USDA Natural Resources Conservation Service

Ecological site R024XY057NV
CHANNERY HILL

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General information

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

MLRA notes

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

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

Ecological site concept

This Channery Hill site is on summits and side slopes of mountains, hills and rock pediments. Soils are very shallow to bedrock, well drained and formed in residuum/colluvium derived from shale, rhyolite, siltstone and phyllite. The soil profile is characterized by an ochric epipedon, an argillic horizon and greater than 50 percent rock fragments by volume.

Associated sites

R024XY026NV	**STONY SLOPE 8-10 P.Z.** This site is on summits and side slopes of lower mountains, hills, and upper piedmont slopes. The soil profile is characterized by an ochric epipedon and an argillic horizon.

R024XY002NV	**LOAMY 5-8 P.Z.** This site is on fan remnants. The soils associated with this site are very deep, well drained and formed in alluvium derived from mixed parent material. Less than 25 percent rock fragments throughout the profile, a gravely surface and a horizon of salt accumulation (natric).
R024XY020NV	**DROUGHTY LOAM 8-10 P.Z.** The soils associated with this ecological site are deep, well drained, and formed in alluvium derived from mixed parent material. The soil profile is characterized by an ochric epipedon and high amounts of sand and gravel below 16 inches (40cm). Soil temperature regime is mesic. This site includes limited available soil moisture due to texture and precipitation zone. Plant available water is influenced by soil texture, presence and abundance of rock fragments, soil depth, aspect, elevation and landscape position.
R024XY025NV	**LOAMY SLOPE 5-8 P.Z.** Site found on hills and low mountains. Soils are shallow to bedrock, well drained and formed in residuum/colluvium derived from volcanics. The plant community is dominated by shadscale ATCO), bud sagebrush (ARSP5) and squireltail (ELEL5). Shallow depth and coarse fragments in the profile occupy plant growing space and reduce the available water capacity.

Similar sites

R024XY018NV	**Claypan 10-12 P.Z.** Low sagebrush (ARAR8) dominant shrub; Bluebunch wheatgrass (PSSPS)- Thurber's needlegrass (ACTH7) codominant grasses.
R024XY030NV	**SHALLOW CALCAREOUS LOAM 8-10 P.Z.** Black sagebrush (ARNO4) dominant shrub; Indian ricegrass (ACHY)- Thurber's needlegrass (ACTH7) codominant grasses.
R024XY031NV	**SHALLOW CALCAREOUS LOAM 10-14 P.Z.** Low sagebrush (ARAR8) dominant shrub; Bluebunch wheatgrass (PSSPS)- Thurber's needlegrass (ACTH7) codominant grasses.
R024XY016NV	**Mountain Ridge** Idaho fescue (FEID) dominant grass; Low sagebrush (ARAR8) and/or Black sagebrush (ARNO4) dominant shrubs; less productive site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula subsp. longicaulis*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

The Channery Hill site occurs on summits and side slopes of mountains, hills, and rock pediments. Slopes range from 15 to 50 percent. Elevations are 4,500 to 6,500 feet (1,372 to 1,981 m).

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill (3) Rock pediment
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	4,500–6,500 ft
Slope	15–50%
Water table depth	72 in

Aspect	Aspect is not a significant factor

Climatic features

The climate associated is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 10 inches (20 to 25cm). Mean annual air temperature is 47 to 53 degrees F. The average growing season is about 100 to 130 days.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	
Precipitation total (average)	10 in

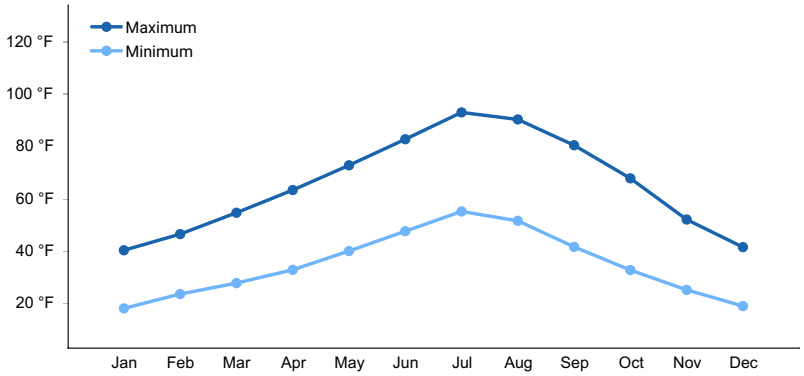


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils have a shallow effective rooting zone with depth to bedrock ranging from 4 to 14 inches (10 to 36 cm). The soil profile is characterized by an ochric epipedon, argillic horizon and greater than 50 percent channers and rock fragments throughout the profile. The available water capacity is very low. Runoff is very high. Surface soil rock fragments provide a stabilizing effect on surface erosion conditions. The soil series associated with this site include: Rocconda.

Table 4. Representative soil features

Parent material	(1) Colluvium–shale and siltstone (2) Residuum
Surface texture	(1) Very channery loam (2) Very cobbly loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	4–14 in
Surface fragment cover <=3"	24–37%
Surface fragment cover >3"	2–20%
Available water capacity (0-40in)	0.4–0.5 in

Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	24–42%
Subsurface fragment volume >3" (Depth not specified)	2–20%

Ecological dynamics

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

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity has increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability with the soil profile (Bates et al. 2006).

The perennial bunchgrasses that are dominant on this site include Indian ricegrass and squirreltail. These species generally have somewhat shallower root systems than the shrubs, but root densities are often as high as or higher than those of shrubs in the upper 0.5 m but taper off more rapidly than shrubs. Differences in root depth distributions between grasses and shrubs result in resource partitioning in these shrub/grass systems.

The Great Basin sagebrush communities have high spatial and temporal variability in precipitation both among years and within growing seasons. Nutrient availability is typically low but increases with elevation and closely follows moisture availability. The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition or can increase resource pools by the decomposition of dead plant material following disturbance. The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007). The introduction of annual weedy species, like cheatgrass, may cause an increase in fire frequency and eventually lead to an annual state. Conversely, as fire frequency decreases, sagebrush will increase and with inappropriate grazing management the perennial bunchgrasses and forbs may be reduced.

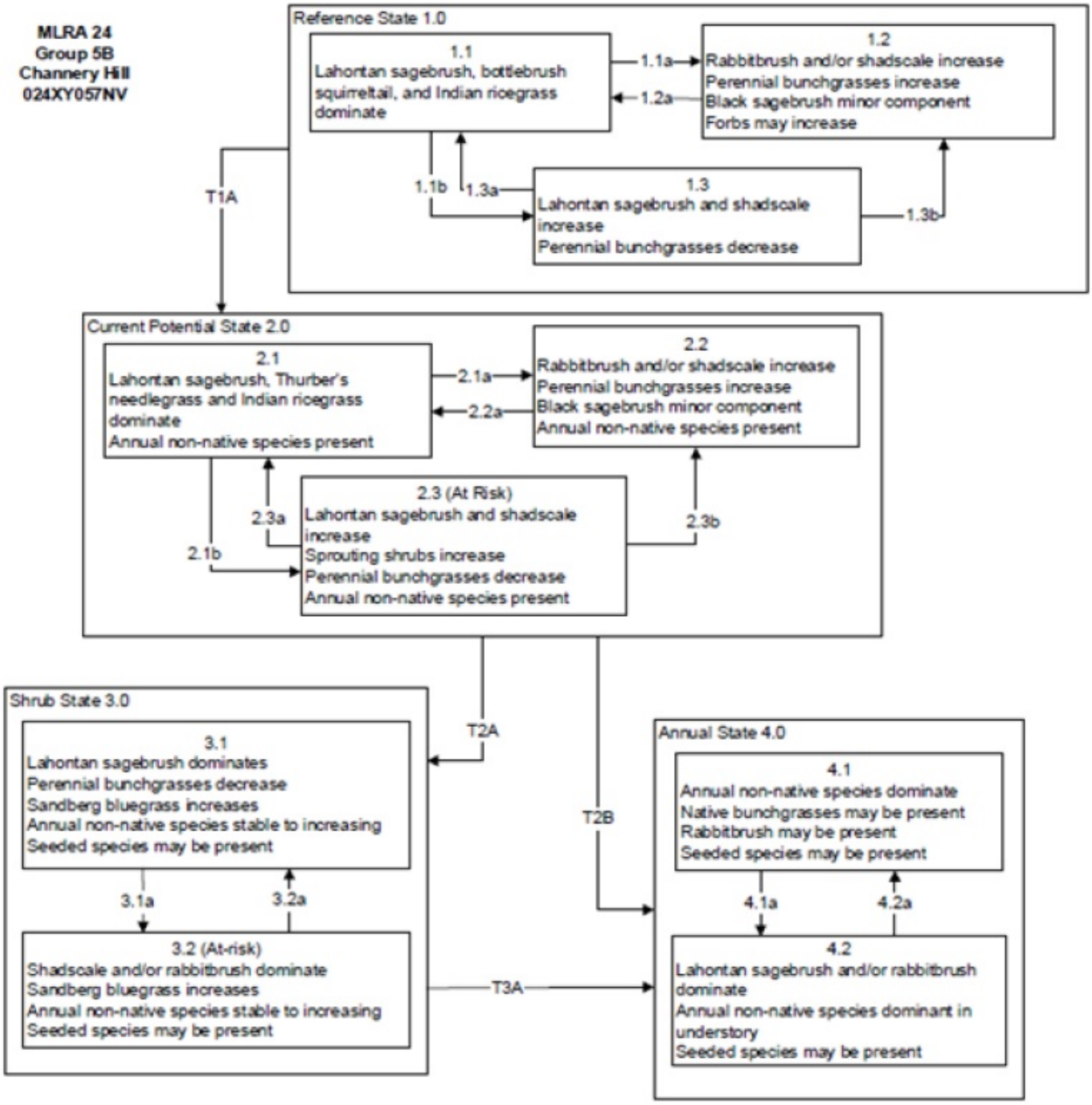
The ecological site has low to moderate resilience to disturbance and resistance to invasion. Increased resilience increases with elevation, aspect, increased precipitation and increased nutrient availability. Three possible alternative stable states have been identified for this site.

Fire Ecology:
Fire is not a major ecological component of these community types (Winward 2001), and would be infrequent. Fire return intervals have been estimated at 100 to 200 years (Kitchen and McArthur 2007); however, fires were probably patchy due to the low productivity of these sites. Black sagebrush plants have no morphological adaptations for surviving fire and must reestablish from seed following fire (Wright et al. 1979). In lower precipitation zones shadscale (*Atriplex confertifolia*), spiny hopsage (*Grayia spinosa*) and rabbitbrush (*Chrysothamnus viscidiflorus* or *Ericameria nauseosa*) may become the dominant shrub species following fire, often with an understory of Sandberg bluegrass and/or cheatgrass and other weedy species. Sandberg bluegrass has been

found to increase following fire likely due to its low stature and productivity (Daubenmire 1975).

Indian ricegrass is the dominant perennial bunchgrass and is fairly fire tolerant (Wright 1985), which is likely due to its low culm density and below ground plant crowns. Indian ricegrass has been found to reestablish on burned sites through seed dispersed from adjacent unburned areas (Young 1983, West 1994). Thus the presence of surviving, seed producing plants is necessary for reestablishment of Indian ricegrass. Grazing management following fire to promote seed production and establishment of seedlings is important.

State and transition model



Channery Hill
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Reference State 1.0 Community Pathways:
1.1a: Low severity fire resulting in a mosaic pattern.
1.1b: Time and lack of disturbance such as fire. Drought, herbivory, or combinations of these would reduce the perennial grasses in the understory.
1.2a: Time and lack of disturbance such as fire.
1.3a: Low severity fire or herbivory resulting in a mosaic pattern.
1.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native plants.

Current Potential State 2.0 Community Pathways:
2.1a: Fire or brush treatments (i.e. mowing) with minimal soil disturbance.
2.1b: Time and lack of disturbance such as fire. Drought, inappropriate grazing management, or combinations of these would reduce the perennial grasses in the understory.
2.2a: Time and lack of disturbance such as fire, drought, inappropriate grazing management, or combinations of these.
2.3a: Low severity fire creates sagebrush/grass mosaic. Brush treatment with minimal soil disturbance and/or grazing management that reduces shrubs would allow for an increase in perennial bunchgrasses.
2.3b: High severity fire significantly reduces sagebrush and leads to early/mid-seral community.

Transition T2A: Time and lack of disturbance and/or inappropriate grazing management (to 3.1) or fire, soil disturbing brush treatments and/or inappropriate sheep grazing (3.2).
Transition T2B: Fire in at-risk community phase (from 2.3) may transition to annual state (4.0), soil disturbing treatments may also transition to an annual state.

Shrub State 3.0 Community Pathways:
3.1a: Fire and/or sheep grazing management which reduces black sagebrush. Brush treatments (i.e. mowing) with minimal soil disturbance.
3.2a: Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows for the shrub component to recover.

Transition T3A: Fire and/or soil disturbing treatments (i.e. failed restoration attempts) (to 4.0).

Annual State 4.0 Community Pathways:
4.1a: Time and lack of disturbance (unlikely to occur).
4.2a: Fire.

State 1
Reference State

The Reference State 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 shrub dominant phase and a grass dominate 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. Due to the nature and extent of disturbance in this site, all three plant community phases would likely occur in a mosaic across the landscape.

Community 1.1
Reference Plant Community 1.1

The reference plant community is dominated by Lahontan sagebrush, Indian ricegrass, and bottlebrush squirreltail. Potential vegetative composition is about 30 percent grasses, 5 percent forbs and 65 percent shrubs. Approximate ground cover (basal and crown) is 5 to 15 percent.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	163	227	293
Grass/Grasslike	75	105	135
Forb	12	18	22
Total	**250**	**350**	**450**

Community 1.2
Reference Plant Community 1.2

This community phase is characteristic of a post-disturbance, early seral community phase. Indian ricegrass, squirreltail and other perennial bunchgrasses dominate. Sprouting shrubs such as Douglas' rabbitbrush, spiny hopsage, and shadscale may increase. Lahontan sagebrush could still be present in unburned patches. Forbs may increase post-fire but will likely return to pre-burn levels within a few years. Sandberg bluegrass will generally increase following fire, but may decrease in below-average years of precipitation. Sandberg bluegrass may also increase.

Community 1.3
Reference Plant Community 1.3

Lahontan 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 and/or herbivory. Sandberg bluegrass may increase in the understory and become the dominant grass on the site.

Pathway 1.1a
Community 1.1 to 1.2

A low severity fire would decrease the overstory of sagebrush and allow the understory perennial grasses to increase. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring facilitating an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts.

Pathway 1.1b
Community 1.1 to 1.3

Absence of disturbance over time, significant herbivory, chronic drought or combinations of these would allow the sagebrush overstory to increase and dominate the site. This will generally cause a reduction in perennial bunch grasses; however Sandberg bluegrass may increase in the understory depending on the grazing management. Heavy spring grazing will favor an increase in sagebrush.

Pathway 1.2a
Community 1.2 to 1.1

Time and lack of disturbance will allow sagebrush to re-establish.

Pathway 1.3a
Community 1.3 to 1.1

A low severity fire, herbivory or combinations will reduce the sagebrush overstory and create a sagebrush/grass mosaic.

Pathway 1.3b
Community 1.3 to 1.2

Fire will decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the

site. Fires will typically be high intensity in this community phase due to the dominance of sagebrush resulting in removal of the overstory shrub community.

State 2
Current Potential State

The Current Potential State is similar to the Reference State and has three similar community phases. Ecological function has not changed in this state, but the resiliency of the state has been reduced by the presence of invasive weeds. These non-native species can be highly flammable, and promote fire where historically fire had been infrequent. 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.

Community 2.1
Plant Community 2.1

This community phase is compositionally similar to the Reference State Community Phase 1.1 with the presence of non-native species in trace amounts. This community is dominated by Lahontan sagebrush in the overstory with Indian ricegrass and squirreltail dominant in the understory.

Community 2.2
Plant Community 2.2

This community phase is characteristic of a post-disturbance, early seral community where annual non-native species are present. Sagebrush is present in trace amounts; perennial bunchgrasses dominate the site. Depending on fire severity patches of intact sagebrush may remain. Rabbitbrush or other sprouting shrubs may be increasing. Annual non-native species are stable or increasing within the community. Sandberg bluegrass will generally increase following fire, but may decrease in below-average years of precipitation. Annual non-native species generally respond well after fire and may be stable or increasing within the community.

Community 2.3
Plant Community (At-Risk) 2.3

Lahontan sagebrush dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing, or from both. Rabbitbrush may be a significant component. Sandberg bluegrass may increase and become co-dominant with deep rooted bunchgrasses. Annual non-native species may be stable or increasing due to lack of competition with perennial bunchgrasses. This site is susceptible to further degradation from grazing, drought, and fire. This community is at risk of crossing a threshold to either Shrub State 3.0 (grazing or fire) or Annual State 4.0 (fire).

Pathway 2.1a
Community 2.1 to 2.2

A low severity fire would decrease the overstory of sagebrush and allow the understory perennial grasses to increase. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management favoring an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts. Annual non-native species are likely to increase after fire. Brush treatments with minimal soil disturbance may also reduce the sagebrush overstory and allow an increase in perennial grasses.

Pathway 2.1b
Community 2.1 to 2.3

Absence of disturbance over time, chronic drought, inappropriate grazing management or combinations of these would allow the sagebrush overstory to increase and dominate the site. Inappropriate grazing management reduces the perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory.

Pathway 2.2a
Community 2.2 to 2.1

Absence of disturbance over time and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of black sagebrush can take many years.

Pathway 2.3a
Community 2.3 to 2.1

Grazing management that reduces shrubs will allow the perennial bunchgrasses in the understory to increase. Heavy late-fall/winter grazing may cause mechanical damage to sagebrush promoting the perennial bunchgrass understory. 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. A low severity fire would decrease the overstory of sagebrush and allow the understory perennial grasses to increase. Due to low fuel loads in this State, fires will likely be small creating a mosaic pattern.

Pathway 2.3b
Community 2.3 to 2.2

Fire will decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. Fires will typically be high intensity due to the dominance of sagebrush in this phase, resulting in removal of the overstory shrub community. Annual non-native species respond well to fire and may increase post-burn.

State 3
Shrub State

The Shrub State has two community phases, one that is characterized by a Lahontan sagebrush overstory and the other with a shadscale or rabbitbrush overstory with a Sandberg bluegrass understory. The site has crossed a biotic threshold and site processes are being controlled by shrubs. Bare ground has increased and pedestalling of grasses may be excessive.

Community 3.1
Plant Community 3.1

Lahontan sagebrush dominates overstory while Sandberg bluegrass dominates the understory. Deep-rooted perennial bunchgrasses have significantly declined. Annual non-native species may be present. Bare ground and soil redistribution may be increasing. The community phase may be at risk of transitioning into an Annual State.

Community 3.2
Plant Community (At-Risk) 3.2

Shadscale and/or rabbitbrush dominate the overstory. Broom snakeweed may be present to increasing. Annual non-native species may be increasing and bare ground is significant. This site is at risk for an increase in invasive annual weeds.

Pathway 3.1a
Community 3.1 to 3.2

Fire reduces Lahontan sagebrush to trace amounts and allows for sprouting shrubs such as rabbitbrush to dominate. Shadscale may also establish post-fire and become dominate. Inappropriate or excessive sheep grazing could also reduce cover of sagebrush and allow shadscale or sprouting shrubs to dominate the community. Brush treatments with minimal soil disturbance would facilitate sprouting shrubs and Sandberg bluegrass.

Pathway 3.2a
Community 3.2 to 3.1

Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows for the shrub component to recover.

State 4
Annual State

The Annual State has two community phases; one dominated by annual non-native species and the other is a shrub dominated site. This state is characterized by the dominance of annual non-native species such as cheatgrass and tansy mustard in the understory. Sagebrush and/or rabbitbrush may dominate the overstory. Annual non-native species and squirreltail dominate the understory.

Community 4.1
Plant Community 4.1

Annual non-native plants such as cheatgrass or tansy mustard dominate the site.

Community 4.2
Plant Community 4.2

Lahontan sagebrush remains in the overstory with annual non-native species, likely cheatgrass, dominating the understory. Trace amounts of desirable bunchgrasses may be present.

Pathway 4.1a
Community 4.1 to 4.2

Time and lack of disturbance. Occurrence of this pathway is unlikely.

Pathway 4.2a
Community 4.2 to 4.1

Fire allows for annual non-native species to dominate site.

Transition T1A
State 1 to 2

Trigger: Introduction of non-native annual plants. Slow variables: Over time the annual non-native plants will increase within the community. 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.

Transition T2A
State 2 to 3

Trigger: To Community Phase 3.1: Inappropriate cattle/horse grazing will decrease or eliminate deep rooted perennial bunchgrasses, increase Sandberg bluegrass and favor shrub growth and establishment. To Community Phase 3.2: Severe fire will remove sagebrush overstory, decrease perennial bunchgrasses and enhance Sandberg bluegrass. Soil disturbing brush treatments and/or inappropriate sheep grazing will reduce sagebrush and potentially increase sprouting shrubs and Sandberg bluegrass. Slow variables: Long-term decrease in deep-rooted perennial grass density and/or Lahontan sagebrush.

Transition T2B
State 2 to 4

Trigger: Catastrophic fire likely in at risk community phase 2.3, or soil surface disturbance. Slow variables: Increased production and cover of non-native annual species. Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs changes energy and nutrient capture and cycling both spatially and temporally within the

community. Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires.

Transition T3B
State 3 to 4

Trigger: Fire or treatments that disturb the soil and existing plant community (ex: failed restoration attempts). Slow variables: 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.

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**			43–124	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	18–53	–
	squirreltail	ELEL5	*Elymus elymoides*	18–53	–
	Sandberg bluegrass	POSE	*Poa secunda*	7–18	–
2	**Secondary Perennial Grasses**			7–18	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	2–11	–
Forb					
3	**Perennial Forbs**			7–28	
	aster	ASTER	*Aster*	2–11	–
	milkvetch	ASTRA	*Astragalus*	2–11	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	2–11	–
	buckwheat	ERIOG	*Eriogonum*	2–11	–
	lupine	LUPIN	*Lupinus*	2–11	–
	phlox	PHLOX	*Phlox*	2–11	–
Shrub/Vine					
4	**Primary Shrubs**			146–239	
	little sagebrush	ARARL3	*Artemisia arbuscula ssp. longicaulis*	125–175	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	7–28	–
	spiny hopsage	GRSP	*Grayia spinosa*	7–18	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	7–18	–
5	**Secondary Shrubs**			7–35	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4–11	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	4–11	–
	horsebrush	TETRA3	*Tetradymia*	4–11	–

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing, due to the low forage production and steep slopes. Grazing management should be keyed to dominant grasses and palatable shrubs production. Lahontan sagebrush is considered a valuable browse plant during the spring, fall and winter months. In some areas it is of little value in winter due to heavy snow. Nevada ephedra is important winter range browse for domestic cattle, sheep and goats.

Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of livestock. Shadscale provides good browse for domestic sheep. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Domestic sheep browse the succulent new growth of spiny hopsage in late winter and early spring. 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. Sandberg 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.

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:
Lahontan sagebrush is considered a valuable browse plant during the spring, fall and winter months. In some areas it is of little value in winter due to heavy snow. Mule deer utilize and sometimes prefer Lahontan sagebrush, particularly in winter and early spring. Mule deer, bighorn sheep, and pronghorn browse Nevada ephedra, especially in spring and late summer when new growth is available. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of wildlife particularly during spring and summer before the hardening of spiny twigs. It supplies browse, seed, and cover for birds, small mammals, rabbits, deer, and pronghorn antelope. Spiny hopsage provides a palatable and nutritious food source for big game animals. Spiny hopsage is used as forage to at least some extent by domestic goats, deer, pronghorn, and rabbits. 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. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover.

Hydrological functions

Runoff is very high. Permeability is slow. Hydrologic soil group is D. Rills are none to rare. Rock fragments armor the soil surface. Water flow patterns are none to few. Rock fragments armor the soil surface. Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a "normal" condition. Gullies are none to rare. Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact.

Recreational uses

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

Other products

Native Americans used Nevada ephedra as a tea to treat stomach and kidney ailments. Seeds of shadscale were used by Native Americans for bread and mush. Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

Nevada ephedra is useful for erosion control, and seedlings have been successfully planted onto reclaimed strip mines. Atrazine may be effective in controlling Nevada ephedra, though some plants can survive through crown sprouting. Irrigation may increase control by atrazine. Spiny hopsage has moderate potential for erosion control and low to high potential for long-term revegetation projects. It can improve forage, control wind erosion, and increase soil stability on gentle to moderate slopes. Spiny hopsage is suitable for highway plantings on dry sites in Nevada. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Humboldt County, NV	
Township/Range/Section	T36N R41E S31
UTM zone	N
UTM northing	4533543
UTM easting	466334
Latitude	40° 57′ 8″
Longitude	117° 24′ 0″
General legal description	NE¼ Edna Mountains south of Emigrant Canyon near Golonda, Humboldt County, Nevada. This site also occurs in Pershing County, Nevada.

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Contributors

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Approval

Kendra Moseley, 3/06/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Patti Novak-Echenique
Contact for lead author	State Rangeland Management Specialist

Date	03/19/2010
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 30-50%.

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

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) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during catastrophic events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil stability values should be 3 to 6 on most soil textures found on this site. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. (To be field tested.)

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically fine platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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., Indian ricegrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are not typical. Subangular blocky sub-surface horizons or subsoil argillic horizons are not to be interpreted as compacted layers.

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

    Dominant: Reference Plant Community: Low shrubs (Lahontan sagebrush)

    Sub-dominant: Deep-rooted, cool season, perennial bunchgrasses > associated shrubs > shallow-rooted, cool season, grasses > deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, perennial and annual forbs

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.

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14. **Average percent litter cover (%) and depth (in):** Within plant interspaces (± 10-20%) and depth of litter is <½ inch.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (end of May) ± 350 lbs/ac; Spring moisture significantly affects total production.

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

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