

# Ecological site R024XY046NV GRAVELLY NORTH SLOPE

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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.

## MLRA notes

Major Land Resource Area (MLRA): 024X–Humboldt Basin and Range Area

Major land resource area (MLRA) 24, the Humboldt Area, covers an area of approximately 8,115,200 acres (12,680 sq. mi.). It is found in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Elevations range from 3,950 to 5,900 feet (1,205 to 1,800 meters) in most of the area, some mountain peaks are more than 8,850 feet (2,700 meters). A series of widely spaced north-south trending mountain ranges are separated by broad valleys filled with alluvium washed in from adjacent mountain ranges. Most valleys are drained by tributaries to the Humboldt River. However, playas occur in lower elevation valleys with closed drainage systems. Isolated ranges are dissected, uplifted fault-block mountains. Geology is comprised of Mesozoic and Paleozoic volcanic rock and marine and continental sediments. Occasional young andesite and basalt flows (6 to 17 million years old) occur at the margins of the mountains. Dominant soil orders include Aridisols, Entisols, Inceptisols and Mollisols. Soils of the area are generally characterized by a mesic soil temperature regime, an aridic soil moisture regime and mixed geology. They are generally well drained, loamy and very deep. Approximately 75 percent of MLRA 24 is federally owned, the remainder is primarily used for farming, ranching and mining. Irrigated land makes up about 3 percent of the area; the majority of irrigation water is from surface water sources, such as the Humboldt River and Rye Patch Reservoir. Annual precipitation ranges from 6 to 12 inches (15 to 30 cm) for most of the area, but can be as much as 40 inches (101 cm) in the mountain ranges. The majority of annual precipitation occurs as snow in the winter. Rainfall occurs as high-intensity, convective thunderstorms in the spring and fall.

## Ecological site concept

This ecological site is on mountain side slopes with northern aspects. Soils are very deep, well drained and formed in colluvium derived from mixed rocks. The soil profile is characterized by a mollic epipedon and greater than 35 percent rock fragments distributed throughout the profile. Important abiotic factors contributing to the presence of this site include north aspect, frigid soil temperature and xeric soil moisture.

## Associated sites

|                    |  |
|--------------------|--|
| <b>R024XY016NV</b> | <p><b>Mountain Ridge</b></p> <p>This site is on convex-convex landform positions, such as mountain ridges, summits and shoulders. Soils associated with this site are shallow, well drained, and formed in colluvium or residuum derived from igneous and/or sedimentary rocks. Important abiotic factors associated with this ecological site include low water holding capacity and reduced effective moisture due to high runoff, reduced snow accumulation, shallow depth and high amounts of rock fragments throughout the profile.</p> |
| <b>R024XY029NV</b> | <p><b>SOUTH SLOPE 12-16 P.Z.</b></p> <p>Important abiotic factors contributing to the presence of this ecological site include a south-west to south-east aspects and an aridic bordering on xeric soil moisture regime that contributes to a more droughty site concept than the precipitation zone would suggest.</p>  |

|                    |   |
|--------------------|---|
| <b>R024XY021NV</b> | <p><b>Loamy Slope 12-14 P.Z.</b></p> <p>Soils are moderately deep, well drained, and formed in residuum/colluvium derived from volcanic parent material. The soil profile is characterized by a dark surface horizon (mollic epipedon), a horizon of clay accumulation (argillic horizon) within 30 centimeters, and 18-35 percent clay in the particle size control section.</p>   |
| <b>R024XY023NV</b> | <p><b>NORTH SLOPE 14+ P.Z.</b></p> <p>The soil profile is characterized by a pachic epipedon and greater than 35 percent rock fragments in the particle size control section. The north aspect and the thick mollic epipedon reflecting the increased vegetative production due to increased available soil moisture. Site dominated by Mountain big sagebrush (ARTRV)/ Idaho fescue (FEID); soils very deep, higher AWC.</p>       |
| <b>R024XY027NV</b> | <p><b>CLAYPAN 12-16 P.Z.</b></p> <p>Soils are moderately deep, well drained and formed in residuum derived from volcanic parent material. Sites include an abrupt boundary in the upper soil profile that results in wet non-satiated conditions during the spring and early summer. Under natural conditions the reference state is dominated by low sagebrush (ARAR8), Idaho fescue (FEID), and bluebunch wheatgrass (PSSPS).</p> |

**Similar sites**

|                    |   |
|--------------------|---|
| <b>R024XY018NV</b> | <p><b>Claypan 10-12 P.Z.</b></p> <p>Bluebunch wheatgrass (PSSPS)-Thurber's needlegrass (ACTH7) codominant grasses; less productive site</p> |
|--------------------|---|

**Table 1. Dominant plant species**

|            |                                 |
|------------|---------------------------------|
| Tree       | Not specified                   |
| Shrub      | (1) <i>Artemisia tripartita</i> |
| Herbaceous | (1) <i>Festuca idahoensis</i>   |

**Physiographic features**

This site is on mountain side slopes on mostly northerly exposures. Slopes range from 30 to 75 percent. Elevations are 5800 to about 7500 feet (1768 to about 2286 m).

**Table 2. Representative physiographic features**

|                    |                    |
|--------------------|--------------------|
| Landforms          | (1) Mountain slope |
| Runoff class       | High               |
| Flooding frequency | None               |
| Ponding frequency  | None               |

|                   |                 |
|-------------------|-----------------|
| Elevation         | 1,770 – 2,290 m |
| Slope             | 30 – 80 %       |
| Water table depth | 180 cm          |
| Aspect            | NW, N, NE       |

### Climatic features

The climate associated with this site is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 12 to about 16 inches (30 to about 41 cm). Mean annual air temperature is 43 to 47 degrees F. The average growing season is about 80 to 100 days. There is no climate station available for this site.

Table 3 Representative climatic features

|                               |          |
|-------------------------------|----------|
| Frost-free period (average)   | 100 days |
| Freeze-free period (average)  |          |
| Precipitation total (average) | 410 mm   |

### Influencing water features

There are no influencing water features associated with this site.

### Soil features

The soils associated with this site are very deep, well drained and formed in colluvium derived from mixed parent material influenced with loess high in volcanic ash. Soils have a mollic epipedon and greater than 35 percent rock fragments through the soil profile. Northern aspects allows snow accumulation persists on this site late into spring when the soil is not frozen. Snow melt, at this time, adds to the soil moisture supply.

Soil series associated with this site is Climine.

Table 4. Representative soil features

|                      |  |
|----------------------|--|
| Parent material      | (1) Colluvium<br>(2) Loess<br>(3) Volcanic ash     |
| Surface texture      | (1) Very fine sandy loam<br>(2) Very gravelly loam |
| Family particle size | (1) Loamy  |

|  |                 |
|--|-----------------|
| Drainage class   | Well drained    |
| Permeability class                                       | Moderate        |
| Soil depth   | 180 – 210 cm    |
| Surface fragment cover <=3"                              | 10 – 40 %       |
| Surface fragment cover >3"                               | 0 – 10 %        |
| Available water capacity<br>(0-101.6cm)                  | 12.45 – 12.7 cm |
| Calcium carbonate equivalent<br>(0-101.6cm)              | Not specified   |
| Electrical conductivity<br>(0-101.6cm)                   | Not specified   |
| Sodium adsorption ratio<br>(0-101.6cm)                   | Not specified   |
| Soil reaction (1:1 water)<br>(0-101.6cm)                 | 6.6 – 7.8       |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 10 – 70 %       |
| Subsurface fragment volume >3"<br>(Depth not specified)  | 0 – 10 %        |

### Ecological dynamics

An ecological site is the product of all the environmental factors responsible for its development and it has a set of key characteristics that influence a site's resilience to disturbance and resistance to invasives. Key characteristics include 1) climate (precipitation, temperature), 2) topography (aspect, slope, elevation, and landform), 3) hydrology (infiltration, runoff), 4) soils (depth, texture, structure, organic matter), 5) plant communities (functional groups, productivity), and 6) natural disturbance regime (fire, herbivory, etc.) (Caudle et al. 2013). Biotic factors that influence resilience include site productivity, species composition and structure, and population regulation and regeneration (Chambers et al. 2013).

This ecological site is dominated by deep-rooted cool season, perennial bunchgrasses and long-lived shrubs (50+ years) with high root to shoot ratios. The dominant shrubs usually root to the full depth of the winter-spring soil moisture recharge, which ranges from 1.0 to over 3.0 m (Dobrowolski et al. 1990). Root length of mature sagebrush plants was measured to a depth of 2 meters in alluvial soils in Utah (Richards and Caldwell 1987). These shrubs have a flexible generalized root system with development of both deep taproots and laterals near the surface (Comstock and Ehleringer 1992).

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity has increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability within the soil profile (Bates et al. 2006). Mountain big sagebrush are generally long-lived; therefore it is not necessary for new individuals to recruit every year for perpetuation of the stand. Infrequent large recruitment events and simultaneous low, continuous recruitment is the foundation of population maintenance (Noy-Meir 1973). Survival of the seedlings is dependent on adequate moisture conditions.

Native insect outbreaks are also important drivers of ecosystem dynamics in sagebrush communities. Climate is generally believed to influence the timing of insect outbreaks especially a sagebrush defoliator, Aroga moth (*Aroga websteri*). Aroga moth infestations have occurred in the Great Basin in the 1960s, early 1970s, and have been ongoing in Nevada since 2004 (Bentz et al 2008). Thousands of acres of big sagebrush have been impacted, with partial to complete die-off observed. Aroga moth can partially or entirely kill individual plants or entire stands of big sagebrush (Furniss and Barr 1975). Threetip sagebrush is less

The Great Basin sagebrush communities have high spatial and temporal variability in precipitation both among years and within growing seasons. Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition or can increase resource pools by the decomposition of dead plant material following disturbance. The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007).

South-facing slopes will generally express a higher abundance of bluebunch wheatgrass, while north-facing slopes will have more Idaho fescue. Production will be higher on sites with deeper soils. Overgrazing by livestock and horses will cause a decrease in deep-rooted perennial bunchgrasses, mainly Idaho fescue and bluebunch wheatgrass. Continued inappropriate grazing management may result in an increase in Sandberg bluegrass (*Poa secunda*), balsamroot (*Balsamorhiza* spp.), lupine (*Lupinus* spp.), sagebrush, and rabbitbrush (*Chrysothamnus viscidiflorus*). Depending on timing sheep grazing may result in either an increase of threetip sagebrush or decrease in threetip sagebrush with an increase in perennial grasses (Ellison, 1960).

This ecological site has moderate to high resilience to disturbance and resistance to invasion. Increased resilience increases with elevation, aspect, increased precipitation and increased nutrient availability. Five possible stable states have been identified for the Loamy Slope 12-14" ecological site. Differences in resilience to disturbance for the remaining ecological sites contained within this DRG are described at the end of this document. Due to a high percentage of rock fragments on the soils surface this site reduces the risk of erosion compared to other sites in the group. This site is resilient against annual invasives and tree encroachment, and the tree and invasive annual dominated states of other sites in this DRG have not been observed at this site.

#### Fire Ecology:

Threetip sagebrush may resprout after fire (McArthur et. al. 2004), though Mountain big sagebrush is killed by fire (Neunswander 1980, Blaisdell et al. 1982) and does not resprout (Blaisdell 1953). Post fire regeneration occurring from seeds will vary depending on site characteristics, seed source, and fire characteristics, but threetip sagebrush can communities recover fire in five to ten years (Schlatterer, 1972). Pre-settlement fire return intervals in mountain big sagebrush communities varied from 15 to 25 years (Burkhardt and Tisdale 1969, Houston 1973, and Miller et al. 2000). Mountain big sagebrush seedlings can grow rapidly and may reach reproductive maturity within 3 to 5 years (Bunting et al. 1987). Mountain big sagebrush may return to pre-burn density and cover within 15-20 years following fire, but establishment after severe fires may proceed more slowly (Bunting et al. 1987).

Depending on fire severity, rabbitbrush, Utah serviceberry (*Amelanchier utahensis*), desert peach (*Prunus andersonii*) and mountain snowberry (*Symphoricarpos orbiculatus*) may increase after fire due to their ability to sprout. Douglas' rabbitbrush is top-killed by fire, but sprouts vigorously after fire (Kuntz 1982, Akinsoji 1988). Mountain snowberry is also top-killed by fire, but resprouts after fire from rhizomes (Leege and Hickey 1971, Noste and Bushey 1987). Snowberry has been noted to regenerate well and exceed pre-burn biomass in the third season after a fire (Merrill et al. 1982). Utah serviceberry resprouts from the root crown. If balsamroot is common before fire, they will increase after fire or with heavy grazing (Wright 1985). As cheatgrass increases fire frequencies will also increase, at frequencies between 0.23 and 0.43 times a year, even sprouting shrubs such as rabbitbrush will not survive (Whisenant 1990).

The effect of fire on bunchgrasses relates to culm density, culm-leaf morphology, and the size of the plant. The initial condition of bunchgrasses within the site along with seasonality and intensity of the fire all factor into the individual species response. For most forbs and grasses the growing points are located at or below the soil surface providing relative protection from disturbances which decrease above ground biomass, such as grazing or fire. Thus, fire mortality is more correlated to duration and intensity of heat which is related to culm density, culm-leaf morphology, size of plant and abundance of old growth (Wright 1971, Young 1983)

Idaho fescue response to fire varies with condition and size of the plant, season and severity of fire, and ecological conditions. Mature Idaho fescue plants are commonly reported to be severely damaged by fire in all seasons (Wright et al. 1979). Initial mortality may be high (in excess of 75%) on severe burns, but usually varies from 20 to 50 percent (Barrington et al 1988). Rapid burns have been found to leave little damage to root crowns, and new tillers are produced with onset of fall moisture (Johnson et al. 1994). However, Wright and others (1979) found the dense, fine leaves of Idaho fescue provided enough fuel to burn for hours after a fire had passed, thereby killing or seriously injuring the plant regardless of the intensity of the fire (Wright et al. 1979). Idaho fescue is commonly reported to be more

sensitive to fire than the other prominent grass on this site, bluebunch wheatgrass (Conrad and Poulton 1966). However, Robberecht and Defosse (1995) suggested the latter was more sensitive. They observed culm and biomass reduction with moderate fire severity in bluebunch wheatgrass, whereas a high fire severity was required for this reduction in Idaho fescue. Also, given the same fire severity treatment, post-fire culm production was initiated earlier and more rapidly in Idaho fescue (Robberecht and Defosse 1995).

Bluebunch wheatgrass has coarse stems with little leafy material, therefore the aboveground biomass burns rapidly and little heat is transferred downward into the crowns (Young 1983). Bluebunch wheatgrass was described as fairly tolerant of burning, other than in early spring in eastern Oregon (Britton et al. 1990). Uresk et al. (1976) reported burning increased vegetative and reproductive vigor of bluebunch wheatgrass. Thus, bluebunch wheatgrass is considered to experience slight damage to fire but is more susceptible in drought years (Young 1983). Most authors classify the plant as undamaged by fire (Kuntz 1982).

Thurber's needlegrass a minor component of this plant community, is moderately resistant to wildfire (Smith and Busby 1981), but can be severely damaged and have high mortality depending on season and severity of fire. Post fire regeneration usually occurs from seed, but plants that are not completely killed by fire will continue growth during favorable conditions (Koniak 1985).

Basin wildrye also a minor component of this plant community, is relatively resistant to fire, particularly dormant season fire, as plants sprout from surviving root crowns and rhizomes (Zschaechner 1985).

## State and transition model

Figure 1. State and Transition Model 2021

Figure 2. STM Narrative 2021

## Additional community tables

Table 5. Community 1.1 plant community composition

| Group                  | Common Name                      | Symbol | Scientific Name                             | Annual Production () | Foliar Cover (%) |
|------------------------|----------------------------------|--------|---|----------------------|------------------|
| <b>Grass/Grasslike</b> |                                  |        |   |                      |                  |
| 1                      | <b>Primary Perennial Grasses</b> |        |   | 424-888              |                  |
|                        | Idaho fescue                     | FEID   | <i>Festuca idahoensis</i>                   | 303-504              | –                |
|                        | Cusick's bluegrass               | POCU3  | <i>Poa cusickii</i>                         | 101-303              | –                |
|                        | bluebunch wheatgrass             | PSSPS  | <i>Pseudoroegneria spicata ssp. spicata</i> | 20-81                | –                |
| 2                      | <b>Primary Perennial Grasses</b> |        |   | 50-151               |                  |
|                        | Thurber's needlegrass            | ACTH7  | <i>Achnatherum thurberianum</i>             | 6-30                 | –                |
|                        | squirreltail                     | ELEL5  | <i>Elymus elymoides</i>                     | 6-30                 | –                |
|                        | basin wildrye                    | LECI4  | <i>Leymus cinereus</i>                      | 6-30                 | –                |
|                        | Sandberg bluegrass               | POSE   | <i>Poa secunda</i>                          | 6-30                 | –                |
| <b>Forb</b>            |                                  |        |   |                      |                  |
| 3                      | <b>Primary Perennial Forbs</b>   |        |   | 20-50                |                  |
|                        | tapertip hawksbeard              | CRAC2  | <i>Crepis acuminata</i>                     | 20-50                | –                |
| 4                      | <b>Secondary Perennial Forbs</b> |        |   | 50-101               |                  |
|                        | aster                            | ASTER  | <i>Aster</i>                                | 6-50                 | –                |
|                        | milkvetch                        | ASTRA  | <i>Astragalus</i>                           | 6-50                 | –                |
|                        | arrowleaf balsamroot             | BASA3  | <i>Balsamorhiza sagittata</i>               | 6-50                 | –                |
|                        | buckwheat                        | ERIOG  | <i>Eriogonum</i>                            | 6-50                 | –                |
|                        | lupine                           | LUPIN  | <i>Lupinus</i>                              | 6-50                 | –                |
|                        | phlox                            | PHLOX  | <i>Phlox</i>                                | 6-50                 | –                |
| <b>Shrub/Vine</b>      |                                  |        |   |                      |                  |
| 5                      | <b>Primary Shrubs</b>            |        |   | 151-252              |                  |
|                        | threetip sagebrush               | ARTR4  | <i>Artemisia tripartita</i>                 | 151-252              | –                |
| 6                      | <b>Secondary Shrubs</b>          |        |   | 20-101               |                  |
|                        | Utah serviceberry                | AMUT   | <i>Amelanchier utahensis</i>                | 10-30                | –                |
|                        | mountain big sagebrush           | ARTRV  | <i>Artemisia tridentata ssp. vaseyana</i>   | 10-30                | –                |
|                        | yellow rabbitbrush               | CHVI8  | <i>Chrysothamnus viscidiflorus</i>          | 10-30                | –                |

|  |           |       |                       |       |   |
|--|-----------|-------|-----------------------|-------|---|
|  | currant   | RIBES | <i>Ribes</i>          | 10-30 | - |
|  | snowberry | SYMPH | <i>Symphoricarpos</i> | 10-30 | - |

**Table 6. Community 1.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 7. Community 1.3 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 8. Community 2.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 9. Community 2.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 10. Community 2.3 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 11. Community 3.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

**Table 12. Community 3.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|-------|-------------|--------|-----------------|----------------------|------------------|
|-------|-------------|--------|-----------------|----------------------|------------------|

## Animal community

**Livestock Interpretations:** This site has limited value for livestock grazing, due to steep slopes. Grazing management should be keyed to dominant grasses and palatable shrubs production. Idaho fescue provides important forage for many types of domestic livestock. The foliage cures well and is preferred by livestock in late fall and winter. Cusick's bluegrass makes up only a small proportion of the biomass of the sagebrush communities in which it lives, but it is often taken preferentially by cattle, especially early in the season. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for livestock. Although bluebunch wheatgrass can be a crucial source of forage, it is not necessarily the most highly preferred species. Threetip sagebrush may provide some browse for domestic sheep but its value to cattle appears limited. It is not used by cattle in Nevada. 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: Idaho fescue provides important forage for several wildlife species. It is reported to be good forage for pronghorn, and deer in ranges of northern Nevada. Deer, elk, and mountain goat also use Cusick's bluegrass early in the season. The value of Cusick's bluegrass as cover for small animals has been rated as poor to fair. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for wildlife. Bluebunch wheatgrass does not generally provide sufficient cover for ungulates, however, mule deer are frequently found in bluebunch-dominated grasslands. Threetip sagebrush is not a preferred browse for most wild ungulates. Threetip sagebrush is used to some extent by mule deer in both summer and winter. Elk do not generally feed on threetip sagebrush. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover.

## Hydrological functions

Runoff is high. Permeability is moderate. Hydrologic soil group is B. Rills are none to rare. Rock fragments armor the soil surface. Water flow patterns are none to rare. Rock fragments armor the soil surface. Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition. Gullies are none. Perennial herbaceous plants (i.e., Idaho fescue) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

## Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for hiking and has potential for upland and big game hunting.

## Inventory data references

NASIS soil component data.

## Type locality

|                                 |   |
|---------------------------------|---|
| Location 1: Humboldt County, NV |   |
| Township/Range/Section          | T36N R37E S11   |
| UTM zone                        | N   |
| UTM northing                    | 4540194   |
| UTM easting                     | 434136  |
| Latitude                        | 41° 0' 37"  |
| Longitude                       | 117° 45' 59"  |
| General legal description       | SE¼ North-facing sideslope, approximately ¼ mile below the top of Winnemucca Mountain, Humboldt County, Nevada. |

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## Approval

Kendra Moseley, 3/06/2025

## 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)                    | Patti Novak-Echenique                 |
| Contact for lead author                     | State Rangeland Management Specialist |
| Date  | 03/19/2010                            |
| Approved by                                 |                                       |
| Approval date                               |                                       |
| Composition (Indicators 10 and 12) based on | Annual Production                     |

## Indicators

1. **Number and extent of rills:** Rills are none to rare. Rock fragments armor the soil surface.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare. Rock fragments armor the soil surface.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 10-20%.

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5. **Number of gullies and erosion associated with gullies:** Gullies are none.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during catastrophic events.

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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):** Soil stability values should be 3 to 6 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically subangular blocky. Soil surface colors are dark and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 3 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (i.e., Idaho fescue) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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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):** Compacted layers are not typical. Subangular blocky or massive sub-surface horizons are not to be interpreted as compacted layers.

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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: Reference Plant Community: Deep-rooted, cool season, perennial bunchgrasses**

**Sub-dominant: Tall shrubs (i.e., threetip sagebrush) > shallow-rooted, cool season, perennial bunchgrasses > associated shrubs > deep-rooted, cool season, perennial forbs > fibrous, shallow-rooted, cool season, perennial and annual forbs**

**Other:**

**Additional:**

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

**Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.**

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14. **Average percent litter cover (%) and depth ( in): Within plant interspaces ( $\pm 20\%$ ) and depth of litter is  $< \frac{1}{2}$  inch.**
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

**For normal or average growing season (end of May)  $\pm 900$  lbs/ac; Spring moisture significantly affects total 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: Increasers include Douglas rabbitbrush, singleleaf pinyon, and Utah juniper. Invaders include halogeton, Russian thistle, bassia, annual mustards, and cheatgrass.**
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17. **Perennial plant reproductive capability: All functional groups should reproduce in average (or normal) and above average growing season years.**
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