USDA Natural Resources Conservation Service

Ecological site R026XY011NV
SOUTH SLOPE 8-12 P.Z.

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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): 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 Influenced Ranges LRU receives greater precipitation that the mountain ranges of central Nevada. Amount of precipitation varies in relation to the local strength of the Sierra Nevada 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 southerly-facing sideslopes of mountains, hills, rock pediments, and fan piedmonts. Soil profiles are modified with high volumes of rock fragments.

Associated sites

R026XY023NV	**CLAYPAN 10-12 P.Z.**

Similar sites

R026XY022NV	**STONY SLOPE 8-10 P.Z.** SADOD3 rarely occurs on site; less productive site
R026XY016NV	**LOAMY 8-10 P.Z.** SADOD3 and EPVI minor species on site; slopes typically less than 30%
R026XY033NV	**SANDY CLAYPAN 8-10 P.Z.** PUTR2 codominant shrub
R026XY015NV	**SHALLOW LOAM 10-12 P.Z.** ACTH7 & ACSP12 codominant
R026XY018NV	**GRANITIC SOUTH SLOPE 10-12 P.Z.** soils derived form granitic parent materials
R026XY029NV	**ERODED SLOPE 10-12 P.Z.** less productive site
R026XY017NV	**LOAMY HILL 10-12 P.Z.** JUOS dominates visual aspect of site
R026XY010NV	**LOAMY 10-12 P.Z.** more productive site; SADOD3 and EPVI minor species on site; slopes typically less than 30%

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Ephedra viridis*
Herbaceous	(1) *Achnatherum speciosum*

Physiographic features

This site occurs on southerly-facing sideslopes of mountains, hills, rock pediments, and fan piedmonts. Slopes range from 4 to 75 percent, but slope gradients of 15 to 50 percent are most typical. Elevations are 4400 to 7500 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill (3) Pediment
Runoff class	High to very high
Elevation	4,400–7,500 ft
Slope	4–75%
Aspect	SE, S, SW

Climatic features

The climate associated with this site is arid, characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 12 inches. Mean annual air temperature is 43 to 52 degrees F. The average growing season is about 80 to 130 days.

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)	8-12 in
Frost-free period (average)	105 days
Freeze-free period (average)	
Precipitation total (average)	10 in

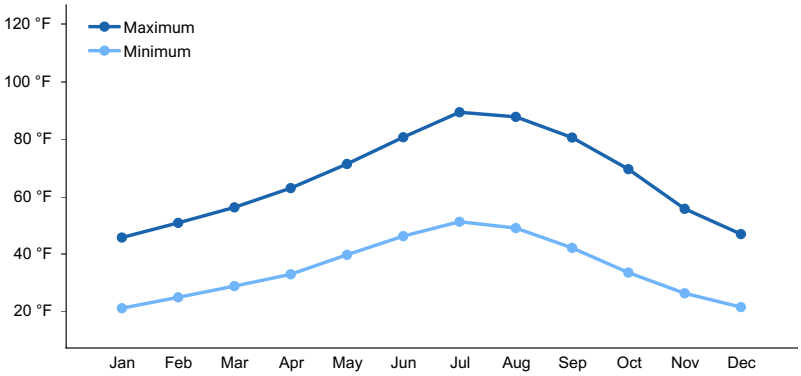


Figure 1. Monthly average minimum and maximum temperature

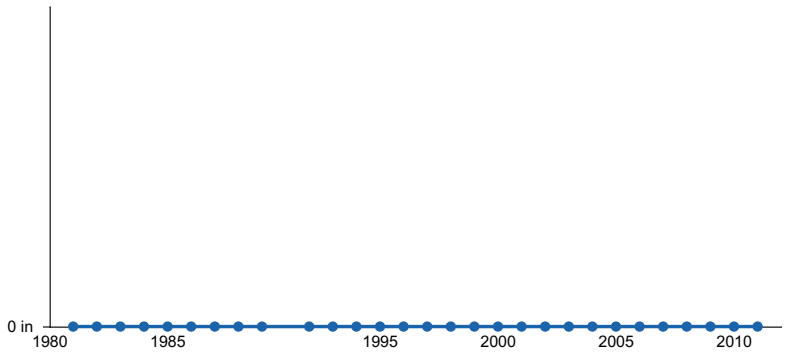


Figure 2. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils are typically shallow to soft bedrock and well drained. The available water capacity is low to very low. Soil profiles are modified with high volumes of rock fragments. These soil factors, in addition to high temperature resulting from the southerly exposure, limit the productivity and diversity of native plants on the site. Soil series associated with this site include: Chill, Flex, and Yuko.

Table 4. Representative soil features

Parent material	(1) Residuum–volcanic rock (2) Residuum–granite
Surface texture	(1) Very gravelly sandy loam (2) Stony loam (3) Gravelly sandy loam
Family particle size	(1) Loamy (2) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate to moderately slow
Soil depth	6–14 in
Surface fragment cover <=3"	9–33%
Surface fragment cover >3"	0–8%
Available water capacity (0-40in)	0.6–1.5 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)	6.1–7.8
Subsurface fragment volume <=3" (Depth not specified)	9–41%
Subsurface fragment volume >3" (Depth not specified)	0–4%

Ecological dynamics

Where management results in over use by livestock and/or feral horses, Wyoming big sagebrush, Douglas' rabbitbrush, Anderson's peachbrush increase, while desert needlegrass and Indian ricegrass decrease. Cheatgrass and annual forbs are the species most likely to invade this site. Utah juniper readily increases on this site where it occurs adjacent to this woodland type.

Fire Ecology:
The fire return interval for Wyoming big sagebrush communities ranges from 10 to 70 years. Fire is the principal means of renewal for decadent stands of Wyoming big sagebrush. Wyoming big sagebrush is killed by fire and establishes after fire from a seedbank; from seed produced by remnant plants that escaped fire; and from plants adjacent to the burn that seed in. Green ephedra generally sprouts vigorously from the roots or woody root crown after fire and rapidly produces aboveground biomass from surviving meristematic tissue.
Purple sage has a high tolerance to fire and will respout following fire. Needlegrasses are damaged by burning due to the dense plant material that can burn slowly and long, charring to the growing points. Late summer and early fall fires are the least harmful. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Bottlebrush squirreltail's small size, coarse stems, and sparse leafy material aid in its tolerance of fire. Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources. Frequency of disturbance greatly influences postfire response of bottlebrush squirreltail. Undisturbed plants within a 6 to 9 year age class generally contain large amounts of dead material, increasing bottlebrush squirreltail's susceptibility to fire. Bluegrass is generally unharmed by fire. It produces little litter, and its small bunch size and sparse litter reduces the amount of heat transferred to perennating buds in the soil. Its rapid maturation in the spring also reduces fire damage, since it is dormant when most fires occur.

Description of MRLA 26 Disturbance Response Group 7

Disturbance Response Group (DRG) 7 consists of four ecological sites (Stringham et al. 2021). The precipitation zone for these sites ranges from 6 to 12 inches. The elevation range for this group is 4,400 to 7,200 feet. Slopes range from 2 to 75 percent; however, 2 to 50 percent are typical. The soils on these sites range from shallow to deep but are typically moderately deep and well drained. Available water holding capacity for these sites is low. Many of these sites exhibit a high volume of rock fragments which help to increase infiltration but can take up plant growing space. These sites are dominated by an overstory of Wyoming big sagebrush (*Artemisia tridentata* ssp. wyomingensis) and an understory of Thurber’s needlegrass (*Achnatherum thurberianum*) or desert needlegrass (*Achnatherum speciosum*). Green ephedra (*Ephedra viridis*) and Indian ricegrass (*Achnatherum hymenoides*) are also common on these sites. Average annual production for a normal year ranges from 450-800 lbs/ac.

Disturbance Response Group 7 Ecological Sites

Loamy 8-10" – Modal Site R026XY016NV
Stony Slope 8-10" R026XY022NV
Droughty Loam 8-10" R026XY024NV
South Slope 8-10” R026XY011NV

Potential Resilience Differences with other Ecological Sites:

South Slope 8-10 (R026XY011NV):
This site occurs on southerly-facing sideslopes of mountains, hills, plateaus, rock pediments and fan piedmonts with slopes that range from 30 to 75 percent. Elevations are higher than the modal site at 6000 to 7200 feet and average annual precipitation of 8 to 12 inches. The vegetation community is similar to the modal site but with desert needlegrass as the dominant grass species. The production is higher than the modal site with 800 lbs/ac in a normal year. The soils of this site a typically shallow to soft bedrock and well drained. The available water capacity is low. In addition to the high temperature of a southerly exposure, the soil factors limit productivity and diversity of native plants on this site.

This is a general text description of the states, phases, transitions, and community pathways possible in the State and Transition model for the MLRA 26 Disturbance Response Group 7.

Reference State 1.0: The Reference State 1.0 is a representative of 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, low 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: Wyoming big sagebrush and Thurber’s needlegrass dominate the site. Ephedra, Indian ricegrass and bottlebrush squirreltail (*Elymus elymoides*) are also common. Utah juniper is described in the site concept and may be present in minor amounts.

Community Phase Pathway 1.1a, from Phase 1.1 to 1.2: Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

Community Phase Pathway 1.1b, from Phase 1.1 to 1.3: Long-term drought, time and/or herbivory favor an increase in Wyoming big sagebrush over deep-rooted perennial bunchgrasses. Combinations of these would allow the sagebrush overstory to increase and dominate the site, causing a reduction in the perennial bunchgrasses. Bottlebrush squirreltail may increase in density depending on the grazing management.

Community Phase 1.2: This community phase is characteristic of a post-disturbance, early to mid-seral community phase. Thurber’s needlegrass can experience high mortality from fire and may be reduced in the community for several years. With low fire severity, Thurber’s needlegrass may dominate the site post-fire. Ephedra, desert peach, spiny hopsage, Indian ricegrass and other perennial grasses are common. Wyoming big sagebrush is killed by fire, therefore decreasing within the burned community. Sagebrush could still be present in unburned patches.

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

Community Phase 1.3: Wyoming big sagebrush increases in the absence of disturbance. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs or from herbivory. Bottlebrush squirreltail will likely increase in the understory and may be the dominant grass on the site.

Community Phase Pathway 1.3a, from Phase 1.3 to 1.1: Aroga moth infestation and/or release from growing season herbivory may reduce sagebrush dominance and allow recovery of the perennial bunchgrass understory.

Community Phase Pathway 1.3b, from Phase 1.3 to 1.2: Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and

reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

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, Russian thistle (Salsola iberica), medusahead, or stork's bill (Erodium spp.) dominate the understory.
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.

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, low 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: Wyoming big sagebrush and Thurber's needlegrass dominate the site. Ephedra, Indian ricegrass and bottlebrush squirreltail are also common on this site. Utah juniper may be present. Non-native annual species are present in minor amounts.

Community Phase Pathway 2.1a, from Phase 2.1 to 2.2: Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs. Annual non-native species generally respond well after fire and may be stable or increasing within the community.

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 would allow the sagebrush overstory to increase and dominate the site, causing a reduction in the perennial bunchgrasses. However, Sandberg bluegrass and/or squirreltail may increase in the understory depending on the grazing management. Heavy spring grazing will favor an increase in sagebrush. Annual non-native species may be stable or increasing within the understory.

Community Phase 2.2: This community phase is characteristic of a post-disturbance, early seral community phase. Thurber's needlegrass, Indian ricegrass, and other perennial bunchgrasses dominate the site. Sprouting shrubs such as rabbitbrush, ephedra, desert peach, and spiny hopsage may increase. Wyoming big sagebrush is killed by fire, therefore decreasing within the burned community. Sagebrush could still be present in unburned patches. Perennial forbs may increase or dominate after fire for several years. Thurber's needlegrass can experience high mortality from fire and may be reduced in the community for several years. Annual non-native species generally respond well after fire and maybe stable or increasing within the community. Rabbitbrush may dominate the aspect for a number of years following wildfire.

Community Phase Pathway 2.2a, from Phase 2.2 to 2.1: Absence of disturbance over time allows for the sagebrush to recover may be combined with grazing management that favors shrubs.

Community Phase Pathway 2.2a, from Phase 2.2 to 2.4: Higher than normal spring precipitation favors annual non-native species such as cheatgrass. Non-native annual species will increase in production and density throughout the site. Perennial bunchgrasses may also increase in production.

Community Phase 2.3: Wyoming big sagebrush increases and the perennial understory is reduced. Decadent sagebrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced

either from competition with shrubs or from inappropriate grazing management. Bottlebrush squirreltail will likely increase in the understory and may be the dominant grass on the site. Utah juniper may be present. Annual non-native species present.

Community Phase Pathway 2.3a, from Phase 2.3 to 2.1: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Other disturbances/practices include brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.

Community Phase Pathway 2.3b, from Phase 2.3 to 2.2: Fire would decrease or eliminate the overstory of sagebrush and allow for the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

Community Phase Pathway 2.3c, from Phase 2.3 to 2.4: Fall, winter, and spring precipitation and temperatures mediate the ability for annual grasses and perennial grasses to germinate and/or survive. Higher than normal spring precipitation creates high annual production of annual grasses (Bradley et al. 2016). Non-native annual species increase in production and density throughout the site. Perennial bunchgrasses may also increase in production.

Community Phase 2.4: This community is at risk of crossing into an annual state. Native bunchgrasses dominate; however, annual non-native species such as cheatgrass may be sub or co-dominant in the understory. Annual production and abundance of these annuals may increase drastically in years with heavy spring precipitation. Seeded species may be present. Sagebrush may be present if coming from phase 2.3. This site is susceptible to further degradation from grazing, drought, and fire.

Community Phase Pathway 2.4a, from Phase 2.4 to 2.2: Fall, winter, and spring precipitation and temperatures mediate the ability for annual grasses and perennial grasses to germinate and/or survive. Depending on temperatures and precipitation in winter and spring, annual grass production may be reduced in favor of perennial bunchgrasses.

Community Phase Pathway 2.4b, from Phase 2.4 to 2.3: Rainfall patterns favoring perennial bunchgrasses. Less than normal spring precipitation followed by higher than normal summer precipitation will increase perennial bunchgrass production.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0:
Trigger: Inappropriate, long-term grazing of perennial bunchgrasses during 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 redistribution and reduces soil organic matter.

T2B: Transition from Current Potential State 2.0 to Annual State 4.0:
Trigger: Fire or a failed range seeding leads to plant community phase 4.1. Inappropriate grazing management that favors shrubs in the presence of non-native annual species leads to community phase 4.2.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Cheatgrass or other non-native annuals dominate understory.

Shrub State 3.0: This state has two community phases; a Wyoming big sagebrush dominated phase and a bottlebrush squirreltail dominated phase. This state is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Bottlebrush squirreltail 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 bottlebrush squirreltail 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: Wyoming big sagebrush dominates the overstory. Bottlebrush squirreltail dominates the

understory. Utah juniper may be present or increasing. Annual non-native species may be present. Understory may be sparse, with bare ground increasing. Pinyon and/or juniper may be present or increasing.

Community Phase Pathway 3.1a, from Phase 3.1 to 3.2: Fire would decrease or eliminate the overstory of sagebrush. A severe infestation of Aroga moth could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the bottlebrush squirreltail, forbs and sprouting shrubs. Heavy fall grazing causing mechanical damage to shrubs, and/or brush treatments with minimal soil disturbance, would greatly reduce the overstory shrubs and allow for Sandberg bluegrass to dominate the site.

Community Phase 3.2: Bottlebrush squirreltail dominates the understory; annual non-natives are present but are not dominant. Trace amounts of sagebrush may be present. Sprouting shrubs may dominate for a number of years following fire.

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

T3A: Transition from Shrub State 3.0 to Annual State 4.0:
Trigger: Fire or inappropriate grazing management can eliminate the bottlebrush squirreltail understory and transition to community phase 4.1 or 4.2.
Slow variable: Increased seed production and cover of annual non-native species.
Threshold: Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and sagebrush truncate energy capture and impact the nutrient cycling and distribution.

T3B: Transition from Shrub State 3.0 to Tree State 5.0:
Trigger: Lack of fire allows for trees to dominate site; may be coupled with inappropriate grazing management that reduces fine fuels.
Slow variables: Increased establishment and cover of juniper trees, reduction in organic matter inputs.
Threshold: Trees overtop Wyoming big sagebrush and out-compete shrubs for water and sunlight. Shrub skeletons exceed live shrubs with minimal recruitment of new cohorts.R3A: Restoration from Shrub State 3.0 to Seeded State 5.0: Brush management, herbicide, and seeding of crested wheatgrass (*Agropyron cristatum*) and/or other desired species.

Annual State 4.0: This state has two community phases; one dominated by annual non-native species and the other is a shrub dominated state. This state is characterized by the dominance of annual non-native species such as cheatgrass, Russian thistle, medusahead, and/or stork’s bill (Erodium spp.) in the understory. Sagebrush and/or rabbitbrush may dominate the overstory.

Community Phase 4.1: Annual non-native plants dominate the site. This phase may have seeded species present if resulting from a failed seeding attempt.

Community Phase Pathway 4.1a, from Phase 4.1 to 4.2: Time and lack of disturbance allows for shrubs to reestablish. Sprouting shrubs such as ephedra, desert peach and rabbitbrush will be the first to reappear after fire. Probability of sagebrush establishment is extremely low.

Community Phase 4.2: Wyoming big sagebrush remains in the overstory with annual non-native species dominating the understory. Trace amounts of desirable bunchgrasses may be present.

Community Phase Pathway 4.2a, from Phase 4.2 to 4.1: Fire allows for annual non-native species to dominate site.

Tree State 5.0: This state has two community phases that are characterized by the dominance of Utah juniper and/or singleleaf pinyon in the overstory. Wyoming big sagebrush and perennial bunchgrasses may still be present, but they are no longer controlling site resources. Soil moisture, soil nutrients, soil organic matter distribution and nutrient cycling have been spatially and temporally altered.

Community Phase 5.1: Utah juniper and/or singleleaf pinyon dominate overstory, sagebrush is decadent and dying, and cover of deep-rooted perennial bunchgrasses is decreasing. Recruitment of sagebrush cohorts is minimal. Annual non-natives may be present or increasing.

Community Phase Pathway 5.1a, from Phase 5.1 to 5.2: Absence of disturbance over time allows for tree cover and density to further increase and out-compete the herbaceous understory species.

Community Phase 5.2: Utah juniper and/or singleleaf pinyon dominates the site and tree leader growth is minimal; annual non-native species may be the dominant understory species and will typically be found under the tree canopies. Trace amounts of sagebrush may be present however dead skeletons will be more numerous than living sagebrush. Bunchgrasses may or may not be present. Bottlebrush squirreltail or mat forming forbs may be present in trace amounts. Bare ground interspaces are large and connected. Soil redistribution is evident.

Community Phase Pathway 5.2a, from Phase 5.2 to 5.1: Manual or mechanical thinning of trees allows understory regrowth due to less competition for resources. This treatment is typically done for fuel management.

T5A: Transition from Tree State 5.0 to Annual State 4.0:
Trigger: Catastrophic crown fire would reduce or eliminate trees to transition the site to 4.1. Tree removal when annual non-natives such as cheatgrass are present would also transition the site to state 4.0.
Slow variable: Increased seed production and cover of annual non-native species.
Threshold: Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and sagebrush truncate energy capture and impact the nutrient cycling and distribution.

R5A: Restoration from Tree State 5.0 to Shrub State 3.0: Tree removal or fire when bottlebrush squirreltail is dominant in the understory will transition to community phase 3.2.

R5B: Restoration from Tree State 5.0 to Seeded State 6.0: Tree removal and seeding of desired species. Tree removal practices that minimize soil disturbance are recommended. Probability of success declines with increased presence of nonnative annual species.

Seeded State 6.0: This state has two community phases: a grass-dominated phase, and a shrub-dominated phase. This state is characterized by the dominance of seeded introduced wheatgrass species in the understory. Forage kochia (*Bassia prostrata*) and other desired seeded species including Wyoming big sagebrush, native and non-native forbs may be present.

Community Phase 6.1: Seeded wheatgrass and/or other seeded species dominate the community. Non-native annual species are present. Trace amounts of Wyoming big sagebrush may be present, especially if seeded.

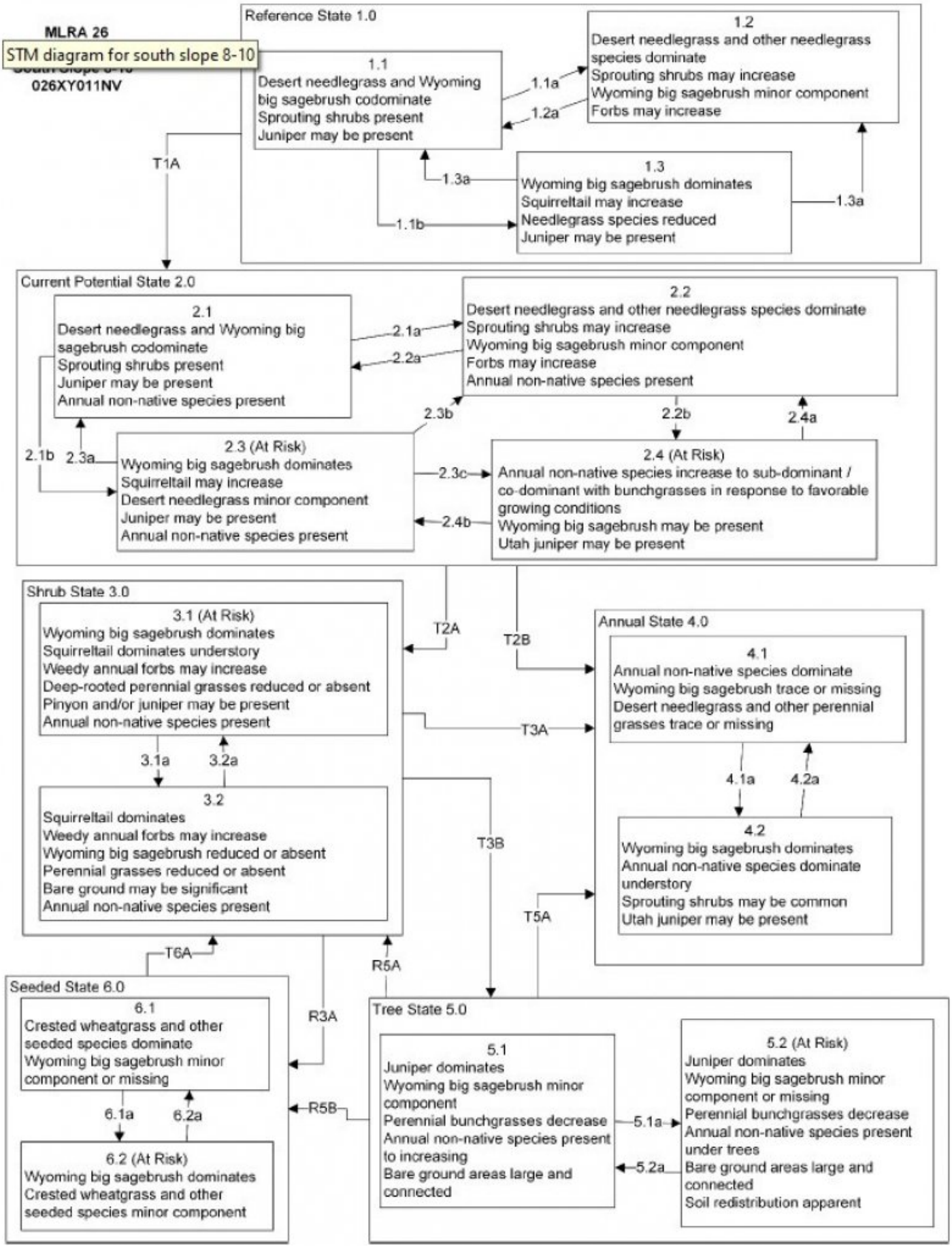
Community Phase Pathway 6.1a, from Phase 6.1 to 6.2: Time and lack of disturbance allow shrubs to increase. Pathway may be coupled with inappropriate grazing management.

Community Phase 6.2: Wyoming big sagebrush increases and becomes dominant in the overstory. Seeded wheatgrass species dominate understory. Annual non-native species may be present in trace amounts.

Community Phase Pathway 6.2a, from Phase 6.2 to 6.1: Fire, brush management and/or Aroga moth infestation reduces sagebrush overstory and allows for seeded wheatgrasses or other seeded grasses to increase.

T6A: Transition from Seeded State 6.0 Shrub State 3.0:
Trigger: Inappropriate, long-term grazing of perennial bunchgrasses during 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.

State and transition model


MLRA 26
STM diagram for south slope 8-10
026XY011NV
Reference State 1.0
1.1
Desert needlegrass and Wyoming big sagebrush codominate
Sprouting shrubs present
Juniper may be present
1.2
Desert needlegrass and other needlegrass species dominate
Sprouting shrubs may increase
Wyoming big sagebrush minor component
Forbs may increase
1.3
Wyoming big sagebrush dominates
Squirreltail may increase
Needlegrass species reduced
Juniper may be present
1.1a
1.2a
1.3a
1.1b
1.3a
T1A
Current Potential State 2.0
2.1
Desert needlegrass and Wyoming big sagebrush codominate
Sprouting shrubs present
Juniper may be present
Annual non-native species present
2.2
Desert needlegrass and other needlegrass species dominate
Sprouting shrubs may increase
Wyoming big sagebrush minor component
Forbs may increase
Annual non-native species present
2.1a
2.2a
2.3b
2.2b
2.4a
2.1b
2.3a
2.3 (At Risk)
Wyoming big sagebrush dominates
Squirreltail may increase
Desert needlegrass minor component
Juniper may be present
Annual non-native species present
2.3c
2.4b
2.4 (At Risk)
Annual non-native species increase to sub-dominant / co-dominant with bunchgrasses in response to favorable growing conditions
Wyoming big sagebrush may be present
Utah juniper may be present
Shrub State 3.0
3.1 (At Risk)
Wyoming big sagebrush dominates
Squirreltail dominates understory
Weedy annual forbs may increase
Deep-rooted perennial grasses reduced or absent
Pinyon and/or juniper may be present
Annual non-native species present
T2A
T2B
3.1a
3.2a
3.2
Squirreltail dominates
Weedy annual forbs may increase
Wyoming big sagebrush reduced or absent
Perennial grasses reduced or absent
Bare ground may be significant
Annual non-native species present
Annual State 4.0
4.1
Annual non-native species dominate
Wyoming big sagebrush trace or missing
Desert needlegrass and other perennial grasses trace or missing
T3A
4.1a
4.2a
4.2
Wyoming big sagebrush dominates
Annual non-native species dominate understory
Sprouting shrubs may be common
Utah juniper may be present
T3B
T5A
T6A
R5A
Seeded State 6.0
6.1
Crested wheatgrass and other seeded species dominate
Wyoming big sagebrush minor component or missing
R3A
6.1a
6.2a
R5B
6.2 (At Risk)
Wyoming big sagebrush dominates
Crested wheatgrass and other seeded species minor component
Tree State 5.0
5.1
Juniper dominates
Wyoming big sagebrush minor component
Perennial bunchgrasses decrease
Annual non-native species present to increasing
Bare ground areas large and connected
5.1a
5.2a
5.2 (At Risk)
Juniper dominates
Wyoming big sagebrush minor component or missing
Perennial bunchgrasses decrease
Annual non-native species present under trees
Bare ground areas large and connected
Soil redistribution apparent

South Slope 8-10"
026XY011NV
KEY

Reference State 1.0 Community Phase Pathways
1.1a: 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. Excessive herbivory and/or long-term drought may also reduce perennial understory.
1.2a: Time and lack of disturbance and/or herbivory that allows for shrub regeneration.
1.3a: High severity fire and/or severe Aroga moth infestation significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native annual species.

Current Potential State 2.0 Community Phase Pathways
2.1a: Low severity fire and/or Aroga moth infestation creates grass/sagebrush mosaic; non-native annual species present.
2.1b: Time and lack of disturbance such as fire. Inappropriate grazing and/or drought will reduce perennial bunchgrasses.
2.2a: Time and lack of disturbance allows for regeneration of sagebrush.
2.2b: Fall and spring growing conditions that favors the germination and production of non-native, annual grasses. Pathway typically occurs 3 to 5 years post-fire and 2.4 may be a transitory plant community.
2.3a: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Brush management (aerial herbicide application), late-fall/winter grazing causing mechanical damage to sagebrush.
2.3b: High severity fire and/or severe Aroga moth infestation significantly reduces sagebrush cover leading to early mid-seral community.
2.3c: Fall and spring growing season conditions that favors the germination and production of non-native annual grasses. 2.4 may be a transitory plant community.
2.4a: Growing season conditions favoring perennial bunchgrass production and reduced cheatgrass production.
2.4b: Growing season conditions favoring perennial bunchgrass production and reduced cheatgrass production.

Transition T2A: Inappropriate grazing management (to 3.1), or high severity fire (to 3.2).
Transition T2B: Fire or brush management causing severe soil disturbance. Annuals like cheatgrass can become dominant under an existing shrub canopy (to 4.2).

Shrub State 3.0 Community Phase Pathways
3.1a: High severity fire; brush management with minimal soil disturbance.
3.2a: Time and lack of disturbance (may take many years).

Transition T3A: Catastrophic fire and/or treatments that disturb the existing plant community (to 4.1). Annuals like cheatgrass can become dominant under an existing shrub canopy (to 4.2).
Transition T3B: Time and lack of disturbance allows maturation of the tree community.

Restoration R3A: Brush management combined with seeding of desired species.

Annual State 4.0 Community Phase Pathways
4.1a: Time and lack of disturbance to allow sagebrush to increase (pathway unlikely).
4.2a: Fire.

Tree State 5.0 Community Phase Pathways
5.1a: Time and lack of disturbance allows for maturation of tree community.
5.2a: Tree thinning treatment (typically for fuels management).

Transition T5A: Catastrophic fire.

Restoration R5A: Tree removal with no seeding from Phase 5.1.
Restoration R5B: Tree removal with minimal soil disturbance with native grasses present and seeding of wheatgrass species.

Seeded State 6.0 Community Phase Pathways
6.1a: Time and lack of disturbance.
6.2a: Fire and/or brush management.

Transition T6A: Inappropriate grazing management favoring shrub dominance and reducing perennial bunchgrasses will lead to phase 3.1. Soil disturbing treatments and/or fire will lead to phase 3.2.

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Wyoming big sagebrush and desert needlegrass. Green ephedra and purple sage are important shrubs. Potential vegetative composition is about 60% grasses, 10% forbs and 30% shrubs. Approximate ground cover (basal and crown) is 25 to 35 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	360	480	600
Shrub/Vine	168	224	280
Forb	60	80	100
Tree	12	16	20
Total	**600**	**800**	**1000**

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**			343–560	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	280–420	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	35–70	–
	squirreltail	ELEL5	*Elymus elymoides*	14–35	–
	bluegrass	POA	*Poa*	14–35	–
2	**Secondary Perennial Grasses**			35–70	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	4–24	–
	needle and thread	HECO26	*Hesperostipa comata*	4–24	–
	basin wildrye	LECI4	*Leymus cinereus*	4–24	–
Forb					
3	**Perennial**			16–80	
	milkvetch	ASTRA	*Astragalus*	4–24	–
	buckwheat	ERIOG	*Eriogonum*	4–24	–
	lupine	LUPIN	*Lupinus*	4–24	–
	beardtongue	PENST	*Penstemon*	4–24	–
	phlox	PHLOX	*Phlox*	4–24	–
Shrub/Vine					
4	**Primary Shrubs**			105–280	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	70–140	–
	mormon tea	EPVI	*Ephedra viridis*	35–70	–
	purple sage	SADOD3	*Salvia dorrii ssp. dorrii var. dorrii*	0–70	–
5	**Secondary Shrubs**			14–56	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4–24	–
	spiny hopsage	GRSP	*Grayia spinosa*	4–24	–
	desert peach	PRAN2	*Prunus andersonii*	4–24	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	4–24	–
	currant	RIBES	*Ribes*	4–24	–
	horsebrush	TETRA3	*Tetradymia*	4–24	–
Tree					
6	**Evergreen**			4–24	
	spiny hopsage	GRSP	*Grayia spinosa*	4–24	–
	Utah juniper	JUOS	*Juniperus osteosperma*	4–24	–

Animal community

Livestock Interpretations:
This site has limited use for livestock grazing due to steep slopes. 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.
Grazing management should be keyed to desert needlegrass, Indian ricegrass, bottlebrush squirreltail, and bluegrass production. Desert needlegrass produces considerable basal foliage and is good forage while young. Young desert needlegrass is palatable to all classes of livestock. Mature herbage is moderately grazed by horses

and cattle but rarely grazed by sheep. Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have produced much new growth. Bottlebrush squirreltail is very palatable winter forage for domestic sheep of Intermountain ranges. Domestic sheep relish the green foliage. Overall, bottlebrush squirreltail is considered moderately palatable to livestock. Bluegrass is a widespread forage grass. It is one of the earliest grasses in the spring and is sought by domestic livestock and several wildlife species. Bluegrass is a palatable species, but its production is closely tied to weather conditions. It produces little forage in drought years, making it a less dependable food source than other perennial bunchgrasses.
Livestock browse Wyoming big sagebrush, but may use it only lightly when palatable herbaceous species are available. Green ephedra is heavily browsed by livestock on winter range but only moderately or lightly browsed during other seasons. Purple sage has low to medium palatability for livestock.

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:
Wyoming big sagebrush is preferred browse for wild ungulates. Pronghorn usually browse Wyoming big sagebrush heavily. 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.
Green ephedra is an important browse species for big game animals. Green ephedra is heavily used by wildlife on winter ranges. Purple sage has low to medium palatability for big game. Desert needlegrass is palatable to wildlife and is grazed during the spring.
Indian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn. Bluegrass is also an important forage species for several wildlife species.

Hydrological functions

Runoff is high to very high. Permeability is moderate to moderately slow. Rills may be common, particularly on steeper slopes.
Water flow patterns are few but can be expected on steeper slopes in areas recently subjected to summer convection storms or rapid snowmelt. Pedestals are 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 non-existent in areas of this site that occur on stable landforms. Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., desert needlegrass] 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

This site has limited potential for deer and game bird hunting. The steep slopes limit accessibility to off-road vehicle use.

Wood products

This site is susceptible to encroachment by pinyon-juniper to the extent that harvesting of Christmas trees, firewood, fence posts and other wood products could be considered.

Other products

Native Americans made tea from big sagebrush leaves. They used the tea as a tonic, an antiseptic, for treating

colds, diarrhea, and sore eyes and as a rinse to ward off ticks. Big sagebrush seeds were eaten raw or made into meal. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

Wyoming big sagebrush is used for stabilizing slopes and gullies and for restoring degraded wildlife habitat, rangelands, mine spoils and other disturbed sites. It is particularly recommended on dry upland sites where other shrubs are difficult to establish. Green ephedra is listed as a successful shrub for restoring western rangeland communities and can be used to rehabilitate disturbed lands. It also has value for reducing soil erosion on both clay and sandy soils. Green ephedra establishes readily through direct seeding, transplants, and stem cuttings. Desert needlegrass seeds are easily germinated and have potential for commercial use. Desert needlegrass may be used for groundcover in areas of light disturbance, but it is susceptible to excessive trampling. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Inventory data references

NASIS data for soil survey areas CA614, CA686, CA729, NV603, NV625, NV628, NV629, NV772, and NV773.

Type locality

Location 1: Carson City County, NV	
General legal description	This site also occurs in Douglas, Lyon, Mineral, Storey and Washoe counties, Nevada.

References

Stringham, T.K., D. Snyder, P. Novak-Echenique, K. O'Neill, A. Lyons, and M. Johns. 2021. Great Basin Ecological Site Development Project: State-and-Transition Models for Major Land Resource Area 26, Nevada and Portions of California..

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)	GK BRACKLEY

Contact for lead author	State Rangeland Management Specialist
Date	02/21/2007
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills may be common, particularly on steeper slopes.

2. **Presence of water flow patterns:** Water flow patterns are few but can be expected on steeper slopes in areas recently subjected to summer convection storms or rapid snowmelt.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ±40%; surface rock fragments 15 to 35%; shrub canopy 20 to 30%; foliar cover of perennial herbaceous plants ± 45%.

5. **Number of gullies and erosion associated with gullies:** Gullies are non-existent in areas of this site that occur on stable landforms.

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

7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) is expected to move the 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.

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.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically thin to thick platy, subangular blocky, or granular. Soil surface colors are light and the soils are typified by an ochric epipedon. Organic carbon of the surface 2 to 3 inches is typically 1 to 1.5 percent dropping off quickly below.

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., desert needlegrass] 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. Platy or massive sub-surface horizons or subsoil argillic horizons shallow to the surface 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: Reference Plant Community: Deep-rooted, cool season, perennial bunchgrasses >> tall shrubs (Wyoming big sagebrush) >> associated mid- to low-shrubs. (By above ground production)

    Sub-dominant: Deep-rooted, cool season, perennial forbs > Shallow-rooted, cool season, perennial grasses > fibrous, shallow-rooted, cool season, perennial and annual forbs. (By above ground production)

    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 are common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<25%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (±15%) and litter depth is ±¼ 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 mid-June) ± 800 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:** Douglas rabbitbrush and Anderson""s peachbrush are increasers. Cheatgrass, snakeweed, Russian thistle, annual mustards, and Utah juniper are invaders.

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17. **Perennial plant reproductive capability:** All functional groups should reproduce in average (or normal) and above average growing season years.
