

## Ecological site F029XY066NV PIMO-JUOS WSG 1R0501 12 to 16

Accessed: 04/25/2024

### 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.

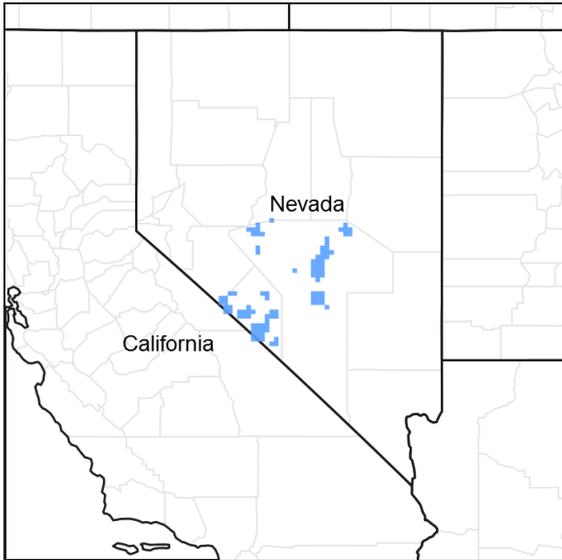


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

### MLRA notes

Major Land Resource Area (MLRA): 029X–Southern Nevada Basin and Range

MLRA 29 consists of north-south trending mountain ranges separated by broad valleys bordered by sloping fans and pediments. Majority of rocks in the mountain masses are from Pliocene and Miocene volcanic sources and include rhyolite, andesite, basalt, dacite and tuff. Paleozoic and Precambrian carbonate rocks are also prominent in the mountains. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments are common in the western and eastern portions of the MLRA. Pleistocene lake sediments and recent alluvium are extensive in the major valleys.

More than 90 percent of MLRA 29 is federally owned, a large portion of which is currently or has been used for training and testing by military forces and the Nuclear Regulatory Commission. Less than 1 percent of the land area, mostly in the valleys, is irrigated. Most of the irrigated land is used for growing grain or hay for livestock. Native shrub-grass rangelands are grazed by domestic livestock, feral horses and wildlife. Average annual precipitation ranges from 4 to 12 inches on the valley floors and may be as high as 36 inches in the mountains. Precipitation occurs as rain and snow during the winter and early spring. Summers are generally hot and dry, but high-intensity, convective thunderstorms are common in July and August. In the eastern portion of this MLRA these summer thunderstorms are frequent enough to influence annual production and species composition of many native plant communities.

### Similar sites

|             |  |
|-------------|--|
| F029XY067NV | <b>PIMO-JUOS WSG 0R0501 12 to 16</b><br>Lower site quality           |
| F029XY084NV | <b>PIMO-JUOS WSG 0R0501 12 to 16</b><br>AMUT-GAFL2 codominant shrubs |
| F029XY095NV | <b>PIMO-JUOS WSG 0R0501 12 to 16</b><br>Lower site quality           |

**Table 1. Dominant plant species**

|            |   |
|------------|---|
| Tree       | (1) <i>Pinus monophylla</i><br>(2) <i>Juniperus osteosperma</i> |
| Shrub      | (1) <i>Artemisia tridentata ssp. vaseyana</i>                   |
| Herbaceous | (1) <i>Poa fendleriana</i><br>(2) <i>Achnatherum</i>            |

## Physiographic features

This Forest community occurs on fan remnants and on mountain sideslopes of mostly northerly aspect at the lower elevations of its range and on all aspects at higher elevations. Slopes range from 4 to over 75 percent, but are typically 15 to 50 percent. Elevations are 5500 to 9500 feet.

**Table 2. Representative physiographic features**

|           |                                       |
|-----------|---------------------------------------|
| Landforms | (1) Mountain slope<br>(2) Fan remnant |
| Elevation | 5,500–9,500 ft                        |
| Slope     | 4–75%                                 |
| Aspect    | Aspect is not a significant factor    |

## Climatic features

The climate associated with this site is semiarid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 12 to about 16 inches. Mean annual air temperature is 40 to 49 degrees F. The average frost-free period is 60 to 120 days. There is no climate station available for this site.

**Table 3. Representative climatic features**

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 120 days |
| Freeze-free period (average)  | 0 days   |
| Precipitation total (average) | 16 in    |

## Influencing water features

There are no influencing water features associated with this site.

## Soil features

The soils associated with this site are typically very shallow to very deep and well drained. These soils are skeletal with as much as 75 percent gravels, cobbles or stones, by volume, distributed throughout their profile. Available water capacity is very low to moderate, but trees and shrubs extend their roots into fractures in the bedrock allowing them to utilize deep moisture. There are high amounts of rock fragments at the soil surface which occupy plant growing space, yet help to reduce evaporation and conserve soil moisture. Runoff is high to very high and potential for sheet and rill erosion is moderate to severe depending on slope. Soil temperature regime is mesic and soil moisture regime is ustic. Soil series associated with this site include: Cucamungo, Ravenswood, Squawtip,

Sylvaniam, and Trailamp.

**Table 4. Representative soil features**

|   |   |
|---|---|
| Surface texture   | (1) Very gravelly loam<br>(2) Very stony loam<br>(3) Very cobbly sandy loam |
| Family particle size                                    | (1) Loamy   |
| Drainage class  | Well drained  |
| Permeability class                                      | Slow to rapid   |
| Soil depth  | 7–84 in   |
| Surface fragment cover ≤3"                              | 7–68%   |
| Surface fragment cover >3"                              | 3–46%   |
| Available water capacity<br>(0–40in)                    | 1–4.9 in  |
| Calcium carbonate equivalent<br>(0–40in)                | 0%  |
| Electrical conductivity<br>(0–40in)                     | 0–4 mmhos/cm  |
| Sodium adsorption ratio<br>(0–40in)                     | 0–5   |
| Soil reaction (1:1 water)<br>(0–40in)                   | 6.1–9   |
| Subsurface fragment volume ≤3"<br>(Depth not specified) | 11–44%  |
| Subsurface fragment volume >3"<br>(Depth not specified) | 2–24%   |

## **Ecological dynamics**

Major Successional Stages of Forestland Development:

**HERBACEOUS:** Vegetation is dominated by grasses and forbs under full sunlight. This stage is experienced after a major disturbance such as crown fire. Skeleton forest (dead trees) remaining after fire or residual trees left following harvest have little or no affect on the composition and production of the herbaceous vegetation.

**SHRUB-HERBACEOUS:** Herbaceous vegetation and woody shrubs dominate the site. 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.

**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 5 to 10 percent. Vegetation consists of grasses, forbs and shrubs in association with tree saplings.

**IMMATURE FOREST:** The visual aspect and vegetal structure are dominated by Utah juniper and singleleaf pinyon trees greater than 4.5 feet in height. The upper crown of dominant and co-dominant trees are cone or pyramidal shaped. Seedlings and saplings of pinyon and Utah juniper are present in the understory. Dominants are the tallest trees on the site; co-dominants are 65 to 85 percent of the highest of dominant trees. Understory vegetation is moderately influenced by a tree overstory canopy of about 10 to 20 percent.

**MATURE FOREST:** The visual aspect and vegetal structure are dominated by pinyon and juniper that have reached maximal heights for the site. Dominant trees average greater than five inches in diameter at one-foot stump height. Upper crowns of singleleaf pinyon and Utah juniper are typically either irregularly or smoothly flat-topped or rounded. Tree canopy cover ranges from 20 to 30 percent. Understory vegetation is strongly influenced by tree

competition, overstory shading, duff accumulation, etc. Few tree seedlings and/or saplings occur in the understory. Infrequent, yet periodic, wildfire is a natural disturbance influencing the understory of mature pinyon-juniper woodlands. This stage of community development is assumed to be representative of this woodland site in the pristine environment.

**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 singleleaf pinyon and Utah juniper that have reached maximal heights for the site. Dominant and co-dominant trees average greater than five inches in diameter at one-foot stump height. Upper crowns are typically irregularly flat-topped or rounded. Understory vegetation is sparse or absent due to tree competition, overstory shading, duff accumulation, etc. Tree canopy cover is commonly greater than 50 percent.

The pinyon-juniper forestland is generally a climax vegetation type throughout its range, reaching climax about 300 years after disturbance, with an ongoing trend toward increased tree density and canopy cover and a decline in understory species over time. Singleleaf pinyon seedling establishment is episodic. Population age structure is affected by drought, which reduces seedling and sapling recruitment more than other age classes. The ecotones between singleleaf pinyon woodlands and adjacent shrublands and grasslands provide favorable microhabitats for singleleaf pinyon seedling establishment since they are active zones for seed dispersal, nurse plants are available, and singleleaf pinyon seedlings are only affected by competition from grass and other herbaceous vegetation for a couple of years.

Several natural and anthropogenic processes can lead to changes in the spatial distribution of pinyon-juniper woodlands over time. These include 1) tree seedling establishment during favorable climatic periods, 2) tree mortality (especially seedlings and saplings) during periods of drought, 3) expansion of trees into adjacent grassland in response to overgrazing and/or fire suppression, and 4) removal of trees by humans, fire, or other disturbance episodes. Specific successional pathways after disturbance in singleleaf pinyon stands are dependent on a number of variables such as plant species present at the time of disturbance and their individual responses to disturbance, past management, type and size of disturbance, available seed sources in the soil or adjacent areas, and site and climatic conditions throughout the successional process.

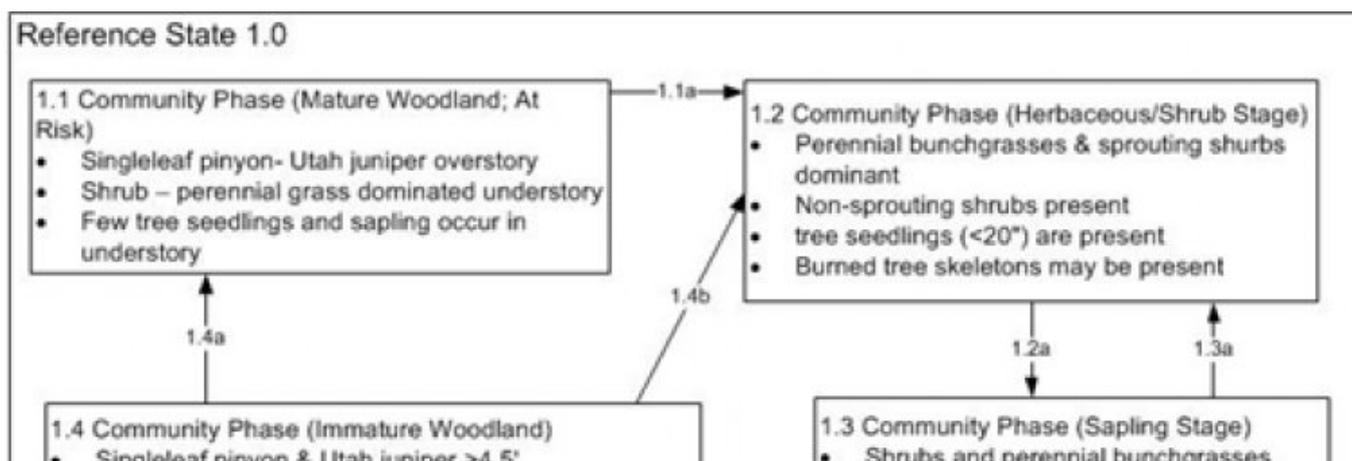
Juniper litter has an allelopathic effect on some understory species, especially Sandberg bluegrass, and blue grama. This effect is particularly evident on heavy, poorly drained clay soils. Broadcasting grass seeds over litter appeared to lower the allelopathic effects.

#### Fire Ecology:

On high-productivity sites where sufficient fine fuels existed, singleleaf pinyon communities burn every 15 to 20 years, and on less productive sites with patchy fuels, fire return intervals may be in the range of 50 to 100 years or longer. Thin bark and lack of self pruning make singleleaf pinyon very susceptible to intense fire. Mature singleleaf pinyon can survive low-severity surface fires but is killed by more severe fires. Most tree seedlings are killed by fire, but cached seeds may survive. Utah juniper is usually killed by fire, especially when trees are small.

Mountain big sagebrush is highly susceptible to injury from fire. Plants are readily killed in all seasons, even light severity fires. Mountain big sagebrush plants top-killed by fire will not resprout.

### State and transition model



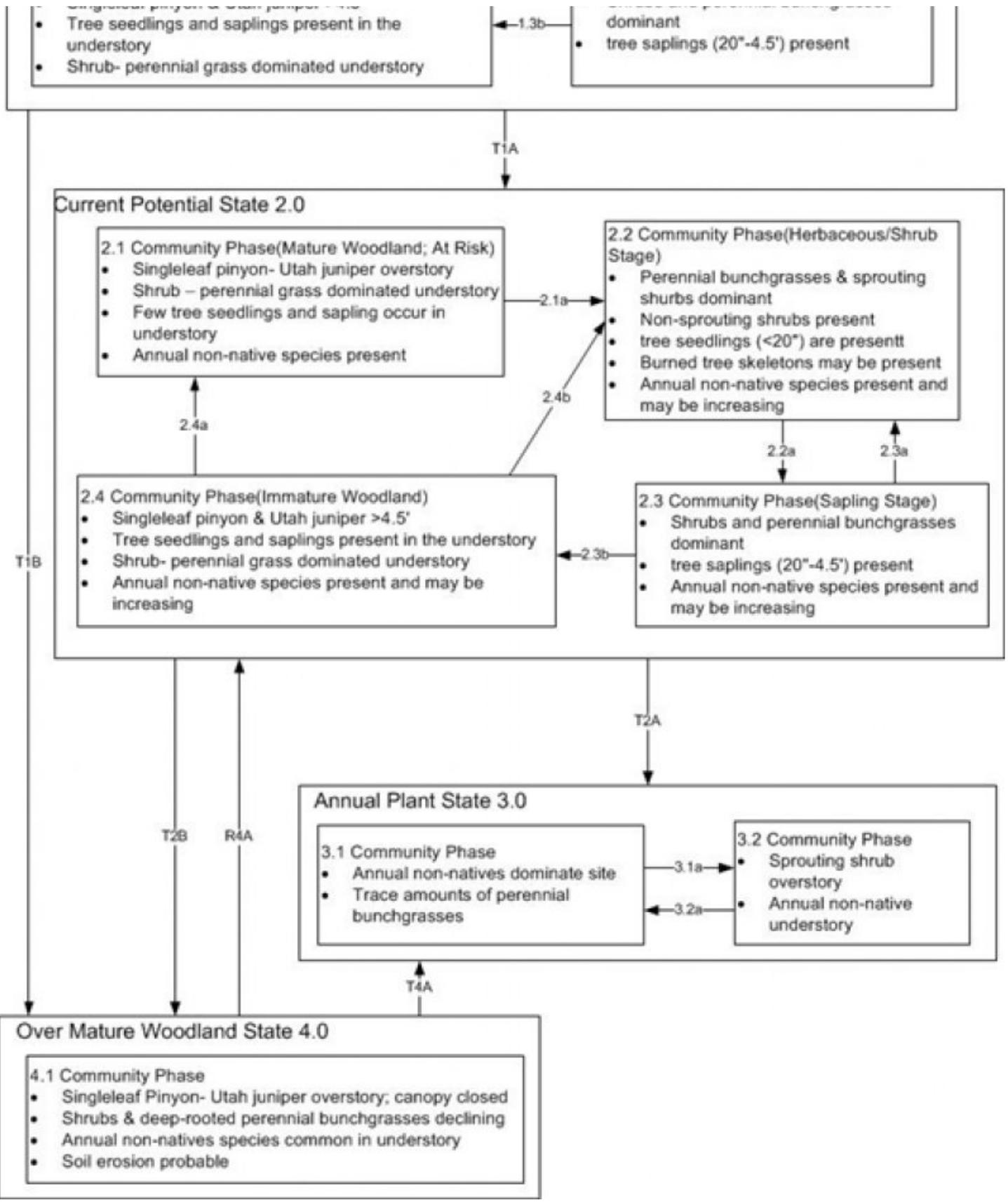


Figure 2. DRAFT STM

## Reference State 1.0 Community Pathways

1.1a: Fire

1.2a: Time and lack of disturbance

1.3a: Fire

1.3b: Time and lack of disturbance

1.4a: Time and lack of disturbance

1.4b: Fire

T1A: Introduction of non-native annual species

T1B: Time and lack of disturbance

## Current Potential State 2.0 Community Pathways

2.1a: Fire

2.2a: Time and lack of disturbance

2.3a: Fire

2.3b: Time and lack of disturbance

2.4a: Time and lack of disturbance

2.4b: Fire

T2A: Severe and Repeated Fire

T2B: Time and lack of disturbance

## Annual State 3.0 Community Pathways

3.1a: Time allows for sprouting shrubs to recover

3.2a: Fire

T3A: Fire

## Over Mature Woodland State 4.0 Community Pathways

R4A: Thinning of trees and seeding or recovery of understory species

T4A: Severe and Repeated Fire

Figure 3. DRAFT STM LEGEND

## State 1

### Reference State

### Community 1.1

#### Reference Plant Community (Mature woodland)

The reference plant community is dominated by singleleaf pinyon and Utah juniper. Mountain big sagebrush is the principal understory shrub. Muttongrass is the most prevalent understory grass. Overstory tree canopy composition is about 50 to 60 percent singleleaf pinyon and 40 to 50 percent Utah juniper. An overstory canopy cover of about 25 percent is assumed to be representative of tree dominance on this site in the pristine environment.

**Forest overstory.** MATURE FORESTLAND: The visual aspect and vegetal structure are dominated by pinyon and juniper that have reached maximal heights for the site. Dominant trees average greater than five inches in diameter at one-foot stump height. Upper crowns of singleleaf pinyon and Utah juniper are typically either irregularly or smoothly flat-topped or rounded. Tree canopy cover ranges from 20 to 30 percent. Understory vegetation is strongly influenced by tree competition, overstory shading, duff accumulation, etc. Few tree seedlings and/or saplings occur in the understory. Infrequent, yet periodic, wildfire is a natural disturbance influencing the understory of mature pinyon-juniper forestlands. This stage of community development is assumed to be representative of this forestland site in the pristine environment.

**Forest understory.** Understory vegetative composition is about 60 percent grasses, 10 percent forbs and 30 percent shrubs and young trees when the average overstory canopy is medium (20 to 35 percent). Average understory production ranges from 250 to 600 pounds per acre with a medium canopy cover. Understory production includes the total annual production of all species within 4.5 feet of the ground surface.

**Table 5. Annual production by plant type**

| <b>Plant Type</b> | <b>Low<br/>(Lb/Acre)</b> | <b>Representative Value<br/>(Lb/Acre)</b> | <b>High<br/>(Lb/Acre)</b> |
|-------------------|--------------------------|---|---------------------------|
| Grass/Grasslike   | 150                      | 240                                       | 360                       |
| Shrub/Vine        | 63                       | 100                                       | 150                       |
| Forb              | 25                       | 40  | 60                        |
| Tree              | 12                       | 20  | 30                        |
| <b>Total</b>      | <b>250</b>               | <b>400</b>                                | <b>600</b>                |

**Community 1.2  
Herbaceous/Shrub**

**Community 1.3  
Sapling**

**Community 1.4  
Immature Woodland**

**State 2  
Current Potential State**

**State 3  
Annual State**

**State 4  
Over Mature Woodland State**

**Additional community tables**

**Table 6. Community 1.1 plant community composition**

| Group                  | Common Name                                   | Symbol | Scientific Name                           | Annual Production (Lb/Acre) | Foliar Cover (%) |
|------------------------|---|--------|---|-----------------------------|------------------|
| <b>Grass/Grasslike</b> |   |        |   |                             |                  |
| 1                      | <b>Primary Perennial Grasses</b>              |        |   | 140–276                     |                  |
|                        | muttongrass                                   | POFE   | <i>Poa fendleriana</i>                    | 40–96                       | –                |
|                        | Indian ricegrass                              | ACHY   | <i>Achnatherum hymenoides</i>             | 20–36                       | –                |
|                        | Letterman's needlegrass                       | ACLE9  | <i>Achnatherum lettermanii</i>            | 20–36                       | –                |
|                        | Dore's needlegrass                            | ACNE9  | <i>Achnatherum nelsonii ssp. dorei</i>    | 20–36                       | –                |
|                        | squirreltail                                  | ELEL5  | <i>Elymus elymoides</i>                   | 20–36                       | –                |
|                        | needle and thread                             | HECO26 | <i>Hesperostipa comata</i>                | 20–36                       | –                |
| 2                      | <b>Secondary Perennial Grasses/Grasslikes</b> |        |   | 18–84                       |                  |
|                        | Thurber's needlegrass                         | ACTH7  | <i>Achnatherum thurberianum</i>           | 4–20                        | –                |
|                        | sedge   | CAREX  | <i>Carex</i>                              | 4–20                        | –                |
|                        | prairie Junegrass                             | KOMA   | <i>Koeleria macrantha</i>                 | 4–20                        | –                |
|                        | Sandberg bluegrass                            | POSE   | <i>Poa secunda</i>                        | 4–20                        | –                |
|                        | blue grama                                    | BOGR2  | <i>Bouteloua gracilis</i>                 | 2–4                         | –                |
| <b>Forb</b>            |   |        |   |                             |                  |
| 2                      | <b>Perennial</b>                              |        |   | 8–40                        |                  |
|                        | arrowleaf balsamroot                          | BASA3  | <i>Balsamorhiza sagittata</i>             | 4–20                        | –                |
|                        | tapertip hawksbeard                           | CRAC2  | <i>Crepis acuminata</i>                   | 4–20                        | –                |
| <b>Shrub/Vine</b>      |   |        |   |                             |                  |
| 4                      | <b>Primary Shrubs</b>                         |        |   | 80–168                      |                  |
|                        | mountain big sagebrush                        | ARTRV  | <i>Artemisia tridentata ssp. vaseyana</i> | 40–96                       | –                |
|                        | antelope bitterbrush                          | PUTR2  | <i>Purshia tridentata</i>                 | 20–36                       | –                |
|                        | snowberry                                     | SYMPH  | <i>Symphoricarpos</i>                     | 20–36                       | –                |
| 5                      | <b>Secondary Shrubs</b>                       |        |   | 12–28                       |                  |
|                        | Utah serviceberry                             | AMUT   | <i>Amelanchier utahensis</i>              | 4–20                        | –                |
|                        | mormon tea                                    | EPVI   | <i>Ephedra viridis</i>                    | 4–20                        | –                |
|                        | Stansbury cliffrose                           | PUST   | <i>Purshia stansburiana</i>               | 2–4                         | –                |
|                        | currant                                       | RIBES  | <i>Ribes</i>                              | 2–4                         | –                |
| <b>Tree</b>            |   |        |   |                             |                  |
| 6                      | <b>Evergreen</b>                              |        |   | 8–40                        |                  |
|                        | Utah juniper                                  | JUOS   | <i>Juniperus osteosperma</i>              | 4–20                        | –                |
|                        | singleleaf pinyon                             | PIMO   | <i>Pinus monophylla</i>                   | 4–20                        | –                |

## Animal community

### Livestock Interpretations:

This site is suited to cattle and sheep grazing where terrain permits. Many areas are not used because of steep slopes or lack of adequate water. Grazing management should be keyed to muttongrass production. Muttongrass is highly nutritious and remains palatable throughout the grazing season. Needlegrasses and Indian ricegrass provide palatable, nutritious feed during the late spring and early summer. New plants of all these grasses are established entirely from seed and grazing practices should allow for ample seed production and seedling establishment. Mountain big sagebrush is eaten by domestic livestock but has long been considered to be of low palatability, and a competitor to more desirable species.

Stocking rates vary with such factors as kind and class of grazing animal, season of use and fluctuations in climate. Actual use records for individual sites, a determination of the degree to which the sites have been grazed, and an

evaluation of trend in site condition offer the most reliable basis for developing initial stocking rates.

Selection of initial stocking rates for given grazing units is a planning decision. This decision should be made ONLY after careful consideration of the total resources available, evaluation of alternatives for use and treatment, and establishment of objectives by the decisionmaker.

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:

Pinyon-juniper woodlands provide shelter and forage for numerous species of wildlife, some of which may be obligate to these woodlands such as pinyon mice and woodrats. The quantity and variety of species using the pinyon-juniper woodlands changes with succession. These forests have value as habitat for several large mammals such as mule deer, pronghorn, bighorn sheep, wild horses, mountain lions, and bears. Gray foxes, bobcats, coyotes, weasels, skunks, badgers, and ringtails search for prey here. Many species of birds and reptiles find food and shelter here. Pinyon-juniper forests are important wintering areas for Clark's nutcrackers. Mountain big sagebrush is highly preferred and nutritious winter forage for mule deer.

### Hydrological functions

Runoff is high to very high and permeability is slow to rapid.

### Recreational uses

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

### Wood products

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.

Utah juniper wood is very durable. Its primary uses have been for posts and fuelwood. It probably has considerable potential in the charcoal industry and in wood fiber products.

#### PRODUCTIVE CAPACITY

This woodland community is of moderate site quality for tree production. Site index ranges from 65 to 90 (Howell, 1940).

Productivity Class: 1.0

CMAI\*: 6.7 to 13.1 ft<sup>3</sup>/ac/yr;

0.50 to 0.90 m<sup>3</sup>/ha/yr.

Culmination is estimated to be at 70 years.

\*CMAI: is the culmination of mean annual increment or highest average growth rate of the stand in the units specified.

Fuelwood Production: 9 to 13 cords per acre for stands averaging 5 inches in diameter at 1 foot height with a medium canopy cover. There are about 289,000 gross British Thermal Units (BTUs) heat content per cubic foot of pinyon pine wood and about 274,000 gross BTUs heat content per cubic foot of Utah juniper. Solid wood volume in a cord varies but usually ranges from 65 to 90 cubic feet. Assuming an average of 75 cubic feet of solid wood per cord, there are about 21 million BTUs of heat value in a cord of mixed pinyon pine and Utah juniper.

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

#### MANAGEMENT GUIDES AND INTERPRETATIONS:

##### 1. LIMITATIONS AND CONSIDERATIONS

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

## 2. ESSENTIAL REQUIREMENTS

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

## 3. SILVICULTURAL PRACTICES

- a. Harvest cut selectively or in small patches size dependent upon site conditions) to enhance forage production.
  - 1) Thinning and improvement cutting - Removal of poorly formed, diseased and low vigor trees for fuelwood.
  - 2) Harvest cutting - Selectively harvest surplus trees to achieve desired spacing. Save large, healthy, full-crowned singleleaf pinyon trees for nut producers. Do not select only "high grade" trees during harvest.
  - 3) Slash Disposal - broadcasting slash improves reestablishment of native understory herbaceous species and establishment of seeded grasses and forbs after tree harvest.
  - 4) Spacing Guide - D+11
- b. Prescription burning program to maintain desired canopy cover and manage site reproduction.
- c. Mechanical tree removal (i.e. chaining) is usually not recommended on this site due to steep slopes.
- d. Pest control - Porcupines can cause extensive damage and populations should be controlled.
- e. Fire hazard - Fire usually not a problem in well-managed, mature stands.

## Other products

Other important uses for singleleaf pinyon are for Christmas trees and as a source of nuts for wildlife and human food. These trees have provided Indians with food for centuries. 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 the markets throughout the United States. The berries of Utah juniper have been used by Indians for food.

Christmas trees: 10 trees per acre per year in stands of medium canopy. Ten trees per acre in stands of sapling stage.

Pinyon nuts: Production varies year to year, but mature woodland stage can yield 300 pounds per acre in favorable years.

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 | <i>PIMO</i> | 65             | 90              | 7        | 13        | —           | —                     | —                      |          |

## Type locality

|                            |  |
|----------------------------|--|
| Location 1: Nye County, NV |  |
| Township/Range/Section     | T2N R48E S33   |
| General legal description  | About 1 mile south of Golden Arrow (Site), south end of Stone Cabin Valley, Kawich Range, Nye County, Nevada. This site also occurs in northern Clark, Esmeralda, Mineral, and Lincoln counties, Nevada. |

## Other references

Fire Effects Information System (Online; <http://www.fs.fed.us/database/feis/plants/>).

USDA-NRCS Plants Database (Online; <http://www.plants.usda.gov>).

Howell, J. 1940. Pinyon and juniper: a preliminary study of volume, growth, and yield. Regional Bulletin 71. Albuquerque, NM: USDA, NRCS; 90p.

USDA-NRCS. 1998. National Forestry Manual - Part 537. Washington, D.C.

## Contributors

HA/RRK

## 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  |                   |
| Approved by                                 |                   |
| 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:**

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17. **Perennial plant reproductive capability:**

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