USDA Natural Resources
Conservation Service

Ecological site R027XY058NV
LOAMY 10-12 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): 027X–Fallon-Lovelock Area

Physiography
Found in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus this area is characterized by isolated uplifted fault block mountain ranges trending north to south that are separated by broad, hydrologically closed basins. The entire area occurs in the rain-shadow of the Sierra Nevada mountains and is influenced by Pleistocene Lake Lahontan which reached its most recent high stand about 12,000 years ago. There is substantial evidence suggesting the western Great Basin has been the site of pluvial-interpluvial cycles for at least the past two million years.
The mountains and valleys are dissected by the Humboldt, Truckee, Carson, and Walker Rivers and their tributaries, all of which terminate within MLRA 27. Extensive playas can be found throughout this area and are the result of drying of ancient Lake Lahontan. Elevation generally ranges from 3,300 to 5,900 feet (1,005 to 1,800 meters) in valleys, but on some mountain peaks it is more than 7,870 feet (2,400 meters).

Geology
Landforms and soils of this MLRA have been heavily influenced by fluctuating lake level over the last 40,000 years. There is a level line evident on the higher slopes marking the former extent of glacial Lake Lahontan. Almost half of this area has surface deposits of alluvial valley fill influenced by lacustrine sediment. The rest has andesite and basalt rocks of different ages. Mesozoic and Tertiary intrusives are concentrated along the western border of the area, and Lower Volcanic Rocks (17 to 43 million years old) are common on the eastern side of the area. Also, some scattered outcrops of Mesozoic sedimentary and volcanic rocks and tuffaceous sedimentary rocks are in the mountains within the interior of this MLRA.

Climate
The average annual precipitation is 5 to 10 inches (125 to 255 millimeters) in most of the area but is as much as 19 inches (485 millimeters) on high mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The amount of precipitation is very low from summer to midautumn. The precipitation in winter occurs mainly as snow. The average annual temperature is 43 to 54 degrees F (6 to 12 degrees C). The freeze-free period averages 155 days and ranges from 110 to 195 days, decreasing in length with elevation.

Water
The amount of precipitation is very low, and water for irrigation is obtained principally from diversions on the four large rivers in the area and from water stored in the Lahontan, Rye Patch, and Weber Reservoirs. Pyramid Lake and Walker Lakes are terminal lakes for the Truckee and Walker Rivers, respectively. Much of the annual flow of both rivers is diverted for irrigation, causing lake levels to fall and levels of dissolved salts to increase causing problems for the native Lahontan cutthroat trout.

Soils
The dominant soil orders are Aridisols and Entisols. The soils in the area are predominantly a mesic temperature

regime, aridic moisture regime, and have a mixed mineralogy. They are generally well drained, loamy or sandy, commonly skeletal, and shallow to very deep. Accumulation of salts, tufa deposits, and eolian sediments with soluble salts over lacustrine deposits influence most of the soils in the basin landforms of this MLRA. Soils on bedrock-controlled landforms are typically comprised of volcanic or tuffaceous sedimentary colluvium over residuum.

Biological Resources
This area supports extensive areas of salt-desert shrub vegetation. Shadscale and Bailey's greasewood are widespread, occurring both individually and together. Grasses are generally sparse, although Indian ricegrass is prominent, especially on the sandy soils. Fourwing saltbush, winterfat, spiny hopsage, wolfberry, ephedra, dalea, and bud sagebrush are common shrubs. Basin wildrye, creeping wildrye, alkali sacaton, saltgrass, black greasewood, rubber rabbitbrush, and big saltbush are important plants on saline bottom lands and terraces. A few marsh areas support cattail, bulrushes, sedges, and rushes. Big sagebrush, along with scattered Utah juniper and singleleaf pinyon, is associated with Thurber needlegrass, desert needlegrass, Sandberg bluegrass, and squirreltail on the higher elevation piedmont slopes and mountains.

Ecological site concept

The Loamy 10-12 P.Z. site occurs on mountain sideslopes. Slope gradients of less than15 percent are typical. Elevations are 5200 to 7800 feet. The soils are moderately deep and well drained.

Associated sites

R027XY054NV	**LOAMY SLOPE 10-12 P.Z.** Less productive site; steeper slopes

Similar sites

R027XY007NV	**LOAMY SLOPE 8-10 P.Z.** Less productive site; ACHY major grass
R027XY072NV	**GRANITIC SLOPE 10-12 P.Z.** Less productive site; granitic PM
R027XY073NV	**GRANITIC SLOPE 12-14 P.Z.** LECI4 minor grass, if present; higher elevations; granitic PM

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis* (2) *Artemisia tridentata ssp. vaseyana*
Herbaceous	(1) *Achnatherum thurberianum* (2) *Leymus cinereus*

Physiographic features

The Loamy 10-12 P.Z. site occurs on mountain sideslopes. Slopes range from 8 to 75 percent, but slope gradients of 4 to 15 percent are most typical. Elevations are 5200 to 7800 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Plateau
Runoff class	High to very high
Elevation	1,585–2,377 m
Slope	8–75%

Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is semiarid with cool, moist winters and warm, dry summers. Average annual precipitation is 10 to 12 inches. Mean annual temperatures are 42 to 53 degrees F. The average growing season is about 90 to 120 days. There is no climate station available for this site.

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	
Precipitation total (average)	305 mm

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are moderately deep and well drained. They formed in colluvium over residuum from granitic rocks. The soils typically have a mollic epipedon and are skeletal in the control section. Soil reaction is neutral or slightly alkaline and the soils noncalcareous throughout. The available water capacity is very low and surface runoff is high to very high. Potential for sheet and rill erosion is high. The soil moisture regime is aridic bordering on xeric and the soil temperature regime is frigid. Associated soil series are Madeline and Say.

The representative soil series is Say, a fine-loamy, mixed, superactive, frigid Aridic Argixerolls. A mollic epipedon occurs from the soil surface to 23 cm and an argillic horizon occurs from 30 to 48 cm.

Table 4. Representative soil features

Parent material	(1) Residuum–granite (2) Colluvium–granite
Surface texture	(1) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate
Soil depth	51–102 cm
Surface fragment cover <=3"	5–10%
Surface fragment cover >3"	0–8%
Available water capacity (0-101.6cm)	5.84–8.89 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.2–7.8

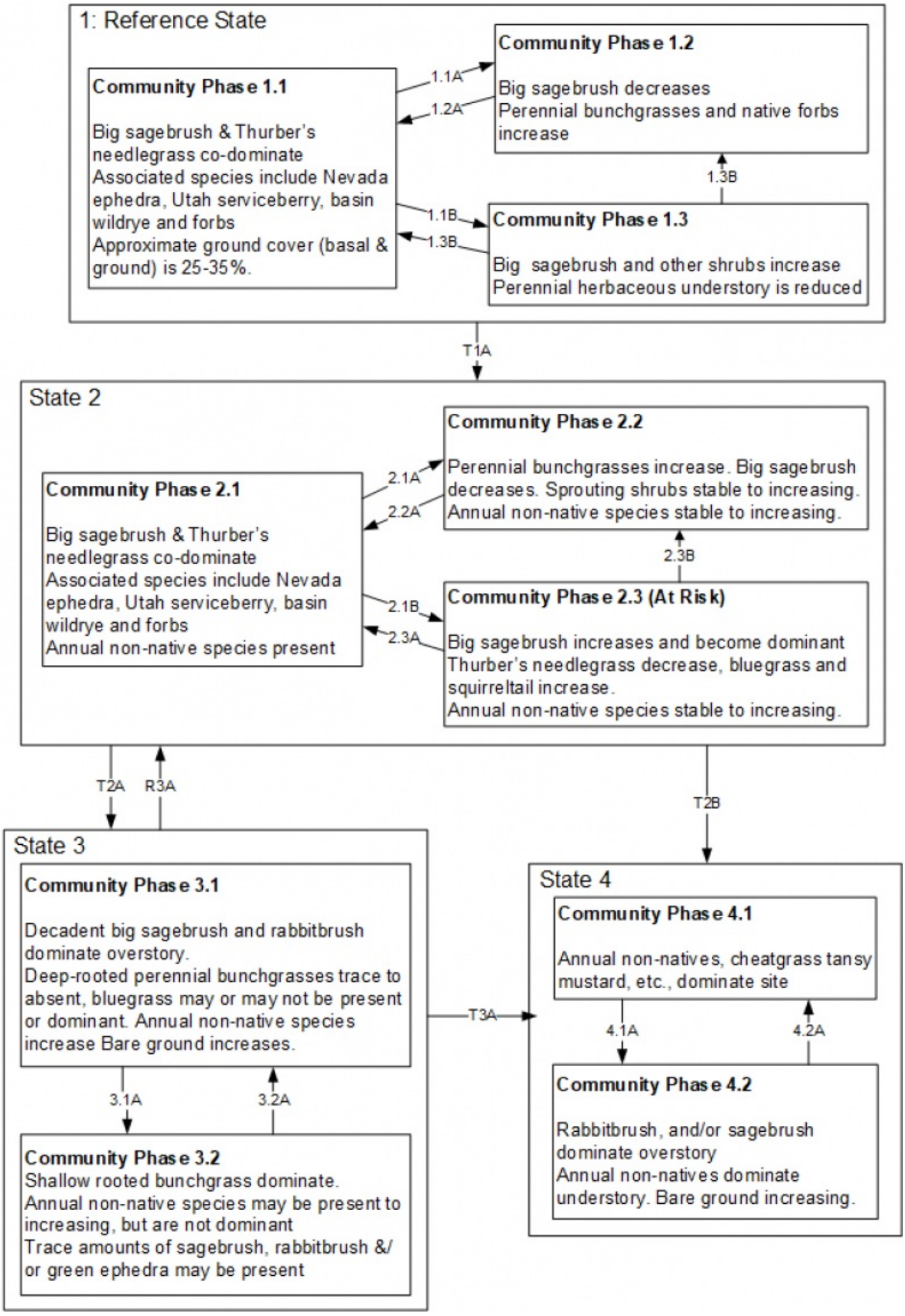
Subsurface fragment volume <=3" (Depth not specified)	10–25%
Subsurface fragment volume >3" (Depth not specified)	3–20%

Ecological dynamics

Where management results in abusive grazing use by livestock or feral horses, Thurber's needlegrass composition declines and is replaced by bluegrasses and bottlebrush squirreltail as the dominant understory grasses. Cheatgrass and other annuals will often dominate the understory as big sagebrush and Douglas' rabbitbrush increase in the overstory with degraded ecological condition. Where site degradation has been fire-induced, broom snakeweed, horsebrush, and rabbitbrush often dominate the site. In the absence of periodic, natural, wildfire, singleleaf pinyon and Utah juniper commonly encroach onto this site.

Fire Ecology:
The fire return interval for Wyoming big sagebrush communities ranges from 10 to over 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.
Mountain big sagebrush is highly susceptible to injury from fire. It is often top-killed by fire and will not resprout.
Thurber’s needlegrass is classified as moderately resistant, but depending on season of burn, phenology, and fire severity, this perennial bunchgrass is moderately to severely damaged by fire. Early season burning is more damaging to this needlegrass than late season burning.
Basin wildrye is top-killed by fire. Older basin wildrye plants with large proportions of dead material within the perennial crown can be expected to show higher mortality due to fire than younger plants having little debris. Basin wildrye is generally tolerant of fire but may be damaged by early season fire combined with dry soil conditions.

State and transition model


1: Reference State
Community Phase 1.1
Big sagebrush & Thurber's needlegrass co-dominate
Associated species include Nevada ephedra, Utah serviceberry, basin wildrye and forbs
Approximate ground cover (basal & ground) is 25-35%.
1.1A
1.2A
Community Phase 1.2
Big sagebrush decreases
Perennial bunchgrasses and native forbs increase
1.3B
1.1B
1.3B
Community Phase 1.3
Big sagebrush and other shrubs increase
Perennial herbaceous understory is reduced
T1A
State 2
Community Phase 2.1
Big sagebrush & Thurber's needlegrass co-dominate
Associated species include Nevada ephedra, Utah serviceberry, basin wildrye and forbs
Annual non-native species present
2.1A
2.2A
Community Phase 2.2
Perennial bunchgrasses increase. Big sagebrush decreases. Sprouting shrubs stable to increasing.
Annual non-native species stable to increasing.
2.3B
2.1B
2.3A
Community Phase 2.3 (At Risk)
Big sagebrush increases and become dominant
Thurber's needlegrass decrease, bluegrass and squirreltail increase.
Annual non-native species stable to increasing.
T2A
R3A
T2B
State 3
Community Phase 3.1
Decadent big sagebrush and rabbitbrush dominate overstory.
Deep-rooted perennial bunchgrasses trace to absent, bluegrass may or may not be present or dominant. Annual non-native species increase Bare ground increases.
3.1A
3.2A
Community Phase 3.2
Shallow rooted bunchgrass dominate.
Annual non-native species may be present to increasing, but are not dominant
Trace amounts of sagebrush, rabbitbrush &/ or green ephedra may be present
T3A
State 4
Community Phase 4.1
Annual non-natives, cheatgrass tansy mustard, etc., dominate site
4.1A
4.2A
Community Phase 4.2
Rabbitbrush, and/or sagebrush dominate overstory
Annual non-natives dominate understory. Bare ground increasing.

Reference State 1.0: The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. 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/mountain big sagebrush and Thurber's needlegrass dominate the site. Indian ricegrass, Sandberg bluegrass, Nevada ephedra and Utah serviceberry are important associated species. Forbs are present but not abundant. This site is tolerant of dry conditions, but prolonged drought will result in an overall decline, with possible mortality, in the plant community.
Community Phase Pathway 1.1a: Fire would decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fine fuel loads.
Community Phase Pathway 1.1b: Natural regeneration over time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Long-term drought, herbivory, or combinations of these would cause a decline in perennial bunchgrasses and fine fuels and lead to a reduced fire frequency allowing big sagebrush to dominate the site.

Community Phase 1.2: This community phase is characteristic of a post-disturbance, early seral community phase. Thurber's needlegrass and other perennial grasses dominate. Depending on fire severity patches of intact sagebrush may remain.
Community Phase Pathway 1.2a: Absence of disturbance over time coupled with natural regeneration allows sagebrush to increase. Patches of mature sagebrush required for a seed source are important for recovery to community phase 1.1.

Community Phase 1.3:
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 and/or from herbivory.
Community Phase 1.3a: Fire decreases or eliminates overstory of sagebrush and allow the perennial bunchgrasses to dominate. Fires would typically be low severity resulting in a mosaic pattern due to low fine 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. 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 1.3b: A low severity/patchy fire reduces the sagebrush overstory and create a sagebrush/grass mosaic with sagebrush and perennial bunchgrasses co-dominant.

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, mustards, bur buttercup and halogeton.
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.

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 non-natives. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks 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 Phase 2.1: Big sagebrush and Thurber's needlegrass dominate the site. Indian ricegrass and squirreltail may be significant components while Sandberg bluegrass and forbs are less common. Non-native annual species present.
Community Phase Pathway 2.1a: Fire reduces the shrub overstory and allows for perennial bunchgrasses to dominate the site. 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. A severe infestation of Aroga moth could also cause a large decrease in sagebrush In sagebrush cover, reducing competition with perennial grasses and forbs. Annual non-native species are likely to increase after fire.
Community Phase Pathway 2.1b: Natural regeneration over time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Chronic drought reduces fine fuels and leads to a reduced fire frequency allowing big sagebrush to dominate the site. Inappropriate grazing management reduces the perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory depending on grazing management.

Community Phase 2.2: This community phase is characteristic of a post-disturbance, early seral community phase. Thurber's needlegrass and other perennial grasses dominate. Big sagebrush is present in trace amounts. Depending on fire severity or intensity of Aroga moth infestations, patches of intact sagebrush may remain. Rabbitbrush may be sprouting. Annual non-native species generally respond well after fire and may be stable or increasing within the community.
Community Phase Pathway 2.2a: Natural regeneration over time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of big sagebrush can take many years and is dependent on multiple years of favorable weather conditions.

Community Phase 2.3 (at risk): This community is at risk of crossing a threshold to another state. Sagebrush dominates the

Community Phase 2.3 (at risk): This community is at risk of crossing a threshold to another state. Sagebrush dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing management, or both. Rabbitbrush may be a significant component. Sandberg bluegrass may increase and become co-dominate with deep rooted bunchgrasses. Annual non-natives species may be stable or increasing due to lack of competition with perennial bunchgrasses. This site is susceptible to further degradation from excessive grazing, prolonged drought, and/or fire.

Community Phase Pathway 2.3a: A change in grazing management that decreases shrubs would allow the perennial bunchgrasses in the understory to increase. Brush management with minimal soil disturbance would also decrease sagebrush and release the perennial understory. Low intensity/patchy fire may create a sagebrush-grass mosaic. Annual non-native species are present and may increase in the community.

Community Phase Pathway 2.3b: Fire would decrease or eliminate the overstory of sagebrush and allow the perennial bunchgrasses to dominate the site. 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.

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 favors an increase in sagebrush.
Slow variables: Long term decrease in deep-rooted perennial grass density.
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 Annual State 4.0
Trigger: To Community Phase 4.1: Severe fire and/or soil disturbing treatments. To Community Phase 4.2: Inappropriate grazing management that favors shrubs in the presence of non-native species.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs truncates, spatially and temporally, nutrient capture and cycling within the community. Increased, continuous fine fuels from annual non-native plants modify the fire regime by changing intensity, size and spatial variability of fires.

Shrub State 3.0:
This state is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Sandberg bluegrass may increase with a reduction in deep rooted perennial bunchgrass competition and may become the dominate grass or the herbaceous understory may be completely eliminated. Sagebrush cover exceeds site concept and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory dominates site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed. Bare ground may be significant with soil redistribution occurring between interspace and canopy locations.

Community Phase 3.1:
Big sagebrush dominates overstory and rabbitbrush may be a significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent. Sandberg bluegrass may dominate the understory. Annual nonnative species are present and may be co-dominant. Bare ground is significant.
Community Phase Pathway 3.1a: Fire, heavy fall grazing causing mechanical damage to shrubs, and/or brush treatments with minimal soil disturbance, will greatly reduce the overstory shrubs to trace amounts and allow Sandberg bluegrass to dominate the site.
Community Phase 3.2:
Bluegrass dominates the site; annual non-native species may be present but are not dominant. Trace amounts of sagebrush may be present. Sprouting shrubs such as Nevada ephedra, Utah serviceberry, Anderson's peachbrush or rabbitbrush may be dominant.
Community Phase Pathway 3.2a: Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The re-establishment of big sagebrush can take many years.

T3A: Transition from Shrub State 3.0 to Annual State 4.0
Trigger: Severe/repeated fire and/or soil disturbing treatments. Possible soil disturbing treatments include attempted restoration with drought tolerant perennials, such as crested wheatgrass. Restoration attempts causing soil disturbance will likely initiate a transition to an annual state. Probability of success very low. Inappropriate grazing management in the presence of annual non-native species.
Slow variables: Increased production and cover of non-native annual 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 spatially and temporally thus impacting nutrient cycling and distribution.

R3A: Restoration from Shrub State 3.0 to Current Potential State 2.0
Brush management with minimal soil disturbance, coupled with seeding of deep rooted perennial native bunchgrasses. Probability of success very low.

Annual State 4.0:
This community is characterized by the dominance of annual non-native species such as cheatgrass and tansy mustard in the understory. Sprouting shrubs such as rabbitbrush, ephedra, etc. may dominate the overstory.

Community Phase 4.1
Annual non-native plants such as cheatgrass or tansy mustard dominate the site. Rabbitbrush may or may not be present.
Community Phase Pathway 4.1a: Time and lack of fire allows for the sagebrush to establish. Probability of sagebrush establishment is extremely low.
Community Phase 4.2: Sprouting shrubs such as spiny hopsage and Rabbitbrush along with broom snakeweed dominate overstory. Big sagebrush may be a minor component. Annual non-native species dominate understory. Trace amounts of desirable bunchgrasses may be present. Bare ground is significant.
Community Phase Pathway 4.2a: Fire eliminates shrubs and allows for annual non-native species to dominate the site.

State 1
Reference State

Community 1.1
Reference Plant Community

The reference plant community is dominated by mountain and/or Wyoming big sagebrush, Thurber's needlegrass, and basin wildrye. 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 (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	471	673	807
Shrub/Vine	235	336	404
Forb	78	112	135
Total	**784**	**1121**	**1346**

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			527–785	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	448–560	–
	basin wildrye	LECI4	*Leymus cinereus*	56–168	–
	Sandberg bluegrass	POSE	*Poa secunda*	22–56	–
2	**Secondary Perennial Grasses**			22–112	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	6–34	–
	squirreltail	ELEL5	*Elymus elymoides*	6–34	–
	needle and thread	HECO26	*Hesperostipa comata*	6–34	–
Forb					
3	**Perennial Forbs**			39–118	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	6–34	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	6–34	–
	buckwheat	ERIOG	*Eriogonum*	6–34	–
	lupine	LUPIN	*Lupinus*	6–34	–
	phlox	PHLOX	*Phlox*	6–34	–
Shrub/Vine					
4	**Primary Shrubs**			157–235	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	78–118	–
5	**Secondary Shrubs**			4–50	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	6–34	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–34	–
	mormon tea	EPVI	*Ephedra viridis*	6–34	–
	desert peach	PRAN2	*Prunus andersonii*	6–34	–
Tree					
6	**Evergreen**			11–67	
	Utah juniper	JUOS	*Juniperus osteosperma*	6–34	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	6–34	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass and palatable shrub production. Thurber’s needlegrass species begin growth early in the year and remain green throughout a relatively long growing season. This pattern of development enables animals to use Thurber’s needlegrass when many other grasses are unavailable. Cattle prefer Thurber’s needlegrass in early spring before fruits have developed as it becomes less palatable when mature. Thurber’s needlegrasses are grazed in the fall only if the fruits are softened by rain.
The early growth and abundant production of basin wildrye make it a valuable source of forage for livestock. It is important forage for cattle and is readily grazed by cattle and horses in early spring and fall. Though coarse-textured during the winter, basin wildrye may be utilized more frequently by livestock and wildlife when snow has covered low shrubs and other grasses.
Sandberg 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:
Thurber needlegrass is valuable forage for wildlife.
Basin wildrye provides winter forage for mule deer, though use is often low compared to other native grasses. Basin wildrye provides summer forage for black-tailed jackrabbits. Because basin wildrye remains green throughout early summer, it remains available for small mammal forage for longer time than other grasses.
Sandberg bluegrass is desirable for pronghorn antelope and mule deer in the spring and preferable in the spring, summer, and fall for elk and desirable as part of their winter range.

Hydrological functions

Runoff is high to very high. Permeability is slow.

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 camping and hiking and has potential for upland and big game hunting.

Other products

Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand.

Other information

Basin wildrye is useful in mine reclamation, fire rehabilitation and stabilizing disturbed areas. Its usefulness in range seeding, however, may be limited by initially weak stand establishment.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T25N R35E S36
General legal description	Cottonwood Canyon area, Stillwater Range, Churchill County, Nevada.
Location 2: Pershing County, NV	
Township/Range/Section	T31N R37E S30
General legal description	Klondike Pass area, East Humboldt Range, Pershing County, Nevada.

Other references

Fire Effects Information System (Online; http://www.fs.fed.us/database/feis/plants/).

USDA-NRCS Plants Database (Online; http://www.plants.usda.gov).

Contributors

GKB

Approval

Kendra Moseley, 6/03/2024

Rangeland health reference sheet

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

Author(s)/participant(s)	Patti Novak-Echenique
Contact for lead author	State Rangeland Management Specialist
Date	07/19/2013
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are none to rare. A few rills can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare but can be expected in areas subjected to summer convection storms or rapid snowmelt usually on steeper slopes.

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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.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 20-50% depending on amount of surface rock fragments

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Some wind-scouring may occur after wildfires.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual & perennial forbs) expected to move distance of slope length during intense summer convection storms or rapid snowmelt events. Persistent litter (large woody material) will remain in place except during large rainfall events.

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 moderate fine platy. Soil surface colors are browns and soils are typified by a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically <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., Thurber's needlegrass, basin wildrye] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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

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

    Dominant: Deep-rooted, cool season, perennial bunchgrasses

    Sub-dominant: tall shrubs (big sagebrush) > associated shrubs > shallow-rooted, cool season, perennial bunchgrasses > deep-rooted, cool season, perennial forbs > fibrous, shallow-rooted, cool season, perennial and annual forbs

    Other: evergreen trees

    Additional: After wildfires, deep-rooted, cool season perennial bunchgrasses, sprouting shrubs (ephedra, rabbitbrush) and forbs will dominate. Sagebrush will be removed for 5 to 10 years.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<10%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (± 25%) and litter depth is <¼ inch.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through June) ± 1000 lbs/ac; Favorable years ± 1200 lbs/ac and unfavorable years ± 700 lbs/ac

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

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