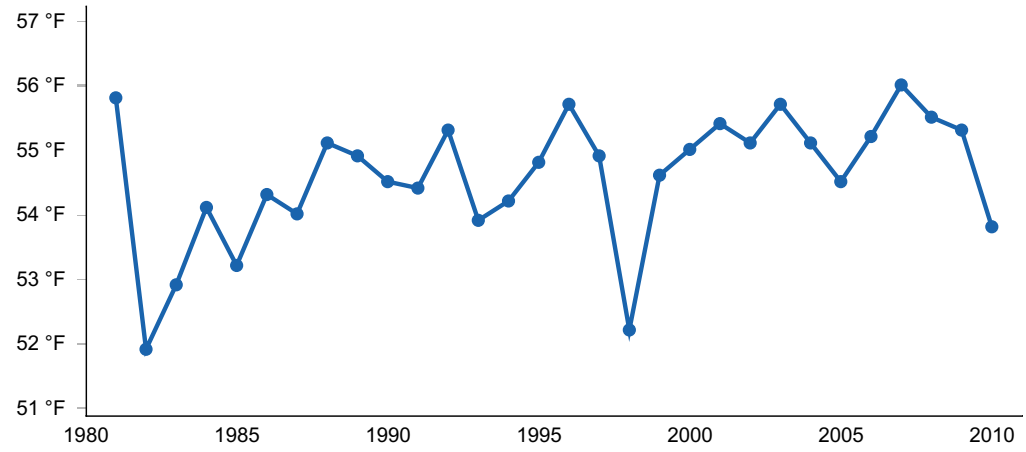


Figure 6. Annual average temperature pattern

Climate stations used

- (1) TEHACHAPI [USC00048826], Tehachapi, CA

Influencing water features

No influencing water features.

Soil features

The Shallow Sandy Slope ecological site is found on shallow, sandy soils formed from granitic colluvium and residuum. The soils are shallow to weathered bedrock that begins between 10 and 20 inches. The coarse textures contribute to very rapid permeability, and the shallow depth to weathered bedrock contributes to very high runoff. Soils are also somewhat excessively drained and available water capacity is very low. The soils are classified as Mixed, mesic, shallow, Torripsammentic Haploxerolls. They have a dark, organic-rich surface soil due to the incorporation of organic matter from the pine litter that covers the soil surface.

Soil survey area - Map unit symbol - Component
CA682 - 5205 - Scodie (major)

Table 4. Representative soil features

Parent material	(1) Colluvium–granite (2) Residuum–granite
Surface texture	(1) Gravelly coarse sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Very rapid
Soil depth	10–20 in
Surface fragment cover <=3"	60–90%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.5–1.1 in
Calcium carbonate equivalent (0-40in)	0–1%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–2
Soil reaction (1:1 water) (0-40in)	6.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	20–25%

Ecological dynamics

Singleleaf pinyon (*Pinus monophylla*) woodlands are found in many western states. Singleleaf pinyon is a slow-growing species and may live over 300 years. It grows best on coarse textured, well drained mollisols (Burns and Honkala 1990). It grows on soils that vary greatly in depth. Its taproot is stunted in shallow soils, but its extensive lateral root system, which may extend at least 3 times the tree height in all directions, provides stability and access to water (Burns and Honkala 1990). Competition for water is great and plays a large role in preventing canopy closure. Competition for light is also important. Many young singleleaf pinyons remain suppressed under the canopy.

The dominant understory species are mountain big sagebrush (*Artemisia tridentata* spp. vaseyana), desert needlegrass (*Achnatherum speciosum*), and Sandberg bluegrass (*Poa secunda*). These species are relatively shade intolerant and are more common in canopy gaps. These species are dominant at elevations directly below the singleleaf pinyon woodlands.

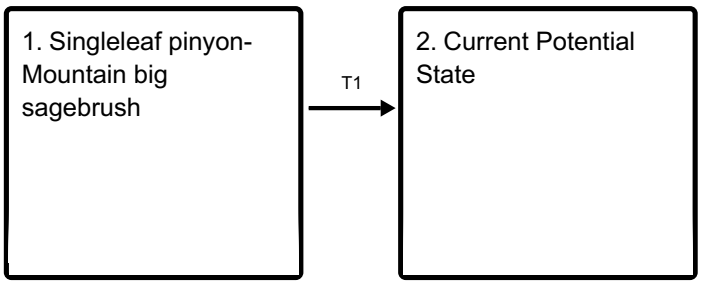
This ecosystem is affected by fire, but fire frequency and intensity may be more erratic in dry climates than in others. Annual production, particularly of herbaceous species, is important for starting and sustaining a fire. Such production is unpredictable in drier climates, and fire return intervals for southern California pinyon woodlands have a wide range from 50 to over 400 years (Zouhar 2001). Singleleaf pinyon may survive light burns, but it is generally not well adapted to fire. It has thin bark, and its low branches help carry fires into the crown. It is frequently killed in severe fires and must re-establish by seed. Grasses and shrubs will establish following a fire and often act as nurse plants for pinyon seedlings. As the seedlings grow, the shrubs and grasses get outcompeted. Re-establishment of the woodland may take several decades (Miller and Tausch 2001).

Parasites, insects, and diseases are also important components of singleleaf pinyon woodlands. Parasites include mistletoes. Trees weakened by mistletoe or drought may be killed by bark beetle infestations. Root diseases may also cause high tree mortality. High mortality of trees will, in turn, increase the risk of wildfire.

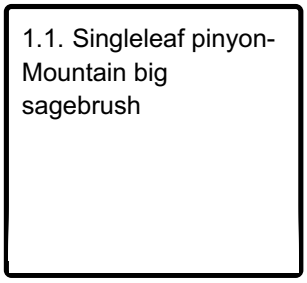
Severe disturbances may contribute to invasion by non-native species. The competition created by these species may delay or prevent the re-establishment of native grasses and shrubs and ultimately the re-establishment of the pinyon woodland.

State and transition model

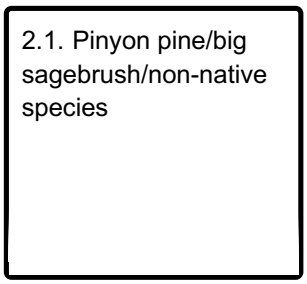
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Singleleaf pinyon- Mountain big sagebrush

The Reference State is dominated by singleleaf pinyon (*Pinus monophylla*). It is typically found on cooler north- and east-facing exposures, but may be found in less dense stands on warmer, drier exposures. Trees in this state range from 150 to 300 years old.

Community 1.1
Singleleaf pinyon- Mountain big sagebrush

The interpretive plant community is the reference plant community prior to European colonization. This plant community is located above mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana) communities. The dominant species is singleleaf pinyon (*Pinus monophylla*). It is typically found on cooler north- and east-facing exposures, but may be found in less dense stands on warmer, drier exposures. Trees in this community range from 150 to 300 years old. The singleleaf pinyon canopy ranges from 30 to 50 percent cover. Understory species are more common where the canopy is less dense or in canopy gaps. These include shrubs such as mountain big sagebrush (*Artemisia tridentata* ssp. vaseyana), mountain joint-fir (*Ephedra viridis*), bastardsage (Eropgonum wrightii), California buckwheat (*Eriogonum fasciculatum*). Perennial grasses are also present and

include Sandberg bluegrass (*Poa secunda*), desert needlegrass (*Achnatherum speciosum*) and squirreltail (*Elymus elymoides*). The plant community is approximately 70% trees, 25% shrubs, and 5% grasses.

Forest overstory. The tree canopy is composed of singleleaf pinyon (Pinus monophylla). Joshua tree (Yucca brevifolia) is a rare component of the tree canopy.

Forest understory. The major understory shrubs are mountain big sagebrush (Artemisia tridentata ssp. vaseyana), bastardsage (Eriogonum wrightii), California buckwheat (Eriogonum fasciculatum), mountain joint-fir (Ephedra viridis). Understory grasses include desert needlegrass (Achnatherum speciosum) and Sandberg bluegrass (Poa secunda). Squirreltail (Elymus elymoides) may be present in small amounts.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	195	300	415
Grass/Grasslike	50	80	125
Forb	5	20	60
Total	**250**	**400**	**600**

Table 6. Ground cover

Tree foliar cover	30-50%
Shrub/vine/liana foliar cover	15-20%
Grass/grasslike foliar cover	2-3%
Forb foliar cover	2-3%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	5-10%
Shrub/vine/liana basal cover	5-10%

Grass/grasslike basal cover	1-2%
Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	25-35%
Surface fragments >0.25" and <=3"	15-25%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	2-3%

Table 8. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	2-3%
>0.5 <= 1	–	–	2-3%	–
>1 <= 2	–	10-15%	–	–
>2 <= 4.5	2-3%	5-7%	–	–
>4.5 <= 13	5-7%	–	–	–
>13 <= 40	25-30%	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2
Current Potential State

The Current Potential State is dominated by singleleaf pinyon (*Pinus monophylla*). It is typically found on cooler north- and east-facing exposures, but may be found in less dense stands on warmer, drier exposures. Trees in this state range from 150 to 300 years old. The Current Potential State is similar to the Reference State, with the exception of non-native species in the plant community.

Community 2.1
Pinyon pine/big sagebrush/non-native species

Community 2.1 is similar to Community 1.1, however the 2.1 plant community includes non-native species.

Transition T1
State 1 to 2

Establishment of non-native species in the plant community.

Additional community tables

Animal community

This woodland community is habitat for many wildlife species. Trees are important nesting sites for birds. Understory shrubs and grasses are important forage species for wildlife. Pinyon seeds are also an important food source.

This ecological site is not well-suited for domestic livestock use due to low forage availability, steep slopes, and lack of water sources.

Hydrological functions

This ecological site has very high runoff, coarse-textured soils, and steep slopes. The wide network of roots created by the vegetation is important for the stability of the site. Loss of vegetation will likely increase runoff and erosion from this site.

Recreational uses

This ecological site can be found in an off-highway vehicle recreation area. Several OHV roads run near this ecological site.

The Pacific Crest Trail passes near this ecological site.

Wood products

Wood of single-leaf pinyon is used primarily for fuel and fence posts. It may also be used for particle board and cement board.

Other products

Pinyon nuts were an important food source for Native Americans. The nuts are still gathered today by many tribes and are an important commercial crop in some areas.

Other information

Pinyon woodlands have had cultural, spiritual, economic, subsistence, aesthetic and medicinal value to Native Americans for thousands of years. The wood of single-leaf pinyon was an important fuel source for railroads and mines. The pitch of single-leaf pinyon was used as an adhesive and caulking material and a paint binder. It may also be used medicinally and chewed like gum.

Table 9. 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*	20	40	1	3	–	–	–	

Inventory data references

1 Line-point intercept transect (2007)
2 Zig-zag transects (2002, 2007)
1 SCS Range 417 Production and Composition Record
NASIS soil component data

Type locality

Location 1: Kern County, CA	
UTM zone	N
UTM northing	3924983
UTM easting	395026
Latitude	35° 27′ 46″
Longitude	118° 9′ 24″
General legal description	This site is located on a north-facing slope of Pinyon Mountain, near SC120 in the Jawbone-Butterbredt ACEC.

Other references

Burns, Russell M., and Barbara H. Honkala, tech. coords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p.

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Miller, R.F. and R.J. Tausch. 2001. The role of fire in pinyon and juniper woodlands: a descriptive analysis. Pages 15-30 in K.E.M. Galley and T.P. Wilson (eds.). Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species. Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management. Miscellaneous Publication No. 11, Tall Timbers Research Station, Tallahassee, FL.

United States Department of Agriculture (USDA), Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Western Regional Climate Center (WRCC). 2002. Western U.S. Climate Historical Summaries [Online]. Desert Research Institute, Reno, NV. Online. http://www.wrcc.dri.edu/Climsum.html. Accessed 28 November 2006.

Zouhar, Kristin L. 2001. *Pinus monophylla*. 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/ [2007, April 26].

Contributors

Heath M. McAllister

Approval

Kendra Moseley, 2/20/2025

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	05/20/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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

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

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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:**

17. **Perennial plant reproductive capability:**