USDA Natural Resources
Conservation Service

Ecological site R023XY090NV
CLAY PLAIN

Last updated: 4/10/2025
Accessed: 12/19/2025

General information

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

Ecological site concept

Currently there is only a draft of the initial concept for this ecological site. The initial concept for this site places it within the Shallow and Mod Deep >12” PZ Low and Lahontan sagebrush and Idaho fescue Ecological Site Group. To view the General STM and other information available for this ESG please go to https://edit.jornada.nmsu.edu/catalogs/esg/023X/R023XY902OR

This site occurs on the outer margins of lake plains and basin floors. Slope gradients of 0 to 2 percent are typical. The soils of this site have formed in lacustrine sediments as well as alluvium from mixed rock sources. These soils have a layer restrictive to root development at a very shallow depth. This site is found on low-lying positions that receive run-in moisture from higher landscapes. The soils are thus subject to ponding (saturated soil conditions) for brief periods in the spring. Early sagebrush (Artemisia arbuscula ssp. longicaulis) is the dominant shrub. Dominant grasses include western needlegrass, bottlebrush squirreltail, bluegrass. Basin wildrye is also an important grass on this site. Following disturbance such as fire and/or hoof action from grazing this site is susceptible to wind erosion. Management after disturbance may require seeding of species to reduce erosion. This site does not have a tree state, however it has an eroded state and is a 4-state model.

Associated sites

R023XY003NV	**CLAY BASIN**
R023XY005NV	**DRY FLOODPLAIN**
R023XY006NV	**LOAMY 8-10 P.Z.**

R023XY023NV	**WET CLAY BASIN**
R023XY082NV	**LOAMY FAN 10-12 P.Z.**

Similar sites

R023XY031NV	**CLAYPAN 10-14 P.Z.** PSSPS-ACTH7 codominant; ARAR8 not ARARL
R023XY059NV	**GRAVELLY CLAYPAN 10-12 P.Z.** ARAR8 not ARARL; different landscapes
R023XY078NV	**ASHY CLAYPAN 10-14 P.Z.** ACTH7-PSSPS codominant; ARAR8 not ARARL; different landscapes
R023XY017NV	**CLAYPAN 14-16 P.Z.** PSSPS-FEID codominant ARAR8 not ARARL; different landscapes
R023XY079NV	**ASHY CLAYPAN (COOL) 10-14 P.Z.** FEID dominant; different landscapes; ARAR8 not ARARL
R023XY021NV	**SCABLAND 10-14 P.Z.** POSE dominant grass; less productive site; different landscapes; ARAR8 not ARARL

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula ssp. longiloba*
Herbaceous	(1) *Achnatherum thurberianum* (2) *Poa cusickii ssp. epilis*

Physiographic features

This site occurs on the outer margins of lake plains and alluvial flats. Slope gradients of 0 to 2 percent are typical. Elevations are 4700 to 6200 feet.

Table 2. Representative physiographic features

Landforms	(1) Lake plain (2) Alluvial flat
Elevation	1,433–1,890 m
Slope	0–2%
Water table depth	168–213 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 12 inches. Mean annual air temperature is 42 to 44 degrees F. The average growing season is about 60 to 90 days.

Nevada's climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada's climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating. Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Average annual precipitation is 16 to over 20 inches. Mean annual air temperature is 41 to 44 degrees F. The average growing season is about 50 to 70 days.

Mean annual precipitaion at the Bear Creek, Nevada SNOTEL station (170501020301) is 37.69 inches.

monthly mean precipitation is:
January 3.84; February 3.75; March 4.38; April 4.9;
May 3.99; June 2.82; July .95; August 1.66;
September 1.22; October 2.12;
November 3.67; December 4.38.

Table 3. Representative climatic features

Frost-free period (average)	75 days
Freeze-free period (average)	
Precipitation total (average)	254 mm

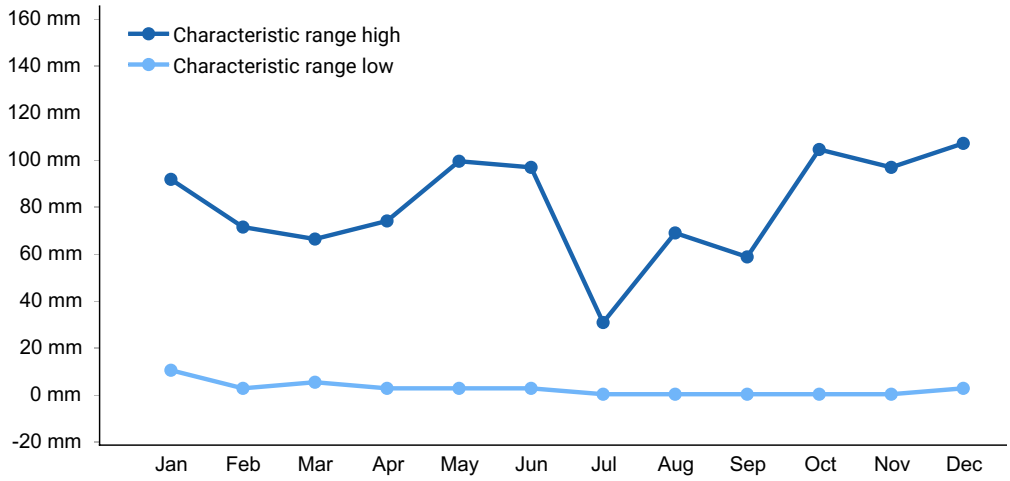


Figure 1. Monthly precipitation range

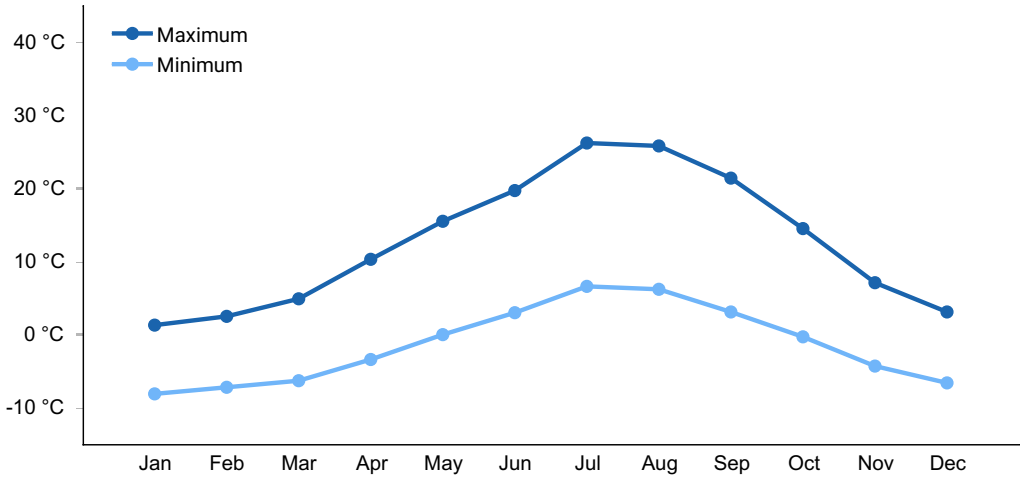


Figure 2. Monthly average minimum and maximum temperature

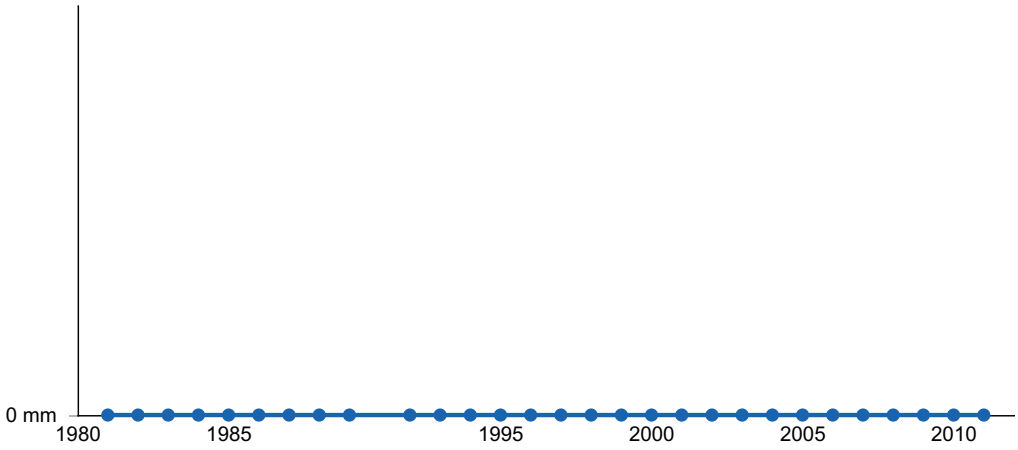


Figure 3. Annual precipitation pattern

Influencing water features

This site is found on low-lying positions that receive run-in moisture from higher landscapes. The soils are thus subject to ponding (saturated soil conditions) for brief periods in the spring.

Soil features

The soils associated with this site have formed in lacustrine sediments as well as alluvium from mixed rock sources. The soils are very deep and moderately well drained. These soils have a layer restrictive to root development at a very shallow depth. This site is found on low-lying positions that receive run-in moisture from higher landscapes. The soils are thus subject to ponding (saturated soil conditions) for brief periods in the spring. The soil series associated with this site include: Macyflet.

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained
Permeability class	Very slow
Soil depth	183–213 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	15.24–15.49 cm
Calcium carbonate equivalent (0-101.6cm)	0%

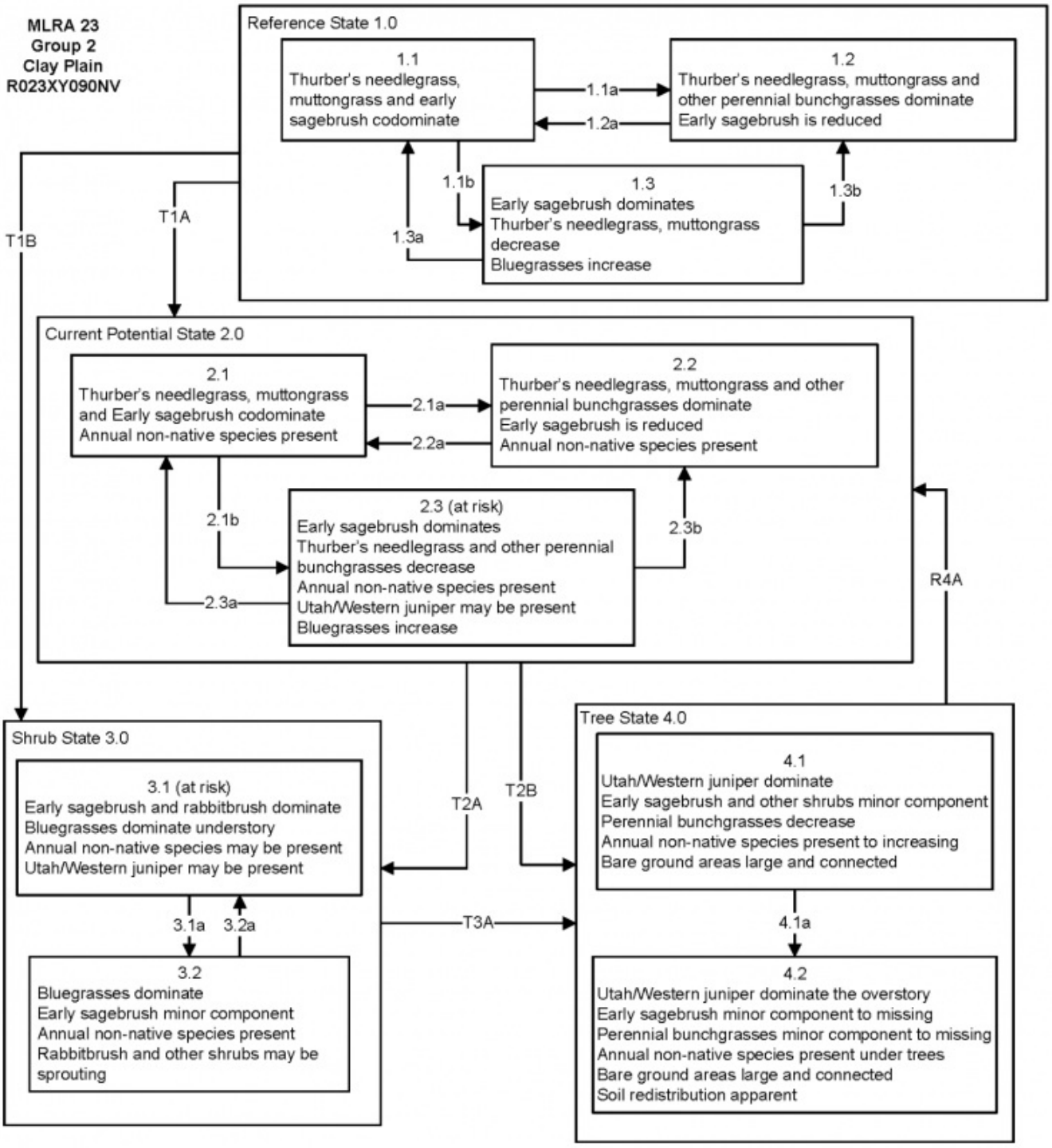
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-101.6cm)	6.1–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Where management results in abusive use by livestock and/or feral horses, rabbitbrush and sagebrush increase, as palatable forage grasses and forbs decline. Sandberg's bluegrass and early sagebrush increase in the plant community and eventually become the dominant vegetation on this site as ecological condition declines.

Fire Ecology:
The mean fire return intervals for early sagebrush communities have been estimated to be from 35 to over 100 years. Fire most often occurs during wet years with high forage production. Early sagebrush is very susceptible to fire damage. Early 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 early sagebrush may re-grow from living branches, but sprouting does not occur. Western needlegrass is moderately damaged by fire. The recovery time is between 3 and 5 years. 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. Cusick's bluegrass is unharmed to slightly harmed by light-severity fall fires. Cusick's bluegrass regenerates after fire from seed and by tillering. 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. Nevada bluegrass is generally unharmed by fire. It produces little litter, and its small bunch size and sparse litter reduces the amount of heat transferred to perennating buds in the soil.

State and transition model


MLRA 23
Group 2
Clay Plain
R023XY090NV
Reference State 1.0
1.1
Thurber's needlegrass, muttongrass and early sagebrush codominate
1.1a
1.2a
1.2
Thurber's needlegrass, muttongrass and other perennial bunchgrasses dominate
Early sagebrush is reduced
1.1b
1.3a
1.3
Early sagebrush dominates
Thurber's needlegrass, muttongrass decrease
Bluegrasses increase
1.3b
T1A
T1B
Current Potential State 2.0
2.1
Thurber's needlegrass, muttongrass and Early sagebrush codominate
Annual non-native species present
2.1a
2.2a
2.2
Thurber's needlegrass, muttongrass and other perennial bunchgrasses dominate
Early sagebrush is reduced
Annual non-native species present
2.1b
2.3a
2.3 (at risk)
Early sagebrush dominates
Thurber's needlegrass and other perennial bunchgrasses decrease
Annual non-native species present
Utah/Western juniper may be present
Bluegrasses increase
2.3b
R4A
Shrub State 3.0
3.1 (at risk)
Early sagebrush and rabbitbrush dominate
Bluegrasses dominate understory
Annual non-native species may be present
Utah/Western juniper may be present
3.1a
3.2a
3.2
Bluegrasses dominate
Early sagebrush minor component
Annual non-native species present
Rabbitbrush and other shrubs may be sprouting
T2A
T2B
T3A
Tree State 4.0
4.1
Utah/Western juniper dominate
Early sagebrush and other shrubs minor component
Perennial bunchgrasses decrease
Annual non-native species present to increasing
Bare ground areas large and connected
4.1a
4.2
Utah/Western juniper dominate the overstory
Early sagebrush minor component to missing
Perennial bunchgrasses minor component to missing
Annual non-native species present under trees
Bare ground areas large and connected
Soil redistribution apparent

MLRA 23
Group 2
Clay Plain
R023XY090NV
KEY

Reference State 1.0 Community Phase Pathways
1.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community, dominated by grasses and forbs.
1.1b: Time and lack of disturbance such as fire or drought. Excessive herbivory would also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire and/or herbivory
1.3b: High severity fire significantly reduces sagebrush.

Transition T1A: Introduction of non-native species such as bulbous bluegrass, cheatgrass and thistles.
Transition T1B: Inappropriate grazing management (3.1). Fire or brush treatment; may be coupled with inappropriate grazing management (3.2).

Current Potential State 2.0 Community Phase Pathways
2.1a: Low severity fire creates grass/sagebrush mosaic; high severity fire significantly reduces sagebrush cover and leads to early/mid-seral community dominated by grasses and forbs; non-native annual species present.
2.1b: Time and lack of disturbance such fire or drought. Inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for shrub regeneration
2.3a: Low severity fire and/or late-fall/winter grazing management causing mechanical damage to sagebrush.
2.3b: High severity fire significantly reduces sagebrush. Brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.

Transition T2A: Inappropriate grazing management (3.1). Fire or brush treatment; may be coupled with inappropriate grazing management (3.2).
Transition T2B: Time and lack of fire allows Utah juniper and pinyon pine to establish and overtop the sagebrush, dominating site resources; may be coupled with inappropriate grazing management.

Shrub State 3.0 Community Phase Pathways
3.1a: Fire or brush management (i.e. mowing) with minimal soil disturbance.
3.2a: Time and lack of disturbance (unlikely to occur)

Transition T3A: Time and lack of fire allows Utah/Western juniper to establish and dominate site resources; may be coupled with inappropriate grazing management that reduces perennial grass density and increases tree establishment.

Tree State 4.0
4.1a: Time without disturbance allows maturation of the tree community

Restoration R4A: Tree removal would decrease tree cover and allow for the understory to recover (4.1)

State 1
Reference Plant Community

Community 1.1
Reference Plant Community

The reference plant community is dominated by Thurber's needlegrass, Cusick's bluegrass and early sagebrush. Basin wildrye is an important grass on this site. Potential vegetative composition is about 65% grasses, 10% forbs and 25% shrubs. Approximate ground cover (basal and crown) is about 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	328	510	656
Shrub/Vine	127	196	252
Forb	49	78	101
Total	**504**	**784**	**1009**

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**			184–690	
	Cusick's bluegrass	POCUE2	*Poa cusickii ssp. epilis*	157–235	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	98–138	–
	western needlegrass	ACOCO	*Achnatherum occidentale ssp. occidentale*	99–137	–
	basin wildrye	LECI4	*Leymus cinereus*	39–118	–
2	**Secondary Perennial Grasses/Grasslikes**			16–63	
	sedge	CAREX	*Carex*	4–16	–
	squirreltail	ELEL5	*Elymus elymoides*	4–16	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	4–16	–
	Sandberg bluegrass	POSE	*Poa secunda*	4–16	–
Forb					
3	**Perennial**			39–78	
	buckwheat	ERIOG	*Eriogonum*	4–24	–
	lupine	LUPIN	*Lupinus*	4–24	–
Shrub/Vine					
4	**Primary Shrubs**			118–196	
	little sagebrush	ARARL	*Artemisia arbuscula ssp. longiloba*	118–196	–
5	**Secondary Shrubs**			16–39	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–16	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass production. Western needlegrass has a spreading and deeply penetrating root system, which makes it resistant to trampling. 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. Cusick's bluegrass makes up only a small proportion of the biomass of the sagebrush communities in which it lives, but it is often taken preferentially by cattle, especially early in the season. 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. Nevada 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. Nevada 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. Early 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.

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:
Early 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 early sagebrush, particularly in winter and early spring. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Sage-grouse prefer mountain big sagebrush and Wyoming big sagebrush communities to basin big sagebrush communities. Western needlegrass provides valuable forage for many species of wildlife. Thurber needlegrass is valuable forage for wildlife. Deer, elk, and mountain goat also use Cusick's bluegrass early in the season. The value of Cusick's bluegrass as cover for small animals has been rated as poor to fair. 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. Nevada 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 medium to very high. Permeability is very slow. Hydrologic soil group is D. Rills and pedestals are rare. Frost heaving and shrink-swell soil activity that affects shallow rooted plants are not indicators of soil erosion. Slope gradients are typically less than 2% (1%) and water flow patterns are rare. Runoff is very slow with ponding common over

most of the area. Gullies are none to rare in areas of this site that occur on stable landforms. Where this site occurs adjacent to active stream channels, gullies and head cuts associated with channel entrenchment may be present. Gullies and head cuts should be healing or stable. Runoff is very slow and ponding occurs in many areas. Deep-rooted perennial grass plants [i.e., Cusick's bluegrass & needlegrasses]) increase infiltration. Infiltration is slow once the surface soil is wetted. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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.

Type locality

Location 1: Washoe County, NV	
Township/Range/Section	T47N R21E S31
UTM zone	N
UTM northing	278877
UTM easting	4647867
Latitude	41° 57′ 6″
Longitude	119° 40′ 4″
General legal description	NE 1/4 SW 1/4, Southeast portion of Macy Flat along east side of road, Washoe 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

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T Stringham (UNR under contract with BLM)

Rangeland health reference sheet

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

Author(s)/participant(s)	GK BRACKLEY
Contact for lead author	State Rangeland Management Specialist
Date	06/20/2006
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are rare.

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2. **Presence of water flow patterns:** Slope gradients are typically less than 2% (1%) and water flow patterns are rare. Runoff is very slow with ponding common over most of the area.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals formed due to erosion are rare. Frost heaving and shrink-swell soil activity that affects shallow rooted plants are not indicators of soil erosion.

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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 ± 55%; surface rock fragments 5 to 15%; shrub canopy 15 to 25%; basal area for perennial herbaceous plants ± 10%.

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5. **Number of gullies and erosion associated with gullies:** Gullies are none to rare in areas of this site that occur on stable landforms. Where this site occurs adjacent to active stream channels, gullies and head cuts associated with channel entrenchment may be present. Gullies and head cuts should be healing or stable.

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

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

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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 4 to 6 on the heavy clay surface soil textures found on this site. (To be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically weak thick-platy at the immediate surface grading to massive below. Soil surface colors are light and the soils having an ochric epipedon are typical. Organic matter of the surface 2 to 4 inches is typically 1 to 2.5 percent, dropping off quickly below.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Runoff is medium to very high and ponding occurs in many areas. Deep-rooted perennial grass plants [i.e., Cusick"s bluegrass & needlegrasses]) increase infiltration. Infiltration is slow once the surface soil is wetted. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** Compacted layers are not typical. Platy or massive sub-surface horizons are not to be interpreted as compacted soil 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: Deep-rooted, cool season, perennial bunchgrasses >> low shrubs (early sagebrush). (By above ground production)

    Sub-dominant: Shallow-rooted, cool season, perennial grasses and grass-like plants = associated shrubs = deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, annual and perennial forbs. (By above ground production)

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Dead branches within individual shrubs are somewhat common and standing dead shrub canopy material may be as much as 15% 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):** Between plant interspaces (±25%) and litter depth 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 (through May) ± 700 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: Cheatgrass, povertyweed, knapweeds, Russian thistle, annual mustards, and foxtail barley are invaders on 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.
