Ecological site R026XY075NV
GRAVELLY MOUNTAIN SHOULDERS 16+ P.Z.

Last updated: 4/10/2024
Accessed: 05/13/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 026X–Carson Basin and Mountains

The area lies within western Nevada and eastern California, with about 69 percent being within Nevada, and 31 percent being within California. Almost all this area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Isolated north-south trending mountain ranges are separated by aggraded desert plains. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are drained by three major rivers flowing east across this MLRA. A narrow strip along the western border of the area is in the Sierra Nevada Section of the Cascade-Sierra Mountains Province of the Pacific Mountain System. The Sierra Nevada Mountains are primarily a large fault block that has been uplifted with a dominant tilt to the west. This structure leaves an impressive wall of mountains directly west of this area. This helps create a rain shadow affect to MLRA 26. Parts of this eastern face, but mostly just the foothills, mark the western boundary of this area. Elevations range from about 3,806 feet (1,160 meters) on the west shore of Pyramid Lake to 11,653 feet (3,552 meters) on the summit of Mount Patterson in the Sweetwater Mountains.

Valley areas are dominantly composed of Quaternary alluvial deposits with Quaternary playa or alluvial flat deposits often occupying the lowest valley bottoms in the internally drained valleys, and river deposited alluvium being dominant in externally drained valleys. Hills and mountains are dominantly Tertiary andesitic flows, breccias, ash flow tuffs, rhyolite tuffs or granodioritic rocks. Quaternary basalt flows are present in lesser amounts, and Jurassic and Triassic limestone and shale, and Precambrian limestone and dolomite are also present in very limited amounts. Also of limited extent are glacial till deposits along the east flank of the Sierra Nevada Mountains, the result of alpine glaciation.

The average annual precipitation in this area is 5 to 36 inches (125 to 915 millimeters), increasing with elevation. Most of the rainfall occurs as high-intensity, convective storms in spring and autumn. Precipitation is mostly snow in winter. Summers are dry. The average annual temperature is 37 to 54 degrees F (3 to 12 degrees C). The freeze-free period averages 115 days and ranges from 40 to 195 days, decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an aridic or xeric soil moisture regime, and mixed or smectitic mineralogy. They generally are well drained, are clayey or loamy and commonly skeletal, and are very shallow to moderately deep.

This area supports shrub-grass vegetation characterized by big sagebrush. Low sagebrush and Lahontan sagebrush occur on some soils. Antelope bitterbrush, squirreltail, desert needlegrass, Thurber needlegrass, and Indian ricegrass are important associated plants. Green ephedra, Sandberg bluegrass, Anderson peachbrush, and several forb species also are common. Juniper-pinyon woodland is typical on mountain slopes. Jeffrey pine, lodgepole pine, white fir, and manzanita grow on the highest mountain slopes. Shadscale is the typical plant in the drier parts of the area. Sedges, rushes, and moisture-loving grasses grow on the wettest parts of the wet flood plains and terraces. Basin wildrye, alkali sacaton, saltgrass, buffaloberry, black greasewood, and rubber rabbitbrush grow on the drier sites that have a high concentration of salts.

Some of the major wildlife species in this area are mule deer, coyote, beaver, muskrat, jackrabbit, cottontail, raptors, pheasant, chukar, blue grouse, mountain quail, and mourning dove. The species of fish in the area include trout and catfish. The Lahontan cutthroat trout in the Truckee River is a threatened and endangered species.

LRU notes

The Sierra Influenced Ranges LRU is characterized by wooded great basin mountains with climatic and biotic affinities to the Sierra Nevada mountain range. The Sierra Influences Ranges LRU receives greater precipitation that the mountain ranges of central NV. Amount of precipitation varies in relation to the local strength of the Sierra NV rain shadow, characterized by pinyon and juniper trees. The White, Sweetwater, Pine Nut, Wassuk, and Virginia ranges of Nevada support varying amounts of Sierra Nevada flora, such as ponderosa pine. Elevations range from 1610 to 2420 meters and slopes range from 5 to 49 percent, with a median value of 22 percent. Frost free days (FFD) ranges from 92 to 163.

Ecological site concept

This site occurs on high mountain shoulders and backslopes of mostly northerly aspects. Slopes range from 15 to 75 percent, but slope gradients of 15 to 50 percent are most typical. Elevations are 7600 to 9400 feet. The soils associated with this site consists of very deep, well drained soils that formed in colluvium and residuum derived from volcanic and granitic rocks. The soil profiles are modified with high amounts of rock fragments. The dominant plants are mountain big sagebrush (Artemisia tridentata ssp. vaseyana) and spike fescue (Leucopoa kingii).

Associated sites

R026XY028NV	**MOUNTAIN RIDGE**
R026XY038NV	**LOAMY SLOPE 14+ P.Z.**
R026XY039NV	**CLAYPAN 14+ P.Z.**
R026XY056NV	**SOUTH SLOPE 16+ P.Z.**

Similar sites

R026XY038NV	**LOAMY SLOPE 14+ P.Z.** ACOCO dominant grass; more productive site
R026XY052NV	**SHALLOW LOAM 16+ P.Z.** KOMA, CAREX and ERMI4 important plants
R026XY056NV	**SOUTH SLOPE 16+ P.Z.** ACLE9-ACOCO codominant grasses with LEKI2; PUTR2 important shrub
R026XY076NV	**MOUNTAIN SHOULDERS 16+ P.Z.** ACLE9 dominant grass; less productive site

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata var. vaseyana*
Herbaceous	(1) *Leucopoa kingii*

Physiographic features

This site occurs on high mountain shoulders and backslopes of mostly northerly aspects. Slopes range from 15 to 75 percent, but slope gradients of 15 to 50 percent are most typical. Elevations are 7600 to 9400 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope

Elevation	2,316–2,865 m
Slope	15–50%
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is subhumid with cool, dry summers and cold, wet winters. Average annual precipitation is 16 to 30 inches. Mean annual air temperature is 36 to 42 degrees F. The average growing season is about 30 to 70 days. Climate data used to support this section were derived from PRISM and is not specifically tied to any dominant climate station.

Nevada's climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada's climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating.

Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	406-762 mm
Frost-free period (average)	50 days
Freeze-free period (average)	
Precipitation total (average)	762 mm

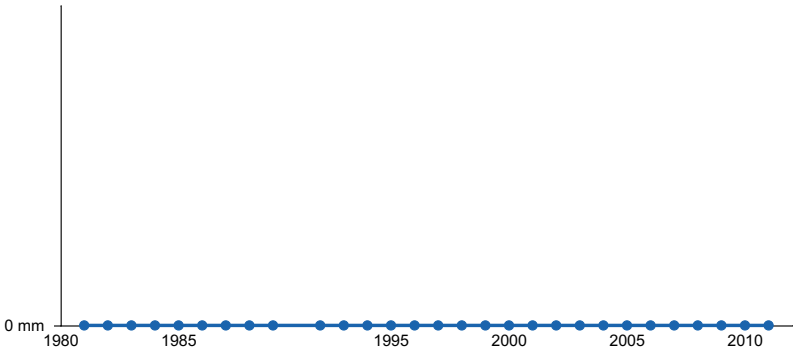


Figure 1. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site consists of very deep, well drained soils that formed in colluvium and residuum derived from volcanic and granitic rocks. The soil profiles are modified with high amounts of rock fragments. The soils are moist during late fall, winter and spring and are dry from July through October for 74 to 90 consecutive days in the four months following the summer solstice. The soils have a xeric moisture regime that borders on aridic. The soil series associated with this site are Dab and Delhew.

Table 4. Representative soil features

Surface texture	(1) Extremely gravelly sandy loam (2) Very gravelly loamy coarse sand
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	183 cm
Surface fragment cover <=3"	65–74%
Surface fragment cover >3"	2–6%
Available water capacity (0-101.6cm)	5.84–8.64 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	40–60%
Subsurface fragment volume >3" (Depth not specified)	20–25%

Ecological dynamics

Where management results in abusive livestock use, spike fescue and other more palatable grasses and forbs

decrease, as mountain big sagebrush, rabbitbrush and bottlebrush squirreltail increase. Cheatgrass and thistles are species likely to invade this plant community.

Fire Ecology:
Presettlement fire return intervals in mountain big sagebrush communities varied from 15 to 25 years. 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.
The rhizomatous, dense growth of spike fescue may lessen the impact of fire on this species. Spike fescue persists following fire via on-site surviving rhizomes, and can colonize an area through off-site seed sources.

State and Transition Model Narrative Group 13
This is a text description of the states, phases, transitions, and community pathways possible in the State and Transition model for the MLRA 26 Disturbance Response Group 13. Sites included in this DRG are: R026XY038NV, R026XY108NV, R026XY075NV, R026XY056NV, R026XY052NV, R026XY112NV, R026XY110NV, R026XF059CA.

Reference State 1.0:
The Reference State 1.0 represents the natural range of variability under pristine conditions. The reference state has three general community phases: a shrub-grass dominant phase, a perennial grass dominant phase and a shrub dominant phase. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, fine fuel loads, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire, periodic drought and/or insect or disease attack.

Community Phase 1.1:
Mountain big sagebrush and perennial bunchgrasses co-dominate. Western needlegrass is the dominant grass species, however there may be several grass species present. Grass, shrub, and forb diversity is high.

Community Phase Pathway 1.1a, from phase 1.1 to 1.2:
Fire would decrease or eliminate the overstory of sagebrush and allow perennial bunchgrasses and forbs to dominate the site. Fires are small, high-severity, stand replacement fires that typically occur from April through October. Patchy fires create a sagebrush/grass mosaic. High severity fire significantly reduces sagebrush cover and leads to an early- to mid-seral community, dominated by grasses and forbs.

Community Phase Pathway 1.1b, from phase 1.1 to 1.3:
Time and lack of disturbance such as fire or drought allow for an increase in mountain big sagebrush. Excessive herbivory and/or long-term drought may also reduce perennial understory.

Community Phase 1.2:
This community phase is characteristic of a post-disturbance, early- to mid-seral community. Western needlegrass, bluegrass and other perennial grasses dominate. Sprouting shrubs such as green rabbitbrush (*Chrysothamnus viscidiflorus*), snowberry (*Symphoricarpos oreophilus*), green ephedra (*Ephedra viridis*), spineless horsebrush (*Tetradymia canescens*) may be a significant component. Mountain big sagebrush is a minor component. Forbs may be a significant component.

Community Phase Pathway 1.2a, from phase 1.2 to 1.1:
Time and lack of disturbance allows sagebrush to reestablish.

Community Phase 1.3:
Mountain big sagebrush becomes dominant in the absence of disturbance. Western needlegrass and other perennial grasses are reduced. Bluegrass may increase. Singleleaf pinyon and/or Utah juniper may be present.

Community Phase Pathway 1.3a, from phase 1.3 to 1.1:
Low severity fire kills some sagebrush and results in a patchwork of shrubs and grasses.

Community Phase Pathway 1.3b, from phase 1.3 to 1.2:
High severity fire significantly reduces sagebrush cover, leading to early- to mid-seral community.

T1A: Transition from Reference State 1.0 to Current Potential State 2.0:
Trigger: This transition is caused by the introduction of non-native annual weeds, such as cheatgrass, mustard and Russian thistle (Salsola spp.).

Slow variables: Over time, the annual non-native plants will increase within the community decreasing organic matter inputs from deep-rooted perennial bunchgrasses resulting in reductions in soil water availability for perennial bunchgrasses.

Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

T2A: Transition from Reference State 1.0 to Shrub State 3.0:
Trigger: Inappropriately managed, long-term grazing of perennial bunchgrasses during the growing season would favor shrubs and initiate transition to Community Phase 3.1. Fire would cause a transition to Community Phase 3.2.

Slow variables: Long-term decrease in deep-rooted perennial grass density resulting in a decrease in organic matter inputs and subsequent soil water decline.

Threshold: Loss of deep-rooted perennial bunchgrasses changes spatial and temporal nutrient cycling and nutrient redistribution and reduces soil organic matter.

Current Potential State 2.0:
This state is similar to the Reference State 1.0. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. This state has the same three general community phases. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, fine fuel loads and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate and adaptations for seed dispersal. Additionally, the presence of highly flammable, non-native species reduces State resilience because these species can promote fire where historically fire has been infrequent leading to positive feedbacks that further the degradation of the system.

Community Phase 2.1:
Mountain big sagebrush and perennial bunchgrasses co-dominate. Western needlegrass is the dominant grass species; however, there may be several grass species present. Grass, shrub, and forb diversity is high. Annual non-native species present.

Community Phase Pathway 2.1a, from phase 2.1 to 2.2:
Fire would decrease or eliminate the overstory of sagebrush and allow perennial bunchgrasses and forbs to dominate the site. Fires would typically be small, high-severity, stand replacing, and patchy due to fine fuel loads. Patchy fires create a sagebrush/grass mosaic. High severity fire significantly reduces sagebrush cover and leads to an early- to mid-seral community, dominated by grasses and forbs.

Community Phase Pathway 2.1b, from phase 2.1 to 2.3:
Time, long-term drought, grazing management that favors shrubs or combinations of these allows the sagebrush overstory to increase and dominate the site, causing a reduction in perennial bunchgrasses.

Community Phase 2.2:
This community phase is characteristic of a post-disturbance, early- to mid-seral community. Western needlegrass, bluegrass and other perennial grasses dominate. Sprouting shrubs such as green rabbitbrush (*Chrysothamnus viscidiflorus*), snowberry (*Symphoricarpos oreophilus*), green ephedra (*Ephedra viridis*), spineless horsebrush (*Tetradymia canescens*) may be a significant component. Mountain big sagebrush is a minor component. Forbs may be a significant component. Annual non-native species are present.

Community Phase Pathway 2.2a, from phase 2.2 to 2.1:

Absence of disturbance over time allows the sagebrush to recover. This may be combined with grazing management that favors shrubs.

Community Phase 2.3:
Mountain big sagebrush increases and the perennial understory is reduced. Squirreltail and bluegrasses may increase. Annual non-native species are present.

Community Phase Pathway 2.3a, from phase 2.3 to 2.1:
Low severity fire kills some sagebrush and results in a patchwork of shrubs and grasses. Other disturbances/practices include brush management with minimal soil disturbance to reduce sagebrush cover.

Community Phase Pathway 2.3b, from phase 2.3 to 2.2
High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0:
Trigger: Inappropriately managed, long-term grazing of perennial bunchgrasses during the growing season would favor shrubs and initiate transition to Community Phase 3.1. Fire would cause a transition to Community Phase 3.2.

Slow variables: Long-term decrease in deep-rooted perennial grass density resulting in a decrease in organic matter inputs and subsequent soil water decline.

Threshold: Loss of deep-rooted perennial bunchgrasses changes spatial and temporal nutrient cycling and nutrient redistribution, and reduces soil organic matter.

Shrub State 3.0:
This state has two community phases: a mountain big sagebrush dominated phase and a rabbitbrush dominated phase. This state is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Squirreltail and bluegrasses will increase with a reduction in deep-rooted perennial bunchgrass competition and become the dominant grass. Sagebrush dominates the overstory and rabbitbrush may be a significant component. Sagebrush canopy cover is high and sagebrush may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory and shallow-rooted understory dominate site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed.

Community Phase 3.1:
Mountain big sagebrush dominates the overstory. Western needlegrass and other deep-rooted perennial grasses are reduced or missing. Bluegrasses may dominate the understory. Bare ground may be significant. Annual non-native species are present.

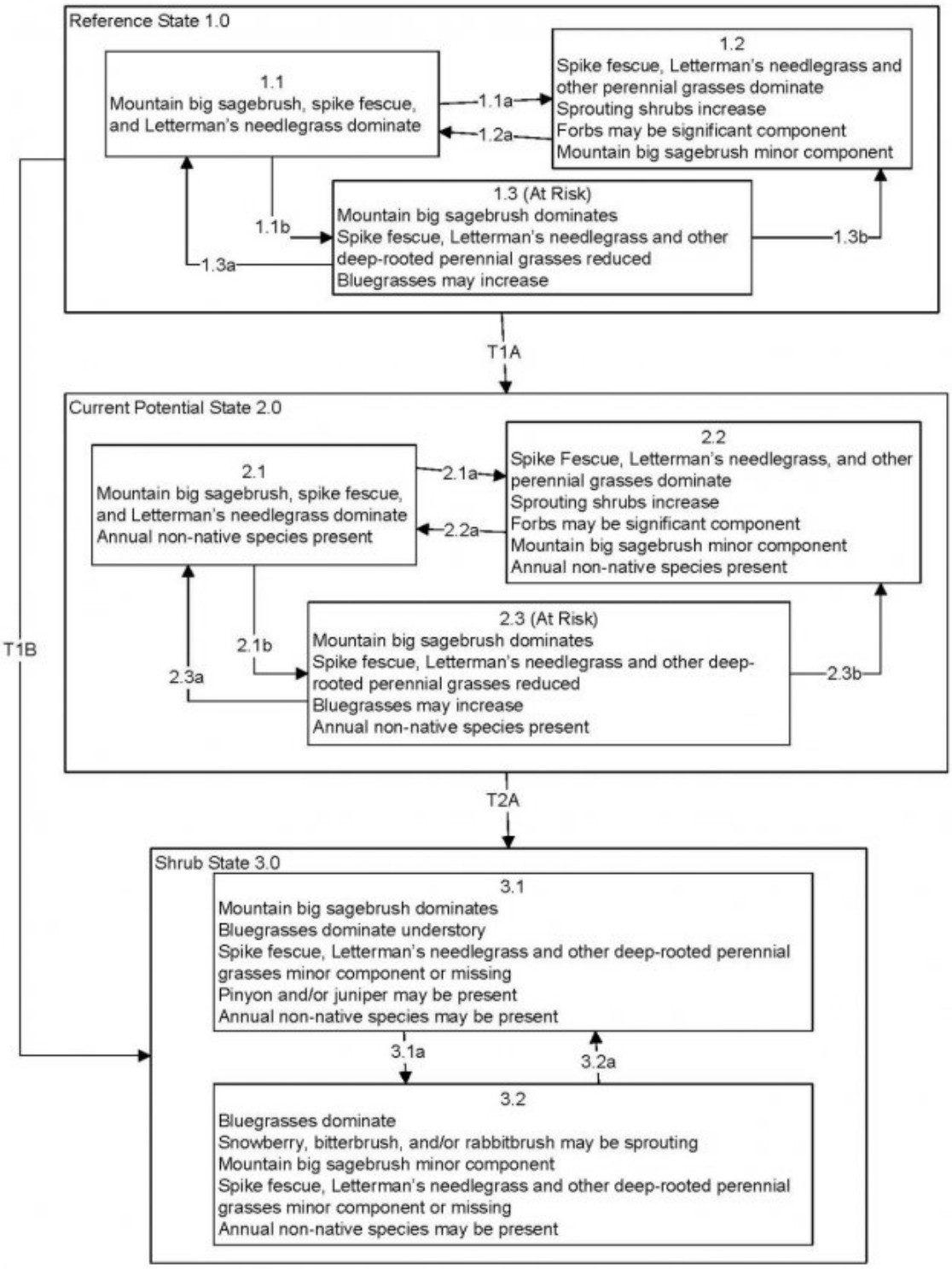
Community Phase Pathway 3.1a, from phase 3.1 to 3.2:
Fire reduces or eliminates the overstory of sagebrush.

Community Phase 3.2:
Bluegrasses dominate the site. Rabbitbrush, bitterbrush, horsebrush, ephedra, and/or snowberry may be sprouting. Mountain big sagebrush is a minor component. Annual non-native species increasing and may be co-dominant in the understory.

Community Phase Pathway 3.2a, from phase 3.2 to 3.1:
Absence of disturbance over time allows sagebrush and other shrubs to recover.

State and transition model

MLRA 26
Group 13
Gravelly Mountain
Shoulders 16+"
026XY075NV



MLRA 26
Group 13
Gravelly Mountain
Shoulders 16+"
026XY075NV
KEY

Reference State 1.0 Community Phase Pathways
1.1a: Low severity fire creates sagebrush/grass mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community, dominated by grasses and forbs.
1.1b: Time and lack of disturbance such as fire or drought. Excessive herbivory and/or long-term drought may also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire creates sagebrush/grass mosaic.
1.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native annual species.
Transition T2B: Inappropriate grazing management (from 1.3 to 3.1).

Current Potential State 2.0 Community Phase Pathways
2.1a: Low severity fire creates sagebrush/grass mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community dominated by grasses and forbs; non-native annual species present.
2.1b: Time and lack of disturbance. Inappropriate grazing management and/or long-term drought may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for regeneration of sagebrush.
2.3a: Low severity fire creates sagebrush/grass mosaic.
2.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T2A: Inappropriate grazing management (to 3.1), or high severity fire (from 2.3 to 3.2).

Shrub State 3.0 Community Phase Pathways
3.1a: Fire.
3.2a: Time and lack of disturbance.

State 1
Reference Plant Community

Community 1.1

Reference Plant Community

The reference plant community is dominated by spike fescue and mountain big sagebrush. Oceanspray is most prevalent in snow accumulation areas and within rock outcrops. Potential vegetative composition is about 55% grasses, 10% forbs and 35% shrubs. Approximate ground cover (basal and crown) is 45 to 60 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	247	432	555
Shrub/Vine	157	275	353
Forb	45	78	101
Total	**449**	**785**	**1009**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			228–534	
	spike fescue	LEKI2	*Leucopoa kingii*	157–314	–
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	39–118	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	16–39	–
	muttongrass	POFE	*Poa fendleriana*	3–12	–
	timberline bluegrass	POGLR2	*Poa glauca ssp. rupicola*	3–12	–
	Wheeler's bluegrass	POWH2	*Poa wheeleri*	2–12	–
2	**Secondary Perennial Grasses/Grasslikes**			16–63	
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	4–24	–
	mountain brome	BRMA4	*Bromus marginatus*	4–24	–
	sedge	CAREX	*Carex*	4–24	–
	squirreltail	ELEL5	*Elymus elymoides*	4–24	–
Forb					
3	**Perennial**			39–118	
	rockcress	ARABI2	*Arabis*	4–16	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	4–16	–
	lupine	LUPIN	*Lupinus*	4–16	–
	ragwort	SENEC	*Senecio*	4–16	–
Shrub/Vine					
4	**Primary Shrubs**			118–196	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	118–196	–
5	**Secondary Shrubs**			16–63	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–16	–
	oceanspray	HOLOD	*Holodiscus*	8–16	–
	snowberry	SYMPH	*Symphoricarpos*	8–16	–
	horsebrush	TETRA3	*Tetradymia*	8–16	–

Animal community

Livestock Interpretations:
This site is suited for livestock grazing where slopes are less than 30 percent. Grazing management should be keyed to spike fescue production. 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. Attentive grazing management is required due to steep slopes and erosive soil surface condition.

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:
Mountain big sagebrush is highly preferred and nutritious winter forage for mule deer and sage grouse. Spike fescue is frequently browsed by mule deer. Letterman's needlegrass and prairie junegrass are other important forage species for several wildlife species.

Hydrological functions

Runoff is medium to high.

Recreational uses

This site offers opportunities for hunting, camping, hiking and photography.

Other products

Native peoples used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing.

Other information

Mountain big sagebrush is easily propagated from seed under greenhouse, nursery, and common garden conditions and has been successfully seeded directly into field sites. Mountain big sagebrush has also been successfully planted in field sites using nursery-grown bare root and containerized stock.

Type locality

Location 1: Douglas County, NV	
Township/Range/Section	T11N R22E S16
General legal description	Pine Nut Mountains, 0.75 miles northeast of Bald Mountain, Douglas County, 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).

Contributors

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Approval

Kendra Moseley, 4/10/2024

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)	Patti Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	07/19/2013
Approved by	Kendra Moseley

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to few. A few will occur on the steeper slopes after summer convection storms or rapid snowmelt.

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2. **Presence of water flow patterns:** None to rare. A few will occur on the steeper slopes after summer convection storms or rapid snowmelt.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare and will occur in water flow patterns.

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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 10-20% depending on amount of surface rock fragments

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5. **Number of gullies and erosion associated with gullies:** 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 large rainfall 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. (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 fine subangular blocky. Soil surface colors are dark grayish-browns and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically 1.25 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 (especially deep-rooted bunchgrasses [i.e., spike fescue, needlegrasses] 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 none. Subangular blocky or massive structure or subsoil argillic horizons are not to be interpreted as compacted.

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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: Deep-rooted, cool season, perennial bunchgrasses

    Sub-dominant: tall shrubs (mountain big sagebrush) > deep-rooted, cool season, perennial forbs > associated shrubs> shallow-rooted, cool season, perennial grasses and grass-like plants >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 (<10%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Reference Plant Community: Under shrubs and between plant interspaces (30-50%) and litter depth is <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 (through June) ± 700 lbs/ac; Favorable years ± 900 lbs/ac and unfavorable years ± 400 lbs/ac

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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:** Potential invaders include cheatgrass, annual mustards, Russian thistle, and halogeton.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years. Reduced reproduction and growth will occur during extreme or extended drought conditions.
