USDA Natural Resources Conservation Service

Ecological site R026XF005CA
Deep Ashy 10-12" 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 Mono-Adobe-Long Valleys LRU is comprised of the basins surrounding Mono Lake, Adobe Valley, and Long Valley to the southeast. Pleistocene and Holocene age alluvium and lacustrine deposits predominate. Ash layers occur from eruptions of the numerous volcanic domes that are mostly in adjacent LRUs. Soil temperature regimes are mesic and soil moisture regimes are aridic. Elevations range from 1310 to 2680 meters and slopes are typically less than 10 percent, however there are some ecological sites within the Mono-Adobe-Long Valleys LRU that are greater than 10 percent. Frost free days (FFD) range from 97-125.

Ecological site concept

The Deep Ashy 10-12" P.Z. site occurs on interdune areas on valley floors and lake terraces. Slopes range from 2 to 8 percent. The soils are mollisols, deep, and excessively drained with a gravelly coarse sand surface texture. The dominant plants are basin big sagebrush (*Artemisia tridentata* ssp. tridentata), antelope bitterbrush (*Purshia tridentata*), and Indian ricegrass (*Achnatherum hymenoides*).

Associated sites

R026XF006CA	**Dry Floodplain** Site occurs flood plains or stream terraces.

Similar sites

R026XF004CA	**Gravelly Coarse Loamy 8-12" P.Z.** Typicallyd found on finer texture soil.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on interdune areas on valley floors and lake terraces. Slopes range from 2 to 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Valley floor (2) Lake terrace
Runoff class	Negligible
Elevation	5,300–7,600 ft
Slope	2–8%
Aspect	Aspect is not a significant factor

Climatic features

The climate on this site is subhumid-continental, characterized by cold, moist winters, and cool dry summers. Average annual precipitation is 8 to 12 inches.

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)	108 days
Freeze-free period (average)	135 days
Precipitation total (average)	10 in

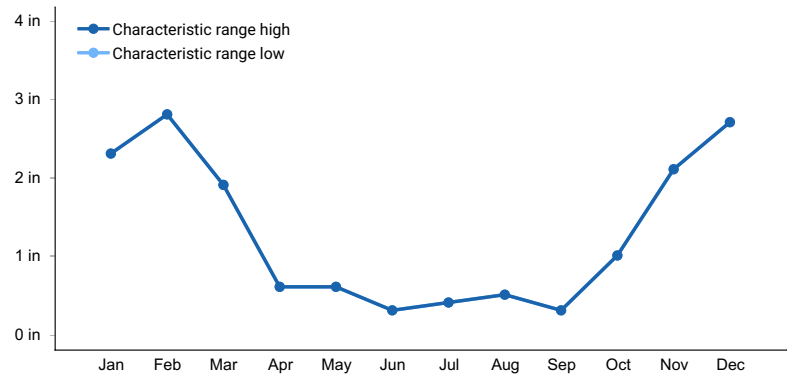


Figure 1. Monthly precipitation range

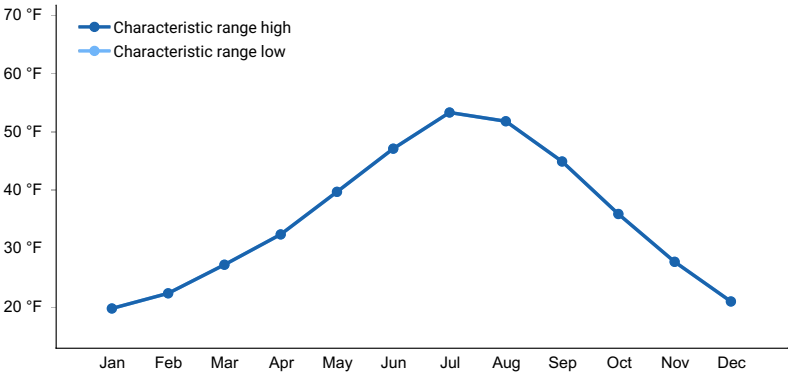


Figure 2. Monthly minimum temperature range

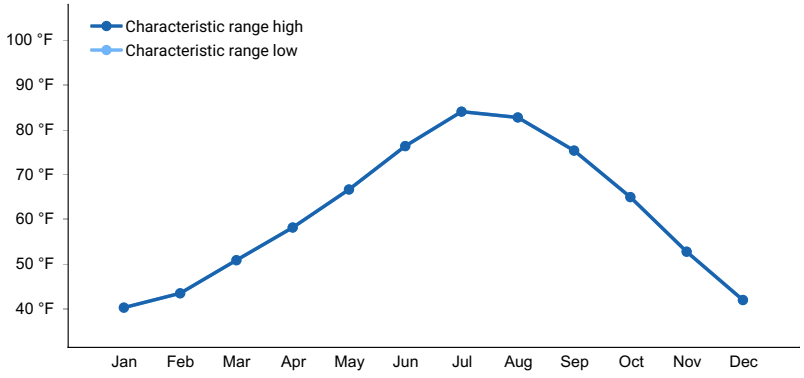


Figure 3. Monthly maximum temperature range

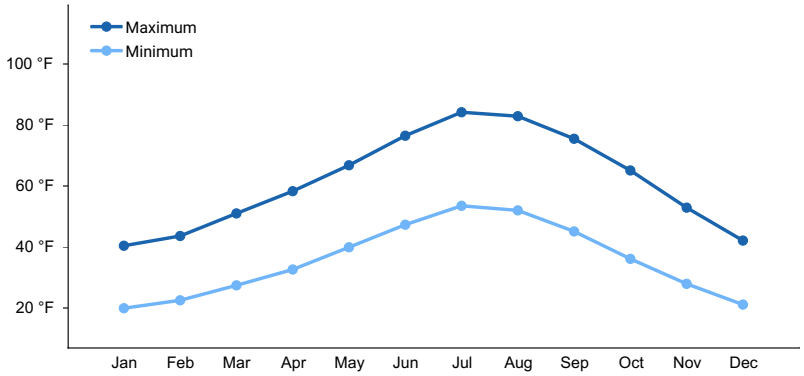


Figure 4. Monthly average minimum and maximum temperature

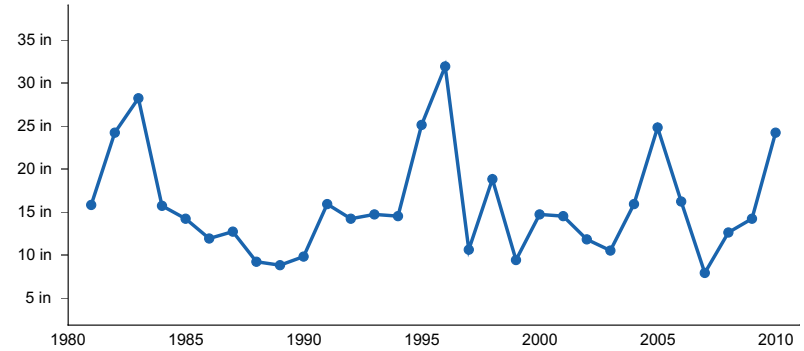


Figure 5. Annual precipitation pattern

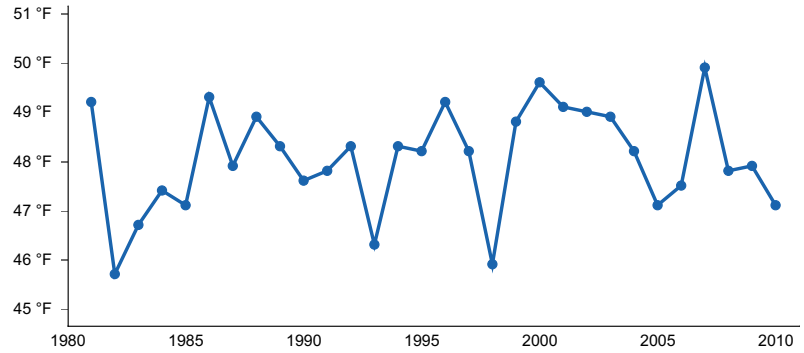


Figure 6. Annual average temperature pattern

Climate stations used

- (1) LEE VINING [USC00044881], Lee Vining, CA

Influencing water features

There are no water features that influence the Deep Ashy 10-12" P.Z. site.

Soil features

The soil is deep and excessively well drained. It was formed in volcanic ash and has a high ash content in the soil. The surface soil texture is gravelly coarse sand. There are less than 30 percent gravel sized rock fragments on the soil surface and subsurface and no rocks 3 inches or larger are found. Soil series correlated to the Deep Ashy 10-12" P.Z. are Brantel (CA732 132bo and CA802 132) and Orecart (CA732 276bo and CA802 276).

Table 4. Representative soil features

Parent material	(1) Volcanic ash

Surface texture	(1) Gravelly coarse sand
Drainage class	Excessively drained
Soil depth	60 in
Surface fragment cover <=3"	26%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	3–4.3 in
Calcium carbonate equivalent (Depth not specified)	0%
Clay content (Depth not specified)	2%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (Depth not specified)	6.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	20%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Disturbance Response Group (DRG) 10 consists of four ecological sites (Stringham et al. 2021). The precipitation zone for these sites ranges from 8 to 12 inches. The elevation range of this group is 3,900 to 7,300 feet with the majority falling between 3,900 and 5,500 feet. Slopes range from 0 to 30 percent, however slopes less than 10 percent are most typical. Soils on these sites range from moderately deep to very deep with available water capacity ranging from very low to moderate. These soils are typically sandy and exhibit rapid intake and deep percolation. These conditions permit deep-rooted plants. Moisture loss from evaporation and runoff is negligible, but these soils are susceptible to wind erosion when vegetation is removed. Annual production in a normal year ranges from 600 to 1000 lbs/ac for the group. The potential native plant community for these sites varies depending on precipitation, elevation and landform. The shrub component is primarily dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. wyomingensis) and basin big sagebrush (*Artemisia tridentata* ssp. tridentata). These sites are characterized by a diverse community of other shrubs, including spiny hopsage (*Grayia spinosa*), fourwing saltbush (*Atriplex canescens*), Antelope bitterbrush (*Purshia tridentata*), desert peach (*Prunus andersonii*), and ephedra (Ephedra spp.). The understory is dominated by deep-rooted perennial bunchgrasses, primarily Indian ricegrass (*Achnatherum hymenoides*) and needle and thread grass (*Hesperostipa comata*). Basin wildrye (*Leymus cinereus*) is an important component of some sites.

Disturbance Response Group 10 Ecological Sites:
Sandy 8-10" Modal Site R026XY020NV
Dune 10-12" R026XY014NV
Sandy Plain R026XY096NV
Deep Ashy 10-12” R026XF005CA

General State and Transition Model Narrative for Group 10

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 10.

Reference State 1.0 Community Phase Pathways:
The Reference State 1.0 is a representation 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:
This community is dominated by needle and thread grass, Indian ricegrass and big sagebrush. Fourwing saltbush, ephedra, and other shrubs are present. Desert needlegrass, basin wildrye, and a variety of perennial and annual forbs are also present in this phase.

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. 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. Release from drought may allow needle and thread and Indian ricegrass to increase in production.

Community Phase Pathway 1.1b, from phase 1.1 to 1.3:
Time and lack of disturbance such as fire or drought allows shrubs to become dominant. Excessive herbivory and/or long-term drought may also reduce perennial herbaceous understory.

Community Phase 1.2:
This community phase is characteristic of a post-disturbance, early seral community. Needle and thread, Indian ricegrass and other perennial grasses dominate. Big sagebrush is a minor component. Forbs and sprouting shrubs may increase.

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:
Big sagebrush increases in the absence of disturbance. Needle and thread, Indian ricegrass and other perennial grasses may be a minor component.

Community Phase Pathway 1.3a, 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. 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. This pathway may also occur after a severe Aroga moth infestation that significantly reduces live sagebrush cover.

Community Phase Pathway 1.3b, from phase 1.3 to 1.1:
Aroga moth infestation reduces live sagebrush cover and allows grasses to increase in the understory. Release from drought may allow needle and thread and Indian ricegrass to increase in production.

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 (Descurainia or Sisymbrium spp.), and Russian thistle (*Salsola tragus*).
Slow variables: Over time the annual non-native plants will increase within the community, decreasing organic matter inputs from deep-rooted perennial bunchgrasses. This leads to reductions in soil water holding capacity.
Threshold: Any amount of introduced non-native species causes an immediate reduction 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 Community Phase Pathways:
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 as the Reference State. 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 reduce 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 annual non-native species reduces State resilience because these species can promote fire where historically fire has been infrequent. This leads to positive feedbacks that further the degradation of the system.

Community Phase 2.1:
This community is dominated by needle and thread grass, Indian ricegrass and big sagebrush. Fourwing saltbush, ephedra, and other shrubs are present. Desert needlegrass, basin wildrye, and a variety of perennial and annual forbs are also present in this phase. 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 for the perennial bunchgrasses to dominate the site. 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.

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.

Community Phase 2.2:
This community phase is characteristic of a post-disturbance, early seral community. Needle and thread, Indian ricegrass and other perennial grasses dominate. Big sagebrush is a minor component. Forbs and sprouting shrubs may increase. Annual non-native species present.

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

Community Phase 2.3 (At-Risk):
Big sagebrush dominates and the perennial grasses become a minor component. Pinyon and juniper may be present. Annual non-native species present.

Community Phase Pathway 2.3a, 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. 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. This pathway may also occur after a severe Aroga moth infestation that significantly reduces live sagebrush cover. Brush treatments with minimal soil disturbance will also decrease sagebrush and release the perennial understory. Annual non-native species are present and may increase in the community.

Community Phase Pathway 2.3b, from phase 2.3 to 2.1:
A change in grazing management that reduces shrubs will allow the perennial bunchgrasses in the understory to dominate. Heavy late-fall or winter grazing may cause mechanical damage and subsequent death to sagebrush, facilitating an increase in the herbaceous understory. Brush treatments with minimal soil disturbance will also decrease sagebrush and release the perennial understory. A low severity fire would decrease the overstory of sagebrush or leave patches of shrubs, and would allow the understory perennial grasses to dominate. This pathway may also occur after a severe Aroga moth infestation that significantly reduces live sagebrush cover. Annual non-native species are present and may increase in the community.

T2A: Transition from Current Potential State 2.0 to Shrub State 3.0:
Trigger: Inappropriate, 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.

T2B: Transition from Current Potential State 2.0 to Tree State 4.0:

Trigger: Time and lack of disturbance or management action allows juniper and/or Pinion to dominate. This may be coupled with grazing management that favors tree establishment by reducing understory herbaceous competition for site resources Feedbacks and ecological processes: Trees increasingly dominate use of soil water, contributing to reductions in soil water availability to grasses and shrubs. Overtime, grasses and shrubs are outcompeted. Reduced herbaceous and shrub production slows soil organic matter inputs and increases soil erodibility through loss of cover and root structure.
Slow variables: Over time the abundance and size of trees will increase.
Threshold: Trees dominate ecological processes and number of shrub skeletons exceed number of live shrubs. Minimal recruitment of new shrub cohorts.

Shrub State 3.0 Community Phase Pathways:
This state has two community phases: a big sagebrush dominated phase and a sprouting shrub dominated phase. This state is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Shrubs dominate the plant community. If coming from phase 2.3, big sagebrush canopy cover is high and these plants may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. Typically this state has little herbaceous understory and may be experiencing soil movement in the interspaces. The shrub overstory dominates site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed.

Community Phase 3.1:
Big sagebrush and other shrubs dominate. Needle and thread, Indian ricegrass and other perennial grasses are only present in trace amounts, under shrubs, or may be missing entirely. Pinyon and/or juniper may be present. Annual non-native species may be present.

Community Phase Pathway 3.1a, from Phase 3.1 to 3.2:
Fire, heavy fall grazing that causes mechanical damage to shrubs, and/or brush treatments with minimal soil disturbance will greatly reduce the overstory shrubs to trace amounts and allow annual forbs and sprouting shrubs to dominate the site.

Community Phase 3.2:
Sprouting shrubs such as fourwing saltbush, spiny hopsage, ephedra, and desert peach dominate the site. Annual forbs may dominate the understory. Perennial grasses and sagebrush may be a minor component or missing entirely. Bitterbrush may be present. Bare ground may be significant. Annual non-native species may be present.

Community Phase Pathway 3.2a, from Phase 3.2 to 3.1:
Time and lack of disturbance allows the shrub component to recover. The establishment of sagebrush can take many years unless aided with restoration efforts.

T3A: Transition from Shrub State 3.0 to Tree State 4.0:
Trigger: Lack of fire allows trees to dominate site. This 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.

T3B: Transition from Shrub State 3.0 to Eroded State 5.0:
Trigger: High-intensity fire (from 3.1) kills all non-sprouting shrubs and many sprouting shrubs.
Slow variables: Increased dominance of sagebrush and/or bitterbrush creates extreme woody fuel conditions. Loss of the deep-rooted bunchgrass understory leaves few plants capable of regenerating post-fire, and eliminates the seed bank of these species.
Threshold: Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses truncates energy capture and impacts nutrient cycling and distribution. Large, potentially decadent shrubs dominate the landscape with a closed canopy.

Tree State 4.0 Community Phase Pathway:
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 4.1:
Utah juniper and/or singleleaf pinyon dominate the overstory and site resources. Trees are actively growing with noticeable leader growth. Trace amounts of bunchgrasses may be found under tree canopies and in interspaces. Sagebrush is stressed and dying. Annual non-native species are present under tree canopies. Bare ground interspaces are large and connected.

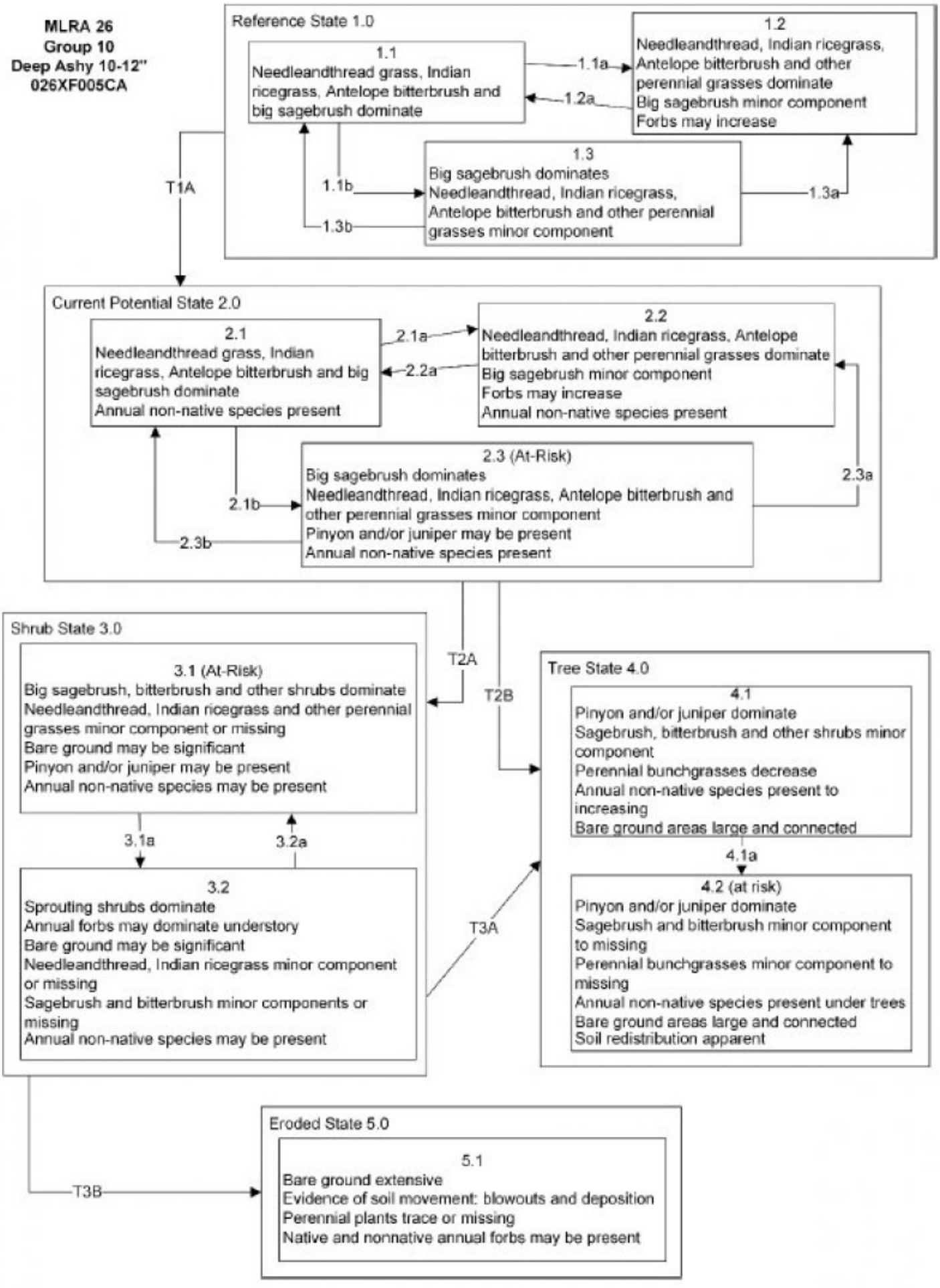
Community Phase Pathway 4.1a, from phase 4.1 to 4.2:
Time and lack of disturbance or management action allows Utah juniper and/or singleleaf pinyon to mature further and dominate site resources.

Community Phase 4.2:
Utah juniper and/or singleleaf pinyon dominate 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 shrub skeletons will be more numerous than live sagebrush. Bunchgrasses may or may not be present. Needle and thread or mat forming forbs may be present in trace amounts. Bare ground interspaces are large and connected. Soil redistribution is evident.

Eroded State 5.0:
This state has one community phase. Abiotic factors including soil redistribution, erosion, and soil temperature are primary drivers of ecological condition within this state. Soil moisture, soil nutrients, and soil organic matter distribution and cycling are severely altered due to degraded soil surface conditions. Soil movement inhibits the germination of new seedlings. Regeneration of shrubs is not evident.

Community Phase 5.1:
Vegetation is sparse and bare ground dominates the visual aspect. Plants that tolerate soil movement and may remain, including Indian ricegrass, needle and thread, desert peach, and annual forbs. Russian thistle may be present. Soil deposition is apparent at the bases of plants and may form small dunes. Skeletons of burned shrubs may be present.

State and transition model


MLRA 26
Group 10
Deep Ashy 10-12"
026XF005CA
Reference State 1.0
1.1
Needleandthread grass, Indian ricegrass, Antelope bitterbrush and big sagebrush dominate
1.1a
1.2a
1.2
Needleandthread, Indian ricegrass, Antelope bitterbrush and other perennial grasses dominate
Big sagebrush minor component
Forbs may increase
1.1b
1.3b
1.3
Big sagebrush dominates
Needleandthread, Indian ricegrass, Antelope bitterbrush and other perennial grasses minor component
1.3a
T1A
Current Potential State 2.0
2.1
Needleandthread grass, Indian ricegrass, Antelope bitterbrush and big sagebrush dominate
Annual non-native species present
2.1a
2.2a
2.2
Needleandthread, Indian ricegrass, Antelope bitterbrush and other perennial grasses dominate
Big sagebrush minor component
Forbs may increase
Annual non-native species present
2.1b
2.3b
2.3 (At-Risk)
Big sagebrush dominates
Needleandthread, Indian ricegrass, Antelope bitterbrush and other perennial grasses minor component
Pinyon and/or juniper may be present
Annual non-native species present
2.3a
Shrub State 3.0
3.1 (At-Risk)
Big sagebrush, bitterbrush and other shrubs dominate
Needleandthread, Indian ricegrass and other perennial grasses minor component or missing
Bare ground may be significant
Pinyon and/or juniper may be present
Annual non-native species may be present
3.1a
3.2a
3.2
Sprouting shrubs dominate
Annual forbs may dominate understory
Bare ground may be significant
Needleandthread, Indian ricegrass minor component or missing
Sagebrush and bitterbrush minor components or missing
Annual non-native species may be present
T2A
T2B
T3A
Tree State 4.0
4.1
Pinyon and/or juniper dominate
Sagebrush, bitterbrush and other shrubs minor component
Perennial bunchgrasses decrease
Annual non-native species present to increasing
Bare ground areas large and connected
4.1a
4.2 (at risk)
Pinyon and/or juniper dominate
Sagebrush and bitterbrush minor component to missing
Perennial bunchgrasses minor component to missing
Annual non-native species present under trees
Bare ground areas large and connected
Soil redistribution apparent
T3B
Eroded State 5.0
5.1
Bare ground extensive
Evidence of soil movement: blowouts and deposition
Perennial plants trace or missing
Native and nonnative annual forbs may be present

MLRA 26
Group 10
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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: High severity fire and/or severe Aroga moth infestation significantly reduces sagebrush and bitterbrush cover leading to early mid-seral community.
1.3b: Low severity fire or Aroga moth infestation resulting in a mosaic pattern.

Transition T1A: Introduction of non-native annual species.

Current Potential State 2.0 Community Phase Pathways
2.1a: Low severity fire creates sagebrush/grass mosaic; high severity fire significantly reduces sagebrush and bitterbrush 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 and bitterbrush.
2.3a: Low severity fire creates sagebrush/grass mosaic, herbivory or combinations. Brush management with minimal soil disturbance reduces sagebrush and bitterbrush.
2.3b: Low severity fire or Aroga moth infestation resulting in a mosaic pattern.

Transition T2A: Inappropriate grazing management (3.1), or high severity fire (3.2).
Transition T2B: Time and lack of disturbance allows maturation of the tree community.

Shrub State 3.0 Community Phase Pathways
3.1a: Fire reduces shrub canopy.
3.2a: Time and lack of disturbance allows for regeneration of sagebrush.

Transition T3A: Time and lack of disturbance allows maturation of the tree community.
Transition T3B: Catastrophic fire in dense shrub cover results in mortality of most perennial plants. Possible from phase 3.1.

Tree State 4.0 Community Phase Pathways
4.1a: Time and lack of disturbance allows for maturation of tree community.
4.2a: Tree thinning treatment (typically for fuels management).

Eroded State 5.0 Community Phase Pathways
None.

State 1
Reference State

Community 1.1
Sagebrush/bunchgrass

Dominant plant species

- basin big sagebrush (*Artemisia tridentata ssp. tridentata*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- Indian ricegrass (*Achnatherum hymenoides*), grass
- needle and thread (*Hesperostipa comata*), grass

Community 1.2

Community 1.3

Pathway 1.1a
Community 1.1 to 1.2

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.

Pathway 1.1b
Community 1.1 to 1.3

Time and lack of disturbance such as fire or drought. Excessive herbivory and/or long-term drought may also reduce perennial understory.

Pathway 1.2a
Community 1.2 to 1.1

Time and lack of disturbance allows for shrub regeneration.

Pathway 1.3b
Community 1.3 to 1.1

High severity fire and/or severe Agora moth infestation significantly reduces sagebrush and bitterbrush cover leading to an early mid-seral community.

Pathway 1.3a
Community 1.3 to 1.2

Low severity fire or Agora moth infestation resulting in a mosaic pattern.

State 2
Current Potential State

Community 2.1

Community 2.2

Community 2.3

Pathway 2.1a
Community 2.1 to 2.2

Low severity fire creates sagebrush/grass mosaic; high severity fire significantly reduces sagebrush and bitterbrush cover and leads to early/mid-seral community dominated by grasses and forbs; non-native annual species present.

Pathway 2.1b
Community 2.1 to 2.3

Time and lack of disturbance. Inappropriate grazing management and/or long-term drought may also reduce perennial understory.

Pathway 2.2a
Community 2.2 to 2.1

Time and lack of disturbance allows for regeneration of sagebrush and bitterbrush.

Pathway 2.3b
Community 2.3 to 2.1

Low severity fire or Aroga moth infestation resulting in a mosaic pattern.

Pathway 2.3a

Community 2.3 to 2.2

Low severity fire creates sagebrush/grass mosaic, herbivory or combinations. Brush management with minimal soil disturbance reduces sagebrush and bitterbrush.

State 3
Shrub State

Community 3.1

Community 3.2

Pathway 3.1a
Community 3.1 to 3.2

Fire reduces shrub canopy.

Pathway 3.2a
Community 3.2 to 3.1

Time and lack of disturbance allows for regeneration of sagebrush.

State 4
Tree State

Community 4.1

Community 4.2

Pathway 4.1a
Community 4.1 to 4.2

Time and lack of disturbance allows for maturation of tree community.

Pathway 4.2a
Community 4.2 to 4.1

Tree thinning treatment (typically for fuels management).

State 5
Eroded State

Community 5.1

Transition T1A
State 1 to 2

Introduction of non-native annual species.

Transition T2A
State 2 to 3

Inappropriate grazing management (3.1), or high severity fire (3.2).

Transition T2B

State 2 to 4

Time and lack of disturbance allows maturation of the tree community.

Transition T3A
State 3 to 4

Time and lack of disturbance allows maturation of the tree community.

Transition T3B
State 3 to 5

Catastrophic fire in dense shrub cover results in mortality of most perennial plants. Possible from CP 3.1.

Additional community tables

Inventory data references

NASIS data for soil survey areas CA732 and CA802.

Type locality

Location 1: Mono County, CA	
Township/Range/Section	T2N R26E S2

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..

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:

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

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

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

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
