USDA Natural Resources Conservation Service

Ecological site R026XY110NV
GRAVELLY SOUTH SLOPE 16+ P.Z.

Last updated: 4/10/2024
Accessed: 05/11/2025

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 Bodie Hills LRU straddles the California-Nevada state boundary, just north of Mono Lake. The area is underlain by late Miocene age volcanic fields with upper Miocene and Pliocene sedimentary deposits over top. The youngest faults in the area are north and north-east striking. Extensive zones of hydrothermally altered rocks and large mineral deposits, including gold and silver rich veins, formed during hydrothermally active periods of the Miocene (John et al. 2015). A primary distinguishing factor between the Bodie Hills and other hills in MLRA 26 is the dominance of volcanic parent material. Elevations range from 2170 to 2650 meters and slopes typically range from 5 to 35 percent. FFD range from 75-105.

Ecological site concept

The Gravelly South Slope 16+ P.Z. site occurs on southerly aspects of mountain sideslopes. The soils associated with this site are moderately deep, well drained soils that formed in colluvium and residuum derived from granodiorite rock. The dominant vegetation is mountain sagebrush (Artemisia tridentata ssp. vaseyana), bitterbrush (Purshia tridentata), and western needlegrass (Achnatherum occidentale ssp. occidentale).

Associated sites

R026XY075NV	**GRAVELLY MOUNTAIN SHOULDERS 16+ P.Z.**

Similar sites

F026XY045NV	**Juniperus osteosperma/Artemisia tridentata ssp. wyomingensis/Achnatherum speciosum-Achnatherum hymenoides** LEKI2 dominant grass

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. vaseyana* (2) *Purshia tridentata*
Herbaceous	(1) *Achnatherum occidentale ssp. occidentale*

Physiographic features

The Gravelly South Slope 16+ P.Z. site occurs on southerly aspects of mountain sideslopes. Slopes range from 50 to 75 percent. Elevations range from 8000 to 9200 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain
Elevation	8,000–9,200 ft
Slope	50–75%
Aspect	SE, S, SW

Climatic features

The climate associated with this site is semiarid with cool, dry summers and cold, wet winters. The mean annual precipitation is 16 to 20 inches, the mean annual temperature is 36 to 43 degrees F., and the frost-free period is 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)	16-20 in
Frost-free period (average)	50 days
Freeze-free period (average)	
Precipitation total (average)	18 in

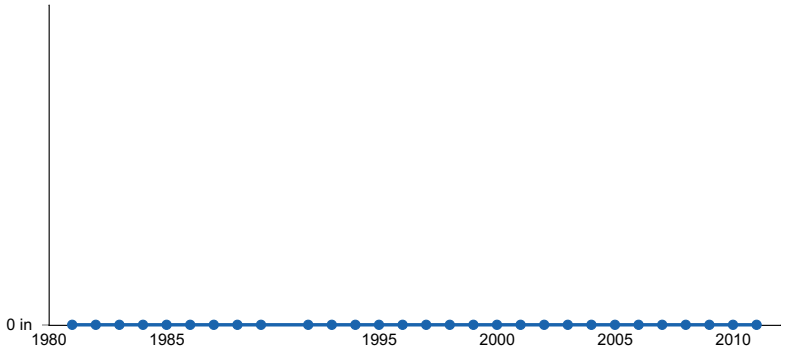


Figure 1. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils are moderately deep, well drained soils that formed in colluvium and residuum derived from granodiorite rock. Available water capacity is very low. Rock fragments in the control section average 50 to 80 percent, and are mostly fine pebbles (2 to 5 mm diameter). Lithology of fragments are granitic rocks such as granodiorite. The soil

moisture is usually moist in the moisture control section in winter and spring and dry from July through October. The moisture regime is xeric that borders on aridic. The soils have an argillic horizon and a mollic epipedon. Soil series associated with this site include Bullville.

Table 4. Representative soil features

Parent material	(1) Colluvium–granodiorite (2) Residuum–granodiorite
Surface texture	(1) Very gravelly coarse sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately slow
Soil depth	20–40 in
Surface fragment cover <=3"	30–40%
Surface fragment cover >3"	0–7%
Available water capacity (0-40in)	1.6–2.2 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.1–7.3
Subsurface fragment volume <=3" (Depth not specified)	40–48%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

Nutrients are being cycled through deep-rooted perennial grasses, shrubs and forbs. Energy capture occurs throughout the entire growing season such that this plant community's site resiliency is maintained. With a lengthened fire return interval (>30 years) an increase in sagebrush cover occurs until mountain big sagebrush dominates resource use. This results in a decrease in cover, vigor and reproduction of the perennial bunchgrasses. Roundleaf snowberry and other woody plants will also increase in prevalence.

Fire Ecology:
Presettlement fire return intervals in mountain big sagebrush communities varied from 15-25 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.
Season of burning and environmental conditions impact antelope bitterbrush ability to survive fire and sprout. Antelope bitterbrush is very susceptible to fire kill. It is considered a weak sprouter and is often killed by summer or fall fire. Antelope bitterbrush in some areas may sprout after light-severity spring fire. High fuel consumptions increase antelope bitterbrush mortality and therefore favors seedling establishment.
Fires top-kill mountain snowberry. Although plant survival may be variable, mountain snowberry root crowns usually survive even severe fires. Mountain snowberry sprouts from basal buds at the root crown following fire.

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.

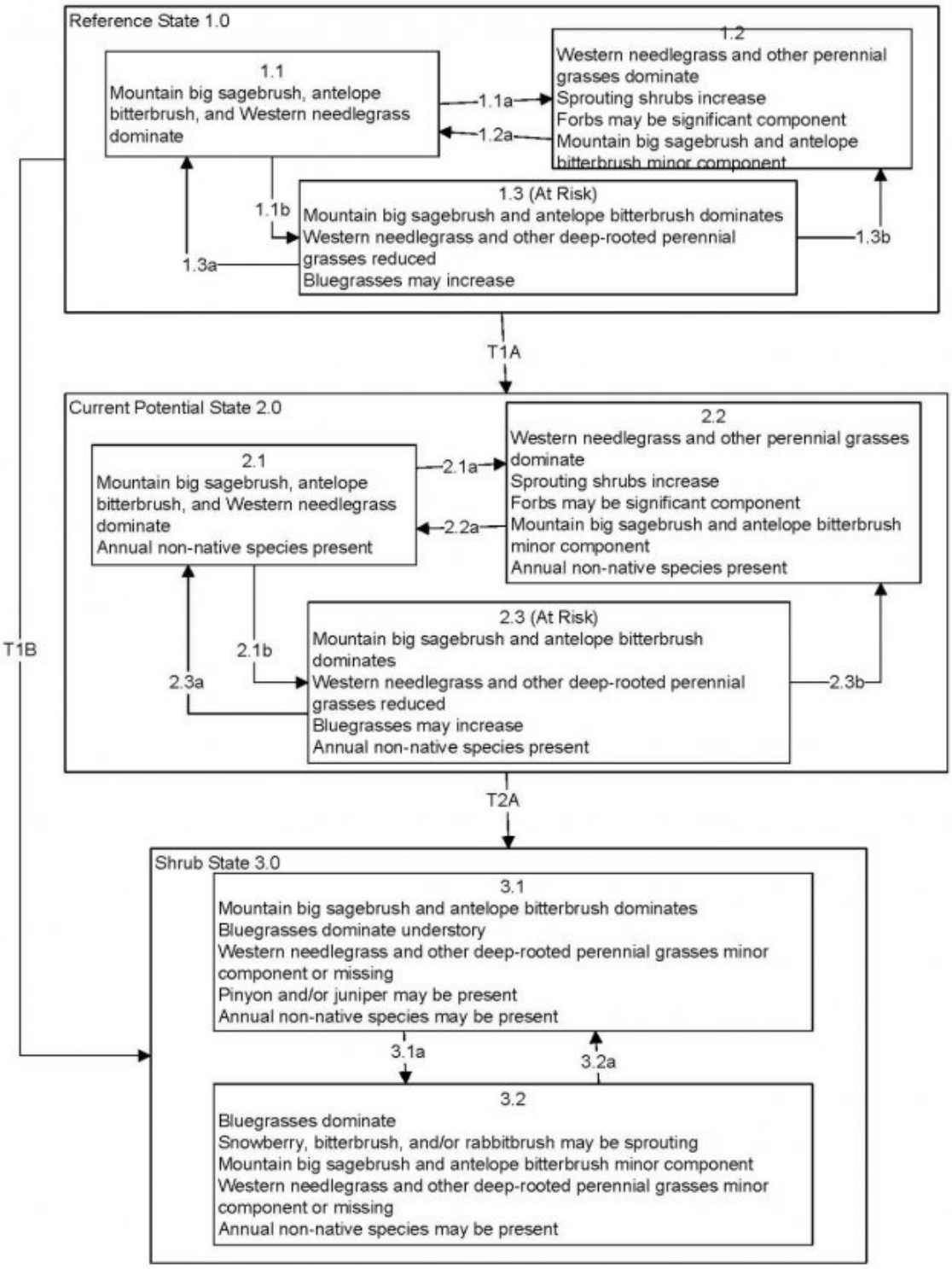
Community Phase Pathway 3.1a, from phase 3.1 to 3.2:
Fire reduces or eliminates the overstory of sagebrush.

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 South Slope 16+"
026XY110NV



MLRA 26
Group 13
Gravelly South Slope 16+"
026XY110NV
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 western needlegrass, mountain big sagebrush, and mountain snowberry. Potential vegetative composition is about 30% grasses, 10% forbs and 60% shrubs. Approximate ground cover (basal and crown) ranges from 40 to 60 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	600	720	900
Grass/Grasslike	300	360	450
Forb	100	120	150
Total	**1000**	**1200**	**1500**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			300–420	
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	300–420	–
2	**Secondary Perennial Grasses**			60–120	
	Letterman's needlegrass	ACLE9	*Achnatherum lettermanii*	6–36	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	6–36	–
	big squirreltail	ELMU3	*Elymus multisetus*	6–36	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	6–36	–
	basin wildrye	LECI4	*Leymus cinereus*	6–36	–
	spike fescue	LEKI2	*Leucopoa kingii*	6–36	–
	bluegrass	POA	*Poa*	6–36	–
Forb					
3	**Perennial**			60–150	
	rockcress	ARABI2	*Arabis*	3–24	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	3–24	–
	cryptantha	CRYPT	*Cryptantha*	3–24	–
	buckwheat	ERIOG	*Eriogonum*	3–24	–
	lupine	LUPIN	*Lupinus*	3–24	–
	phlox	PHLOX	*Phlox*	3–24	–
	vetch	VICIA	*Vicia*	3–24	–
Shrub/Vine					
4	**Primary Shrubs**			440–700	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	240–360	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	180–240	–
	roundleaf snowberry	SYRO	*Symphoricarpos rotundifolius*	24–96	–
5	**Secondary Shrubs/Subshrubs**			24–96	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–24	–
	mormon tea	EPVI	*Ephedra viridis*	6–24	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	6–24	–
	horsebrush	TETRA3	*Tetradymia*	6–24	–

Animal community

Livestock Interpretations:
This site is suited to livestock grazing. Grazing management should be keyed to perennial grass or palatable shrub production. Attentive grazing management is required due to steep slopes and erosive soil surface condition. Due to its southerly exposure, this site loses its snow cover earlier in the spring and plant growth is initiated before that of most adjacent sites. Thus, livestock may concentrate on this site during early spring grazing periods. 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. Antelope bitterbrush is important browse for cattle. Cattle prefer antelope bitterbrush from mid-May through June and again in September and October. Domestic livestock and mule deer may compete for antelope bitterbrush in late summer, fall, and/or winter. Snowberry is readily eaten by all classes of livestock, particularly domestic sheep. Western needlegrass has a spreading and deeply penetrating root system,

which makes it resistant to trampling.

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. Antelope bitterbrush is extensively used by pronghorn antelope and mule deer. Mule deer use of antelope bitterbrush peaks in September, when antelope bitterbrush may compose 91 percent of the diet. Winter use is greatest during periods of deep snow. Antelope bitterbrush seed is a large part of the diets of rodents, especially deer mice and kangaroo rats. Snowberry is an important forage species for deer and elk on high elevation summer ranges. Snowberry is frequently one of the first species to leaf out, making it a highly sought after food in the early spring. Western needlegrass is an important forage species for several wildlife species.
Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Sage-grouse prefer mountain big sagebrush and Wyoming big sagebrush communities to basin big sagebrush communities.

Hydrological functions

Runoff is very high and permeability is moderately slow.

Recreational uses

Aesthetic value is derived from the diverse floral and faunal composition. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

Native americans 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

Antelope bitterbrush has been used extensively in land reclamation. Antelope bitterbrush enhances succession by retaining soil and depositing organic material and in some habitats and with some ecotypes by fixing nitrogen. Mountain snowberry is useful for establishing cover on bare sites and has done well when planted onto roadbanks.

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)	
Contact for lead author	
Date	05/11/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**