USDA Natural Resources
Conservation Service

Ecological site R027XY046NV
COBBLY CLAYPAN 12-14 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 Cobbly Claypan 12-14 P.Z. site occurs on mountain summits and sideslopes on all aspects. Slopes gradients of 30 to 75 percent are typical. Elevations are 5500 to 8700 feet. The soils are typically very deep and well drained. An argillic horizon that restricts root development is present within 10 to 14 inches of the surface. The soil surface is stony, cobbly or very gravelly with more than 65 percent total surface cover of rock fragments.

Associated sites

R027XY083NV	**MOUNTAIN RIDGE** Less productive site

Similar sites

R027XY020NV	**SHALLOW CLAYPAN 8-10 P.Z.** ARARL3 dominant shrub; ACSP12 dominant grass
R027XY079NV	**GRAVELLY CLAYPAN 8-10 P.Z.** ARARL3 dominant grass; ACTH7 dominant grass
R027XY070NV	**DROUGHTY CLAYPAN 8-10 P.Z.** ARARL3 dominant shrub; SAVEB major shrub
R027XY068NV	**GRANITIC CLAYPAN 8-10 P.Z.** ARARL3 dominant shrub; ACSP12 dominant grass
R027XY087NV	**CLAYPAN 14+ P.Z.** More productive site; surface rock fragments typically <45%; gentler slopes
R027XY049NV	**COBBLY CLAYPAN 8-10 P.Z.** ACTH7 dominant grass

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula*
Herbaceous	(1) *Festuca idahoensis*

Physiographic features

The Cobbly Claypan 12-14 P.Z. site occurs on mountain summits and sideslopes on all aspects. Slopes range from 4 to 75 percent, but slope gradients of 30 to 75 percent are typical. Elevations are 5500 to 8700 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope
Runoff class	Very high
Elevation	1,676–2,652 m
Slope	4–75%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is 12 to 14 (16) inches. Mean annual air temperature is 40 to 48 degrees F. The average growing season is about 70 to 100 days. There is no climate station available for this site.

Table 3. Representative climatic features

Frost-free period (average)	100 days
Freeze-free period (average)	
Precipitation total (average)	356 mm

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site have formed in residuum and colluvium from volcanic rocks. These soils are typically very deep and well drained. An argillic horizon that restricts root development is present within 10 to 14 inches of the surface. The soil surface is stony, cobbly or very gravelly with more than 65 percent total surface cover of rock fragments. Available water capacity is very low to low. The moisture distribution is such that limits depth of wetting to about 15 to 20 inches in most years. The soil moisture regime is aridic bordering on xeric and the soil temperature regime is frigid. Permeability is very slow to moderately slow and surface runoff is very high. Potential for sheet and rill erosion is moderate. The soil series associated with this site include: Belate, Cleavage, Ninemile, and Walti.

The representative soil series is Belate, a loamy-skeletal, mixed, superactive, frigid Aridic Argixerolls. A mollic epipedon occurs from the soil surface to 46 cm and an argillic horizon occurs from 30 to 152 cm.

Table 4. Representative soil features

Parent material	(1) Colluvium–rhyolite (2) Residuum–andesite
Surface texture	(1) Very gravelly loam (2) Very gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderately slow
Soil depth	152–213 cm
Surface fragment cover <=3"	9–30%
Surface fragment cover >3"	2–5%
Available water capacity (0-101.6cm)	3.56–12.45 cm

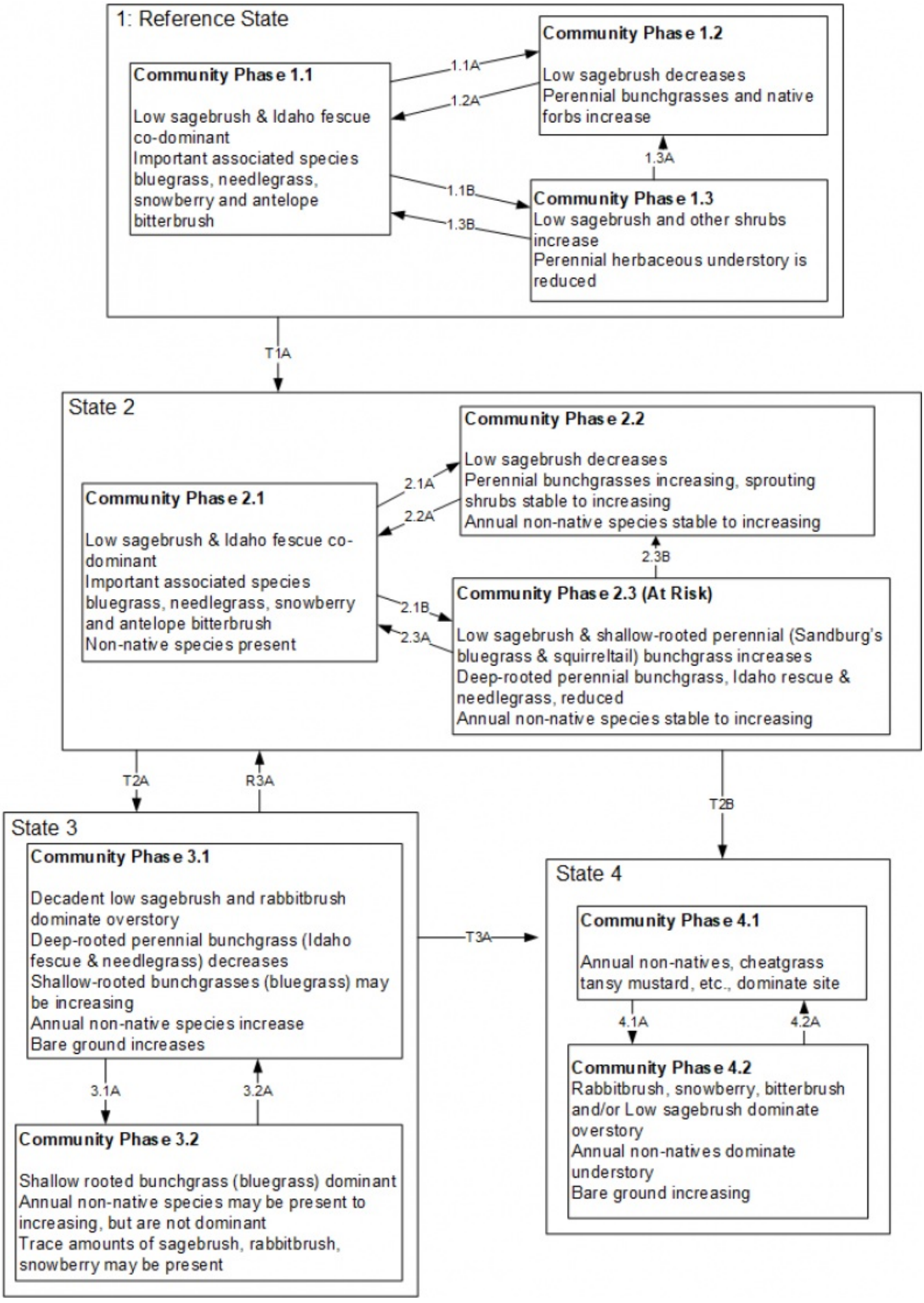
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.8–7.8
Subsurface fragment volume <=3" (Depth not specified)	25–55%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

As ecological condition deteriorates, Idaho fescue, needlegrass, and fibrous-rooted perennial forbs decrease, while rabbitbrush, snowberry and low sagebrush increase. Bluegrasses will initially increase in the shrub understory as Idaho fescue and needlegrass are displaced. Species likely to invade this site are cheatgrass, singleleaf pinyon and Utah juniper.

Fire Ecology:
Prior to 1897, mean fire return intervals for low sagebrush communities have been estimated to be from 35 to over 100 years. Fire most often occurs during wet years with high forage production. Low sagebrush is very susceptible to fire damage. Low sagebrush is usually killed by fire and does not re-sprout. The recovery in burned areas is usually via small, light, wind-dispersed seed for all low sagebrush subspecies. Partially injured low sagebrush may re-grow from living branches, but sprouting does not occur.
Idaho fescue grows in a dense, fine-leaved tuft. Fires tend to burn within the accumulated fine leaves at the base of the plant and may produce temperatures sufficient to kill some of the root crown. Mature Idaho fescue plants are commonly reported to be severely damaged by fire in all seasons.

State and transition model



Reference State 1.0: This state is a representative of the natural range of variability under pristine conditions. State dynamics

are maintained by interactions between climatic patterns and disturbance regimes, including fires set by Native peoples. 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:
Low sagebrush and Idaho fescue co-dominate. Bluegrass and needlegrass species are common. Associated shrubs include snowberry and antelope bitterbrush.
Community Phase Pathway 1.1a: Fire would decrease or eliminate the overstory of sagebrush and allows perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring may be more severe and reduce sagebrush cover to trace amounts.
Community Phase Pathway 1.1b: 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. Idaho fescue, Cusick's bluegrass, muttongrass and needlegrass dominate. Depending on severity/type of disturbance 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:
Sagebrush cover 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 would decrease or eliminate the overstory of sagebrush and allows perennial bunchgrasses to recover. Under natural conditions fires are typically low severity resulting in a mosaic pattern due to low fine fuel loads. A fire following an unusually wet spring 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 creates 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 species such as cheatgrass, mustards, etc.
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: Low sagebrush and Idaho fescue dominate the site. Bluegrass and needlegrass species are common. Associated shrubs include snowberry and antelope bitterbrush. Non-native annual species are present.
Community Phase Pathway 2.1a: Fire reduces 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. 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 sagebrush to dominate the site. Inappropriate growing season grazing reduces the deep-rooted perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory depending on grazing management. Excessive sheep grazing favors Sandberg bluegrass; however, where cattle and/or horses are the dominant grazers, cheatgrass often increases.

Community Phase 2.2: This community phase is characteristic of a post-disturbance, early seral community phase. Idaho fescue and other perennial grasses dominate. Sagebrush may or may not be present in trace amounts. Rabbitbrush and snowberry may be sprouting. Forbs may increase post-fire but will likely return to pre-burn levels within a few years. Annual non-native species are 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 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 deep-rooted perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing management, or from 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 perennial bunchgrasses in the understory to increase. Heavy late-fall/winter grazing may cause mechanical damage and subsequent death to sagebrush, facilitating an increase in the herbaceous understory. An infestation of Aroga moth or a low severity fire would reduce some sagebrush overstory and allow perennial grasses to increase in the community. Brush management with minimal soil disturbance would also decrease sagebrush and release the herbaceous perennial understory. 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 perennial bunchgrasses to dominate the site. Fires would typically be small and patchy due to low fuel loads. A fire following an unusually wet spring or a change in management may be more severe and reduce sagebrush cover to trace amounts.

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 that cause Lahontan sagebrush mortality. 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 dominates the overstory and rabbitbrush, snowberry and/or bitterbrush may be a significant component. 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:
Sagebrush dominates overstory and rabbitbrush, snowberry and/or bitterbrush may be a significant component. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Sandberg bluegrass may dominate the understory. Annual non-native 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 rabbitbrush, snowberry and/or bitterbrush may be increasing.
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 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. Mechanical bush management, mowing, etc., should be considered carefully.

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 and snowberry 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 rabbitbrush, snowberry and/or bitterbrush dominate overstory. Low 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 removes sagebrush 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 low sagebrush and Idaho fescue. Potential vegetative composition is about 55% grasses, 10% forbs and 35% shrubs and trees. Approximate ground cover (basal and crown) is 15 to 25 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	154	247	370
Shrub/Vine	99	157	235
Forb	28	45	67
Total	**281**	**449**	**672**

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**			157–269	
	Idaho fescue	FEID	*Festuca idahoensis*	112–157	–
	Cusick's bluegrass	POCU3	*Poa cusickii*	8–22	–
	muttongrass	POFE	*Poa fendleriana*	8–22	–
	Sandberg bluegrass	POSE	*Poa secunda*	7–22	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	11–22	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	11–22	–
2	**Secondary Perennial Grasses**			9–22	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	2–13	–
	squirreltail	ELEL5	*Elymus elymoides*	2–13	–
Forb					
3	**Perennial Forbs**			22–67	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	2–18	–
	hawksbeard	CREPI	*Crepis*	2–18	–
	buckwheat	ERIOG	*Eriogonum*	2–18	–
	lupine	LUPIN	*Lupinus*	2–18	–
	phlox	PHLOX	*Phlox*	2–18	–
Shrub/Vine					
4	**Primary Shrubs**			90–135	
	little sagebrush	ARAR8	*Artemisia arbuscula*	90–135	–
5	**Secondary Shrubs**			13–49	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	2–13	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	2–13	–
	snowberry	SYMPH	*Symphoricarpos*	2–13	–
Tree					
6	**Evergreen**			4–18	
	Utah juniper	JUOS	*Juniperus osteosperma*	2–9	–
	singleleaf pinyon	PIMO	*Pinus monophylla*	2–9	–

Animal community

Livestock Interpretation:
This site is suitable for livestock grazing. Grazing management should be keyed to Idaho fescue. Idaho fescue provides important forge for many types of domestic livestock. The foliage cures well and is preferred by livestock in late fall and winter.
Domestic sheep and to a much lesser degree cattle consume low sagebrush, particularly during the spring, fall and winter.

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:
Idaho fescue provides important forge for several wildlife species. It is reported to be good forage for pronghorn, and deer in ranges of northern Nevada.
Low 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 low sagebrush, particularly in winter and early spring.

Hydrological functions

Runoff is very high. Permeability is very slow to moderately 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 information

Low sagebrush can be successfully transplanted or seeded in restoration.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Churchill County, NV	
Township/Range/Section	T20N R33E S27
General legal description	South fork of Pete's Canyon, Stillwater Range, Churchill 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

DK/GD

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)	P NOVAK-ECHENIQUE
Contact for lead author	State Rangeland Management Specialist

Date	07/12/2012
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. Rock fragments armor the surface.

2. **Presence of water flow patterns:** Waterflow patterns are none to rare. Rock fragments armor the 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 an indicator of soil erosion.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground ± 5-20%, depending on amount of surface rock fragments

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

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 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 very fine to thick platy or subangular blocky. Soil surface colors are dark gray-browns and soils have a mollic epipedon. Organic matter of the surface 2 to 4 inches is typically less than 1 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., Idaho fescue]) slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact. Snow catch and accumulation is limited on windswept slopes.

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. Massive sub-surface structure or subsoil argillic horizons are not to be interpreted as compacted.

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

    Dominant: Deep-rooted, cool season, perennial bunchgrasses > low shrubs (low sagebrush)

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

    Other: evergreen trees

    Additional: After wildfires, perennial bunchgrasses and forbs dominate. Low sagebrush is removed for several years.

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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 (<10%) have dead centers.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 400 lbs/ac; Favorable years ± 600 lbs/ac; Unfavorable years ± 250 lbs/ac

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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:** Potential invaders include halogeton, 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. Reduced growth and reproduction occur during extreme or extended drought periods.
