Ecological site F030XC294NV
MOUNTAIN SLOPES (White Fir)

Last updated: 4/26/2024
Accessed: 08/17/2024

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 backslopes. Slopes range from 15 to over 75 percent, but slopes are generally 30 to 75 percent. Elevations are from about 7300 to 9000 feet.

The soils associated with this site are moderately deep, excessively drained and formed in colluvium derived from limestone. Surface rock fragments occupy about 75 percent of the soil surface.

This site is part of group concept F030XC287NV.

Associated sites

F030XC293NV	**QUARTZITE SLOPES**

Similar sites

F030XC283NV	**Abies concolor var. concolor/Cercocarpus ledifolius var. intermontanus**
F030XC282NV	**Abies concolor var. concolor/Ribes cereum**

Table 1. Dominant plant species

Tree	(1) *Abies concolor*
Shrub	(1) *Symphoricarpos longiflorus*
Herbaceous	(1) *Poa fendleriana*

Physiographic features

This forest site occurs on mountain backslopes. Slopes range from 15 to over 75 percent, but slopes are generally 30 to 75 percent. Elevations are from about 7300 to 9000 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Mountain slope
Elevation	2,225–2,743 m
Slope	15–75%
Aspect	Aspect is not a significant factor

Climatic features

The climate is semi-arid with warm, dry summers and cold, moist winters. Precipitation is greatest in the winter with a lesser secondary peak in the summer, typical of the Mojave Desert. Average annual precipitation is 13 to 15 inches. Mean annual air temperature is about 47 degrees F. The average growing season is 50 to 150 days.

Table 3. Representative climatic features

Frost-free period (average)	150 days
Freeze-free period (average)	
Precipitation total (average)	381 mm

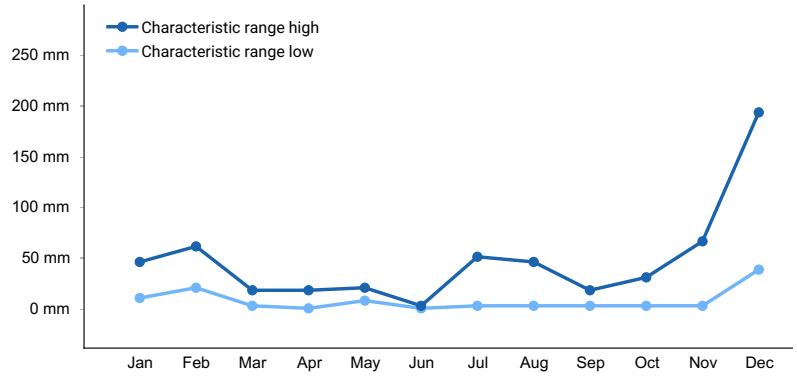


Figure 1. Monthly precipitation range

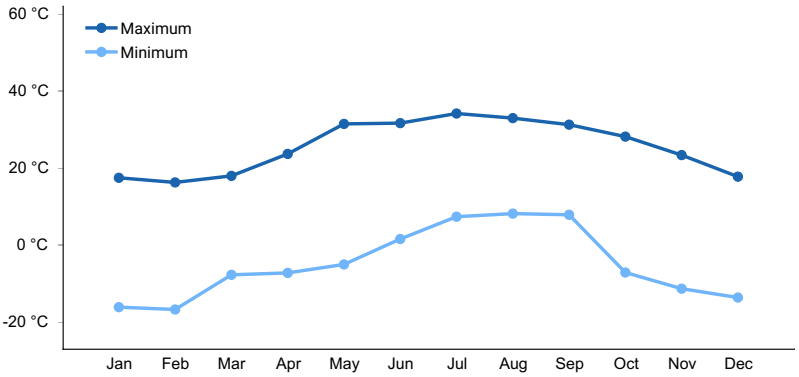


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

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

Soil features

The soils associated with this site are moderately deep, excessively drained and formed in colluvium derived from limestone. Surface rock fragments occupy about 75 percent of the soil surface. A mollic epipedon occurs from 0 to 30cm. The soils associated with ecological site are classified as loamy-skeletal, carbonatic, mesic Aridic Calciustolls

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone
Surface texture	(1) Extremely gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Somewhat excessively drained
Permeability class	Moderate
Soil depth	28–53 cm

Surface fragment cover <=3"	70–80%
Surface fragment cover >3"	40–50%
Available water capacity (0-101.6cm)	2.54–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	0–5%
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)	7.7–8.8
Subsurface fragment volume <=3" (Depth not specified)	35–55%
Subsurface fragment volume >3" (Depth not specified)	5–25%

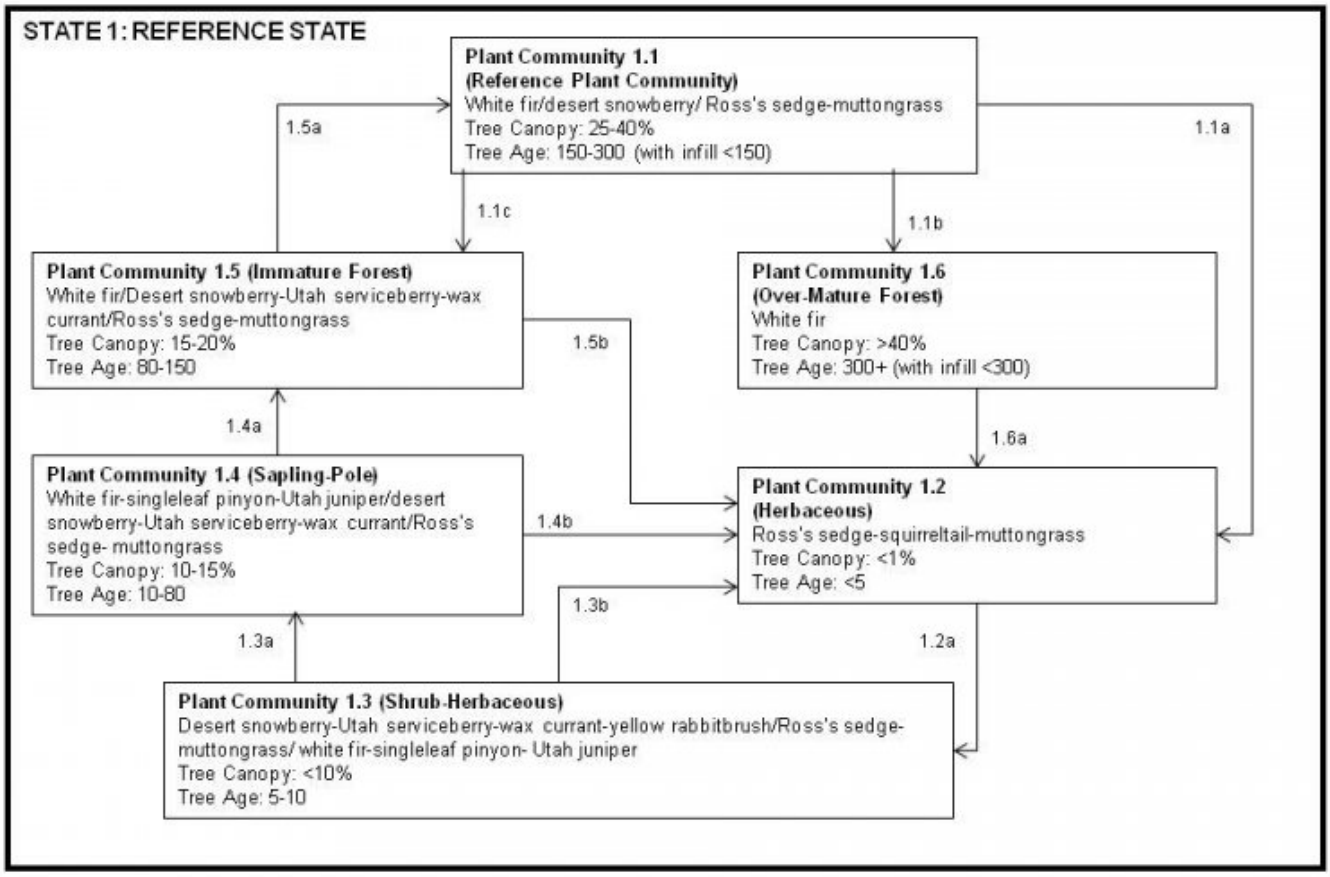
Ecological dynamics

The plant communities of this site are dynamic in response to changes in disturbance regimes and weather patterns. Disturbances, such as fire, play an important role in 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). White fir is found in nearly all the major mountain ranges of the southwest United States. Its relative dominance in the stand depends on the moisture and temperature relationships of the site and the successional stage (Zouhar 2001). Mature white fir growing on high quality sites can reach heights of more than 150 feet. It tends to be a relatively shallow rooted species, but has the ability to adapt to local conditions. White fir is an aggressive pioneer species, as well as, reproducing abundantly under dense shade conditions. Its tolerance of a wide range of ecological conditions make it capable of invading riparian areas, as well as, sagebrush-steppe systems following inappropriate grazing management and/or wildfire suppression (Zouhar 2001).
White fir tends to be a slow growing species and can survive for long periods as a suppressed tree (Zouhar 2001). Tree ages of 300-400 years are characteristic of old growth stands in the Southwest. The crowns of young trees are symmetrical and sharp-pointed, with age they become irregular and rounded at the summit. In widely spaced, stands branches commonly reach to the ground, in more dense stands half or more of the trunk is bare (Zouhar 2001). White fir is susceptible to many diseases including heart rot. The spores from fungi infect the heartwood through wounds in the sapwood or branch stubs. Indicators of heart rot include fire scars, dead or broken tops, dwarfmistletoe, cankers, frost and cracks (Kimmey and Bynum 1961). Managing forest health is important for this ecological site to protect old growth and prevent catastrophic wildfire.

Fire Ecology:
White fir occurs in a variety of habitats and has evolved with a variety of fire regimes. This species is high susceptible to fire with its thin, resin blistered bark and drooping lower branches. As trees mature bark, thickens and lower branches begin to self-prune, they become more resistant to fire. Mortality remains high due to moderately shallow roots and heavy lichen growth on branches. Greater mortality of mature trees can be expected in stands with a deep litter layer, since the duff can smolder for a long period of time after wildfire. White fir reestablishes from wind dispersed seed following fire. Initial seedling establishment does occur on exposed mineral soil, seedling survival is better in partial shade. Fire suppression during the last century has lead to an increased component of white fir in many forests. Small white fir and other shade tolerant species in the understory lead to increased fuel loading. Prescribed burning can be used to control the abundance of white fir in stands where overstory shading has become a problem. However, great caution should be exercised in areas with heavy fuel loading. Utah juniper is usually killed by fire especially when young. Pinyon pine does not generally survive severe fires due to thin bark and lack of self-pruning branches. The small amount of Rocky Mountain ponderosa pine present on this ecological site will easily survive most fire. Fire adaptations include thick bark, an open crown structure, self-pruning branches and deep roots.
Fire top kills desert snowberry and Utah serviceberry. Root crowns survive most fire intensities and sprout from the

basal buds following fire. Wax currant is a weak sprouter following fire. However, fire favors seedling establishment since the seeds require scarification to germinate. Black sagebrush is readily killed by wildfire, reestablishment occurs solely from seed. Yellow rabbitbrush is usually top-killed by fire. However, it establishes after fire from seed and by sprouting. Muttongrass easily survives low severity fall fire. However, more severe burning during the growing season appears to be harmful. Ross's sedge survives fire through buried seeds with long-term viability, seeds germinate following heat treatment.

State and transition model



F30XC294NV *Abies concolor/Symphoricarpos longiflorus/Carex rossii-Poa fendleriana*

State 1
Reference State

The reference state is representative of the natural range of variability under pristine conditions. It is dominated by white fir. Utah juniper, singleleaf pinyon pine and Rocky mountain ponderosa pine occur in various quantities and account for less than 10 percent of the canopy. Primary natural disturbances affecting this ecological site are periodic wildfire, drought, disease and insect attack. Interactions between disturbance regimes and weather patterns determine long-term plant community dynamics. Increased mortality following drought is likely a caused by a combination of insects and disease. This ecological site is currently described by a one state model because additional states have not been identified at this time. If in the future additional stable states are identified on the landscape changes will be made to this model to reflect findings.

Community 1.1
Reference Plant Community

The reference plant community is representative of a healthy, mid-seral condition. Plant community composition and structure are dominated by white fir that have reached or are near maximal heights for the site. Tree canopy

cover ranges from 20 to 40 percent. Mature Utah juniper, singleleaf pinyon pine and Rocky Mountain ponderosa pine collectively account for about 10 percent of the stand. Shade tolerant tree seedlings/saplings occur in the understory. Desert snowberry (*Symphoricarpos longiflorus*), Utah serviceberry (*Amelanchier utahensis*) and wax currant (*Ribes cereum*) are the dominant understory shrubs. Muttongrass (*Poa fendleriana*) and Ross's sedge (*Carex rossii*) are the most common understory grass and grasslikes. This plant community phase is assumed to be represenative of this forest site in a pristine environment.

Forest overstory. An overstory canopy of 20 to 40 percent is assumed to be representative of tree dominance on this site in a pristine environment. Wildfire is recognized as a natural disturbance that influenced the structure and composition of the climax vegetation of this forest site. This site is dominated by white fir (Abies concolor). Utah juniper (Juniperus osteosperma), singleleaf pinyon pine (Pinus monophylla) and Rocky Mountain ponderosa pine (Pinus ponderosa var. scopulorum) do occur in the stand and collectively account for less than 10 percent of the total overstory.

Forest understory. Understory vegetative composition is about 20 percent grass and grasslikes, 30 percent forbs and 50 percent shrubs and young trees when the average overstory canopy is medium (20 to 40 percent). Average understory production ranges from 150 to 400 pounds per acre with a medium canopy cover. Understory production includes the total annual production of all species within 4 1/2 feet of the ground surface.
Desert snowberry (Symphoricarpos longiflorus), Utah serviceberry (Amelanchier utahensis) and wax currant (Ribes cereum) are the dominant understory shrubs. Lesser amounts of black (Artemisia nova) sagebrush and yellow rabbitbrush (Chrysothamnus viscidiflorus) are also found in the understory. Muttongrass (Poa fendleriana) and Ross's sedge (Carex rossii) are the most common understory grass and grasslikes. Perennial forbs dominate the herbaceous component of the understory; common species include Mojave sandwort (Arenaria macradenis), Nuttall's linanthus (Leptosiphon nuttallii) and stemless mock goldenweed (Stenotus acaulis).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	78	157	207
Forb	50	101	129
Grass/Grasslike	34	67	90
Tree	6	11	22
Total	**168**	**336**	**448**

Community 1.2
Herbaceous

This community phase is dominated by grasses and forbs under full sunlight. This stage is experienced for a short period after major disturbance such as crown fire, disease or insect outbreak. Standing snags remaining after fire have little or no affect on the composition and production of herbaceous vegetation, but provide important wildlife habitat. This plant community is at-risk of invasion by non-natives. Non-native species take advantage of the increased availability of critical resources following fire or other disturbance.

Community 1.3
Shrub-Herbaceous

This plant community is characterized by increasing woody perennials. Herbaceous vegetation and woody shrubs dominate this community phase. Various amounts of tree seedlings (less than 20 inches in height) may be present up to the point where they are obviously a major component of the vegetal structure. Sprouting shrubs, such as Utah serviceberry and snowberry, quickly recover and provide favorable sites for establishment of other shrub seedlings.

Community 1.4
Sapling

In the absence of disturbance the tree seedlings develop into saplings (20 inches to 4.5 feet in height) with a range

in canopy cover of about 10 to 15 percent. Vegetation consists of grasses, forbs and shrubs in association with tree saplings. Understory shrubs dominate the plant community. Soil water storage and nutrient cycling are positively influenced by abundance of understory vegetation. Creating a positive feedback for the establishment of more vegetation. White fir is highly susceptible to fire at this age and will be easily killed by fires of all intensities. Dominant shrubs serve as nurse plants for tree seedlings.

Community 1.5
Immature Forest

The visual aspect and vegetal structure are dominated by white fir greater than 4.5 feet in height. At this stage of forest development, the tree canopy has successfully broken through the suppression of early successional shrub communities. The upper crown of white fir trees is cone or pyramidal shaped. Seedlings and saplings of white fir are common in the understory. Dominants are the tallest trees on the site; co-dominants are 65 to 85 percent of the height of dominant trees. Understory vegetation is moderately influenced by a tree overstory canopy of about 15 to 25 percent. The young firs are very susceptible to fire at this stage and will be killed by fires of all severities.

Community 1.6
Over-Mature Forest

In the absence of wildfire or other naturally occurring disturbances, the tree canopy on this site can become very dense. This stage is dominated by white fir that has reached maximal heights for the site. Understory vegetation is sparse due to tree competition, overstory shading, duff accumulation, etc. Suppressed white fir saplings are abundant in the understory. Few seedlings or saplings of Utah juniper, singleleaf pinyon or ponderosa pine are found in the understory due to overstory shading. Tree canopy cover is commonly greater than 40 percent. Even mature white fir are highly susceptible to fire damage, due to thin resin blistered bark and low hanging branches, and will experience high rates of mortality.

Pathway 1.1a
Community 1.1 to 1.2

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

Pathway 1.1c
Community 1.1 to 1.5

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

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, disease, insect attack or other large scale 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 and natural regeneration over time.

Pathway 1.5b
Community 1.5 to 1.2

Stand replacing fire, disease, insect attack or other large scale disturbance.

Pathway 1.6a
Community 1.6 to 1.2

Stand replacing fire, drought, disease and/or insect attack.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial Grasses/Grasslikes**			34–90	
	muttongrass	POFE	*Poa fendleriana*	17–34	–
	Ross' sedge	CARO5	*Carex rossii*	17–34	–
	squirreltail	ELEL5	*Elymus elymoides*	3–17	–
Forb					
2	**Primary Perennial Forbs**			49–112	
	Mojave sandwort	ARMA3	*Arenaria macradenia*	38–76	–
	Nuttall's linanthus	LENUP	*Leptosiphon nuttallii ssp. pubescens*	8–13	–
	Arizona ipomopsis	IPAR2	*Ipomopsis arizonica*	1–8	–
	stemless mock goldenweed	STAC	*Stenotus acaulis*	1–8	–
	firecracker penstemon	PEEA	*Penstemon eatonii*	1–7	–
Shrub/Vine					
3	**Primary Shrubs**			61–165	
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	34–81	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	17–34	–
	black sagebrush	ARNO4	*Artemisia nova*	3–17	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	3–17	–
	wax currant	RICE	*Ribes cereum*	3–17	–
Tree					
4	**Evergreen**			4–22	
	Utah juniper	JUOS	*Juniperus osteosperma*	3–17	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	3–17	–
	ponderosa pine	PIPOS	*Pinus ponderosa var. scopulorum*	3–17	–

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							
white fir	ABCO	*Abies concolor*	Native	–	22–30	–	–
Utah juniper	JUOS	*Juniperus osteosperma*	Native	–	1–4	–	–
singleleaf pinyon	PIMO	*Pinus monophylla*	Native	–	1–4	–	–
ponderosa pine	PIPOS	*Pinus ponderosa var. scopulorum*	Native	–	1–4	–	–

Animal community

Livestock Interpretations: This site is not well suited to livestock grazing although grazing animals may use this site during the hot summer months. Herbaceous forage production is quite low and site is not easily accessed due to steep slopes and lack of adequate water resources. The amount and nature of the understory vegetation in a forestland is highly dependent on the amount and duration of shade provided by the overstory canopy. Significant changes in kinds and abundances of plants occur as the canopy changes, often regardless of grazing use. Muttongrass is a valuable forage resource. It has been rated excellent forage for domestic cattle and horses. Ross’s

sedge value as a forage plant varies depending on the site. It has been rated fair for domestic sheep, horses and cattle. Bottlebrush squirreltail is palatable to domestic livestock. Winter months show greatest use and it generally increases under heavy grazing pressure. Dominant shrubs provide additional foraging resources on this ecological site. Snowberry is one of the first species to leaf out and therefore it is heavily used in the spring. Snowberry is capable of sprouting and therefore can persist and even increase under moderate browsing pressure. Prolonged browsing can result in reduced densities. Black sagebrush is used by domestic livestock, it is considered to be highly palatable to domestic sheep. Cattle and domestic goats browse black sagebrush to a lesser degree. Wax currant provides poor to fair browse for domestic livestock, although it can be of great importance when little else is available. Livestock will eat rabbitbrush in the late fall and winter when more desirable types of forage have been depleted.
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.

Wildlife Interpretations: This area is high-use habitat for a variety of birds including, owls, goatsuckers, swifts, hummingbirds, wood peckers, flycatchers, nuthatches, thrushes and finches. It also has moderate forage value for big game during the summer, fall, and early winter, especially in areas with wax current other browse species in the understory. It is used occasionally by various other song birds, rodents and associated predators natural to the area. Many upland wildlife species find valuable foraging and habitat resources on this site. It is also used by rodents, small mammals and associated predators like golden eagles.
Several wildlife species utilize 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 deer. The seeds and leaves are also used by a variety of birds. Ross’s sedge provides occasional forage for mule deer. Dominant shrubs provide additional foraging resources on this ecological site. Black sagebrush provides an important foraging resource for wild ungulates. Wax currant provides food and cover for wildlife. It is only fair to poor browse for deer, but is important on ranges were little else is available. Desert snowberry provides important forage for deer on high elevation summer ranges. Snowberry is one of the first species to leaf out and therefore it is heavily used in the spring. Snowberry is capable of sprouting and therefore can persist and even increase under moderate browsing pressure, however prolonged browsing can result in reduced densities. Rocky Mountain juniper provides fair winter forage, excellent escape cover and good fawning cover. White fir provides spring forage for mule deer and good cover for many other wildlife species.

Hydrological functions

The slopes associated with this ecological site are generally very steep. However, the soils are somewhat excessively drained. Water moves rapidly through the soil profile, reducing surface erosion.

Recreational uses

This site has high aesthetic value and provides a variety of recreational opportunities such as hiking, camping, permitted hunting, bird watching and nature study. Steep slopes and fragile soil-vegetation complex, however, exclude many other forms of recreation such as the use of off-road vehicles.

Wood products

White fir is a general, all-purpose, construction grade wood. It used for construction faming, plywood, poles and sometimes pulp wood. White fir is commonly plagued by heartroot and is therefore poorly suited for fire wood.

B. MANAGEMENT GUIDES AND INTERPRETATIONS
1. LIMITATIONS AND CONSIDERATIONS
a. Potential for sheet and rill erosion is slight to moderate depending on slope.
b. Severe equipment limitation due to steep slopes.

2. ESSENTIAL REQUIREMENTS
a. Protect soils from accelerated erosion.
b. Manage for protection of wildlife habitat.

c. Adequately protect from uncontrolled burning.

3. SILVICULTURAL PRACTICES
a. Traditional silviculture treatments, such as harvest cutting, are not reasonably applied to this ecological site due to poor site quality and severe limitations for equipment and tree harvest.
This site has potential for using hand-crews for thinning and improvement cuttings to remove diseased and overcrowded trees. Improvement cuttings cut selectively or in small patches (depending on site conditions) to enhance forage production, wildlife habitat and forest health.
1) Thinning and improvement cutting - Removal of poorly formed, diseased and low vigor trees for fuelwood.
2) Slash disposal - broadcasting slash improves reestablishment of native understory species and establishment of seeded grasses and forbs after tree harvest.
b. Fire hazard - Fire usually not a problem in well-managed, mature stands.

Other products

The fruit of wax currant is used for making jam, jelly and pie. Indian tribes native to western America used currants for making pemmican and it is currently grown as an ornamental.

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
white fir	*ABCO*	25	35	44	57	90	–	–	

Type locality

Location 1: Clark County, NV	
Township/Range/Section	T14S R61E S17
UTM zone	N
UTM northing	4064583
UTM easting	663351
Latitude	36° 42′ 46″
Longitude	115° 10′ 15″
General legal description	Approximately .5 miles from Bootleg Spring and Shalecut Spring in Timber Canyon of the Sheep Range, Desert National Wildlife Refuge. Hayford Peak USGS 7.5 minute topographic quadrangle. Clark County Nevada.

Other references

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Contributors

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PN-E

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	08/17/2024
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:**

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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:**

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17. **Perennial plant reproductive capability:**
