Ecological site F030XC250NV
Singleleaf Pinyon Pine Forestland

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 mountain summits and sideslopes. Although this site occurs on all aspects, it is generally restricted to north-facing aspects at the lower elevations of its range. Slopes range from 30 to 75 percent. Elevations range from 3950 to about 6200 feet. This is a pinyon-juniper site.

This site is part of group concept F030XC238NV

Table 1. Dominant plant species

Tree	(1) *Pinus monophylla*
Shrub	(1) *Quercus turbinella*
Herbaceous	(1) *Achnatherum*

Physiographic features

This forest site occurs on mountain summits and sideslopes. Although this site occurs on all aspects, it is generally restricted to north-facing aspects at the lower elevations of its range. Slopes range from 30 to 75 percent. Elevations range from 3950 to about 6200 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Elevation	1,204–1,890 m
Slope	30–75%
Aspect	Aspect is not a significant factor

Climatic features

The primary air masses affecting the Spring Mountains are cold maritime polar air from the Gulf of Alaska and warmer, moist maritime subtropical air from lower latitudes. Occasionally there are invasions of cold continental polar air from northern Canada or the Rocky Mountains. Precipitation in the area results primarily from the passage of cyclones with associated fronts during fall, winter and spring; from closed cyclones in late winter and spring; and from the flow of moist tropical air from the southeast to the southwest quadrant in the summer.

The mean annual precipitation is about 10 to 12 inches. Mean annual air temperature is 51 to 55 degrees F. The average growing season is about 140 to 180 days.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	
Precipitation total (average)	305 mm

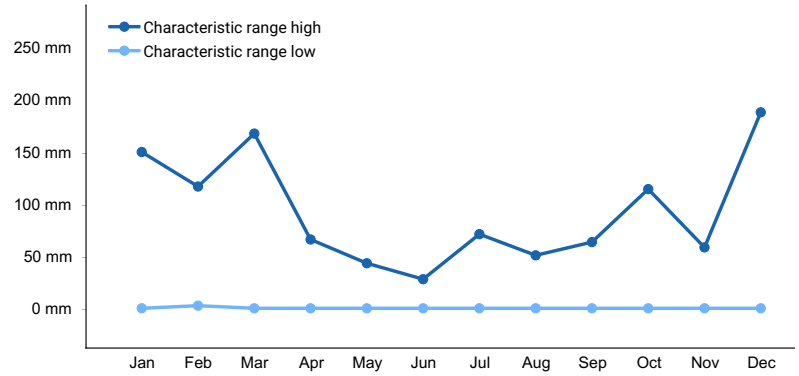


Figure 1. Monthly precipitation range

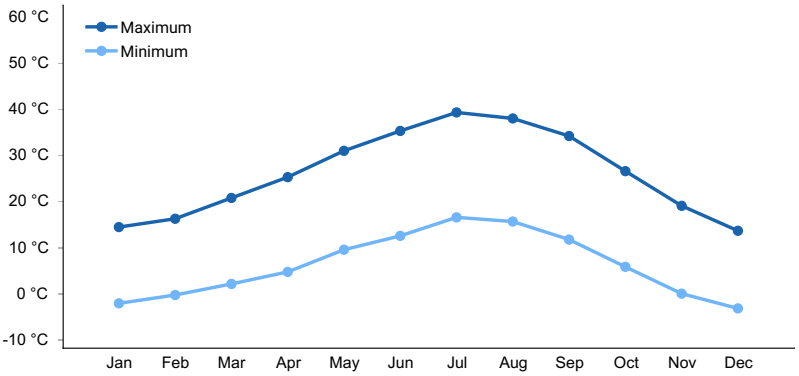


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are typically moderately deep to bedrock, and well drained. These soils have formed in residuum and colluvium from granite, gneiss and schist and other metamorphic rock parent materials. Available water capacity is very low, but trees and shrubs extend their roots into fractures in the bedrock allowing them to utilize deep moisture. There are high amounts of various sized rock fragments. The soil surface is covered with approximately 60 percent gravels, 10 percent cobbles, 5 percent stones, and 2 percent boulders. The soil temperature regime is mesic and the soil moisture regime is aridic bordering on ustic. Soil series associated with site include Jumbopeak.

Table 4. Representative soil features

Surface texture	(1) Extremely gravelly loamy coarse sand (2) Extremely gravelly loamy sand
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	51 cm
Surface fragment cover <=3"	50–70%

Surface fragment cover >3"	17–25%
Available water capacity (0-101.6cm)	4.06–4.32 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	6–7.8
Subsurface fragment volume <=3" (Depth not specified)	35–50%
Subsurface fragment volume >3" (Depth not specified)	1–11%

Ecological dynamics

The plant communities of this site are dynamic in response to change in disturbance regimes and weather patterns. A variety of disturbances at different temporal and spatial scales influence tje vegetation response of a particular site. The natural process of succession is dynamic; an individal plant communtiy can exist in various stable states. Disturbances, such as fire, play an important role is all forest ecosystems. Important processes that are regulated by fire include regeneration and reproduction, seedbed preparation, competition reduction and thinning to maintain stand health (Spurr and Barnes 1964)

The pinyon-juniper forest 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 differentially reduces seedling and sapling recruitment more than other age classes. The ecotones between singleleaf pinyon forests 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.

Pinyon and juniper forest overstory predicts solar radiation and soil moisture patterns, creating a variety of microclimates within the stand (Breshears et al. 1997). 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 wetting than the inter-canopy spaces (Breshears et al. 1997). As the overstory become more dense effects on soil moisture and solar radiation influence understory vegetation. Species diversity and understory production decrease with increased shading.

Soils associated with this site 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 general pinyon-juniper woodlands are open with a shrubby understory. Total vegetative cover is high due to the diverse understory, although the tree cover remains quite low.

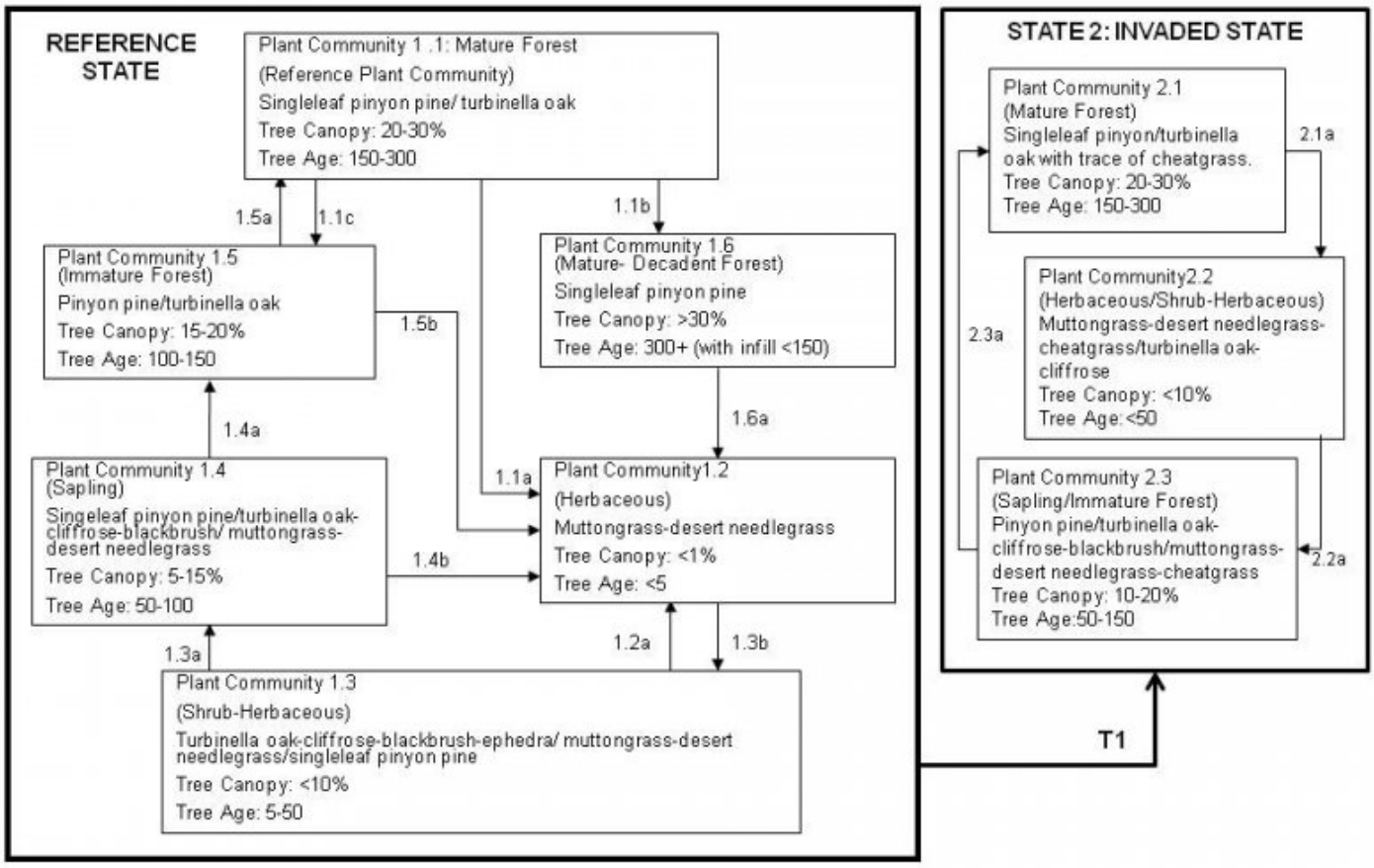
Singleleaf pinyon and Utah juniper are highly susceptible to fire damage. Both have thin, highly flammable bark that provides little protection to the cambium and lack self-pruning branches. Generally pinyon-juniper forests occur on

xeric sites with infertile, shallow, rocky soils, where fires are infrequent and unpredictable. Years with exceptional rainfall lead to increased herbaceous growth and allows for wildfire 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, rate of burn, 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.

In the Great Basin, there is evidence of both frequent, low-severity fires carried by once-abundant perennial grasses, and less frequent, localized stand-replacement fires during extreme conditions. Fires burned in irregular patterns, producing a mosaic of burned and unburned landscape. On high-productivity sites where sufficient fine fuels existed, fires burned every 15 to 20 years, and on less productive sites with patchy fuels, fire intervals may have been in the range of 50 to 100 years or longer. Fire frequency in singleleaf pinyon communities varies with fuel loads and ignition source that, in turn, vary with habitat type, aspect, topography, stand history, and climatic conditions.

Turbinella oak is well adapted to survive fire, it is typically top-killed but resprouts vigorously from the root crown and rhizomes in response to fire or other disturbances. Postfire establishment also occurs from seed. Blackbrush is readily killed by fire and regenerates solely from seed. Recovery post fire may take greater than 60 years. Fire effects on Stansbury cliffrose are variable, severe fire may kill or severely damage cliffrose. Generally it is a weak sprouter that can survive low severity fire. Desert needlegrass tuffed growth form makes it susceptible to fire damage. Fast burning cool fires will remove the accumulation and plant will resprout from the surviving root crown. Muttongrass is slow to recover from severe fire, but can easily recover from light burning, especially in the fall.

State and transition model



030XC250NV

Pinus monophylla/Quercus turbinella/Achnatherum

State 1
Reference State

This state represents the natural range of variability under pristine conditions. This state is dominated by singleleaf pinyon pine. Primary natural disturbance mechanisms affecting this ecological site are wildfire and periodic drought. Timing of fire combined with weather events determines plant community dynamics. This site may experience light to moderate grazing by wildlife. 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 drought, insect attack and disease.

Community 1.1
Reference Plant Community

The reference plant community composition and structure is dominated by singleleaf pinyon pine that have reached or are near maximal heights for the site. Utah juniper may compose up to 15 percent of the overstory canopy. 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, or smoothly flat topped or rounded. Tree canopy cover averages about 20 to 30 percent. Blackbrush and turbinella oak are the principle understory shrubs. 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.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	117	273	352
Grass/Grasslike	34	78	101
Forb	9	20	26
Tree	9	20	26
Total	**169**	**391**	**505**

Community 1.2
Herbaceous

Vegetation is dominated by grasses and forbs under full sunlight. Shrubs able to sprout following disturbance are a minor part of the plant community. This stage is experienced after wildfire, disease or insect outbreak, or other major physical disturbance. Standing snags remaining after disturbance have little or no affect on the composition and production of herbaceous vegetation, but can provide important wildlife habitat.

Community 1.3
Shrub-Hebaceous

This community phase 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 component of the vegetal structure.

Community 1.4
Sapling

In the absence of disturbance, the tree seedlings develop into saplings (20 inches to 4½ feet in height) with a canopy cover generally of about 15 percent. Open canopy allows understory vegetation to be dominated by grasses, forbs and shrubs, in association with tree saplings.

Community 1.5
Immature Forest

Singleleaf pinyon and Utah juniper greater than 4½ feet in height form a major constituent of the visual aspect of the plant community composition and structure. 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.

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. Dominant pinyon and juniper trees typically have open, fragmented, crowns. Upper crowns of dominant and co-dominant trees are normally flat-topped or rounded. Understory herbaceous production is greatly reduced due to tree competition and shading. Tree canopy cover is commonly greater than 35 percent.

Pathway 1.1a
Community 1.1 to 1.2

Stand replacing fire.

Pathway 1.1c
Community 1.1 to 1.5

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

Stand replacing fire or other large scale disturbance.

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

Stand replacing fire or other large disturbance.

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

Large scale disturbance such as, stand replacing fire, total harvest, insect attack.

Pathway 1.6a
Community 1.6 to 1.2

Stand replacing fire, severe insect attack or other large disturbance.

State 2
Invaded State

The Invaded State is characterized by a singleleaf pinyon pine forest with a trace of non-native annuals in the understory. State 2 is functionally similar to the reference state, however the presence of non-natives has reduced the ecological resilience of the site.

Community 2.1
Plant Community 2.1

Compositionally and functionally similar to the reference plant community, with the presence of non-natives in the understory. Management focused on limiting the level of anthropogenic impacts is important for maintaining the health of perennial native species and protecting the site from further degradation.

Community 2.2
Plant Communtiy 2.2

This plant community is characterized by the removal of overstory trees and increased herbaceous vegetation. Non-native annual and perennial native grasses increase. Shrubs capable of sprouting from the root-crown readily regenerate.

Community 2.3
Plant Community 2.3

This plant community is characterized by a sapling/immature forest. Herbaceous plants and shrubs have decreased in the understory. Non-native annual grass present in understory. Overstory canopy ranges from 10-20%.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			34–90	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	11–34	–
	muttongrass	POFE	*Poa fendleriana*	11–34	–
2	**Secondary Perennial Grasses**			6–28	
	little Parish's needlegrass	ACPAD	*Achnatherum parishii var. depauperatum*	3–17	–
	little Parish's needlegrass	ACPAD	*Achnatherum parishii var. depauperatum*	3–17	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–6	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–6	–
	bush muhly	MUPO2	*Muhlenbergia porteri*	0–6	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–6	–
Forb					
3	**Perennial Forbs**			6–22	
	desert globemallow	SPAM2	*Sphaeralcea ambigua*	2–17	–
	phlox	PHLOX	*Phlox*	0–6	–
Shrub/Vine					
4	**Primary Native Shrubs**			112–269	
	Sonoran scrub oak	QUTU2	*Quercus turbinella*	90–196	–
	blackbrush	CORA	*Coleogyne ramosissima*	15–28	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	15–28	–
5	**Secondary Native Shrubs**			11–78	
	Nevada jointfir	EPNE	*Ephedra nevadensis*	3–17	–
	mormon tea	EPVI	*Ephedra viridis*	3–17	–
	pointleaf manzanita	ARPU5	*Arctostaphylos pungens*	1–6	–
	longflower rabbitbrush	CHDE2	*Chrysothamnus depressus*	1–6	–
	Engelmann's hedgehog cactus	ECEN	*Echinocereus engelmannii*	1–6	–
	narrowleaf goldenbush	ERLI6	*Ericameria linearifolia*	1–6	–
	snakeweed	GUTIE	*Gutierrezia*	1–6	–
	banana yucca	YUBA	*Yucca baccata*	1–6	–
	turpentinebroom	THMO	*Thamnosma montana*	0–1	–
	Eastern Mojave buckwheat	ERFAP	*Eriogonum fasciculatum var. polifolium*	0–1	–

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
singleleaf pinyon	PIMO	*Pinus monophylla*	Native	–	75–80	–	–
Utah juniper	JUOS	*Juniperus osteosperma*	Native	–	8–12	–	–
Joshua tree	YUBR	*Yucca brevifolia*	Native	–	5–8	–	–

Animal community

Livestock Interpretations:
This site is suited to cattle and sheep grazing during the summer and fall. Wild horses may use this site year round if water is available. Grazing management should be keyed to needlegrass and galleta grass production. Livestock will often 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. Harvesting trees under a sound management program can open up the tree canopy to allow increased production of understory species desirable for grazing.

Stocking rates vary over time depending upon season of use, climate variations, site, and previous and current management goals. A safe starting stocking rate is an estimated stocking rate that is fine tuned by the client by adaptive management through the year and from year to year.

Wildlife Interpretations:
This site has high value for mule deer during the summer, fall and winter. Pinyon trees provide shelter from winter storms and juniper foliage is also browsed during the winter. Sites where water is available offer good quail habitat and are visited seasonally by mourning dove. Various songbirds, rodents, reptiles and associated predators native to the area also use it.

Hydrological functions

The runoff on this site is high.

Recreational uses

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

Wood products

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.

Christmas trees: About 5 trees per acre per year in stands of medium canopy.

This forest community is of low site quality for tree production. Site index ranges from 35 TO 55. (Howell, 1940).

Productivity Class: 0

Fuelwood Production: 4 to 7 cord 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 BUTs 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 15 to 25 post per acres in stands of medium canopy.

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 sties having extreme surface stoniness.
c. Proper spacing is the key to a well managed, multiple use and multi-product pinyon forest.

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

3. Silvicultural Practices
Silvicultural treatmetns are not reasonably applied on this site due to poor site quality and severe limitations for equipment and tree harvest.

Other products

Pinyon-juniper ecosystems have had subsistence, cultural, spiritual, economic, aesthetic and medicinal value to Native American peoples for centuries, and singleleaf pinyon has provided food, fuel, medicine and shelter to Native Americans for thousands of years. The pitch of singleleaf pinyon was used as 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. Thousands of pounds of nuts are gathered each year and sold on commercial markets throughout the United States.

Pinyon nuts: Production varies year to year, but mature stands can yield about 100 pounds per acre in favorable years.

Table 8. 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*	35	55	3	5	–	–	–	

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T19 S. R70 E. S26 NW
UTM zone	N
UTM northing	4016488n
UTM easting	0755857e
General legal description	Approximately .75 south and .25 miles east of Mica Peak in the Gold Butte area, Clark County, Nevada.

Other references

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Contributors

GKB/TJW

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	05/21/2024
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:**
