Ecological site R023XY060NV
COBBLY CLAYPAN 8-12 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.

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 Clay or Claypan ,12” PZ Low and Lahontan sagebrush and bluebunch wheatgrass/ Thurber’s needlegrass 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/R023XY901NV This site has many cobbles on the soil surface, and is less productive than the modal site with 375 lbs/ac. The soils on this site have formed in alluvium or residuum derived from volcanic rock sources. These soils have a shallow effective rooting zone with depth to bedrock ranging from 10 to 20 inches. Depth to a dense, strong-structured, clay subsoil is less than 10 inches. Available water holding capacity is low. The soils have high amounts of cobbles and/or small stones (over 65 percent ground cover) on the surface which provides a stabilizing effect on surface erosion conditions. Pedestalling of some grass plants is common during the winter due to frost heave. The plant community is dominated by low sagebrush, bluebunch wheatgrass, and Thurber's needlegrass. This site is similar to the modal site; the model has five stable states.

Associated sites

R023XY006NV	**LOAMY 8-10 P.Z.**
R023XY020NV	**LOAMY 10-12 P.Z.**
R023XY031NV	**CLAYPAN 10-14 P.Z.**
R023XY039NV	**LOAMY SLOPE 10-14 P.Z.**

Similar sites

R023XY008NV	**MOUNTAIN RIDGE** FEID dominant grass; higher elevations; different landform; less productive site
R023XY078NV	**ASHY CLAYPAN 10-14 P.Z.** PSSPS-ACTH7 codominant; more productive site

R023XY031NV	**CLAYPAN 10-14 P.Z.** PSSPS-ACTH7 codominant
R023XY059NV	**GRAVELLY CLAYPAN 10-12 P.Z.** ACTH7 dominant grass
R023XY014NV	**SHALLOW LOAM 14+ P.Z.** FEID dominant grass; higher elevations; more productive site
R023XY021NV	**SCABLAND 10-14 P.Z.** POSE dominant grass; less productive site
R023XY079NV	**ASHY CLAYPAN (COOL) 10-14 P.Z.** FEID-ACTH7 codominant; more productive site
R023XY017NV	**CLAYPAN 14-16 P.Z.** PSSPS-FEID codominant; higher elevations; more productive site
R023XY044NV	**VERY COBBLY CLAYPAN** POSE dominant grass; soils are vertisols

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia arbuscula*
Herbaceous	(1) *Pseudoroegneria spicata ssp. spicata* (2) *Achnatherum thurberianum*

Physiographic features

This site occurs on convex summits and backslopes of mountains and fan remnants. Slopes range from 2 to 30 percent, but slope gradients of 4 to 15 percent are typical. Elevations are 5000 to about 6500 feet.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Mountain

Elevation	1,520 – 1,980 m
Slope	0 – 30 %
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 43 to 45 degrees F. The average growing season is about 60 to 110 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)	90 days
Freeze-free period (average)	
Precipitation total (average)	250 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 alluvium or residuum derived from volcanic rock sources. These soils have a shallow effective rooting zone with depth to bedrock ranging from 12 to 20 inches. Depth to a dense, strong-structured, clay subsoil (argillic horizon) is less than 10 inches. There is an abrupt textural change between the surface soil and subsoil. Permeability is slow and the soils are well-drained. Available water holding capacity is very low. Infiltration of water is restricted once these soils are wetted. The soils have high amounts of cobbles and/or small stones on the surface which provide a stabilizing affect on surface erosion conditions. Pedestalling of some grass plants is common during the winter due to frost heave. The soils have a mollic epipedon. The soil moisture regime is aridic bordering on xeric and the temperature regime is mesic. The soil series associated with this site include: Devada and Lunder.

A representative soil series is Lunder, a clayey, smectitic, mesic, shallow Abruptic Arigiduridic Durixerolls. A mollic epipedon occurs from the soil surface to 18 cm and an argillic horizon occurs from 18 to 41 cm. A duripan occurs from 41 to 79 cm.

Table 4. Representative soil features

Parent material	(1) Alluvium – andesite (2) Alluvium – basalt
Surface texture	(1) Very cobbly loam (2) Extremely cobbly clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow
Soil depth	30 – 50 cm
Surface fragment cover <=3"	30 – 60 %
Surface fragment cover >3"	20 %
Available water capacity (0-101.6cm)	4.57 – 5.08 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified

Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.1 – 7.8
Subsurface fragment volume <=3" (Depth not specified)	10 – 40 %
Subsurface fragment volume >3" (Depth not specified)	0 – 30 %

Ecological dynamics

Low sagebrush, Douglas' rabbitbrush and Sandberg's bluegrass increase while Thurber's needlegrass, bluebunch wheatgrass, and other desirable forage grasses decrease with excessive use by livestock.

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. Antelope bitterbrush is considered a weak sprouter and is often killed by summer or fall fire. Antelope bitterbrush in some areas may sprout after light-severity spring fire. High fuel consumptions increase antelope bitterbrush mortality and therefore favors seedling establishment. Burning bluebunch wheatgrass may remove most of the aboveground biomass but does not usually result in plant mortality. Bluebunch wheatgrass is generally favored by burning. Burning stimulates flowering and seed production. However, season of burning affects mortality. 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. Webber's needlegrass is damaged by burning due to dense plant material that can burn slowly and long, charring to the growing points. Late summer and early fall fires are the least harmful. Sandberg 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. Its rapid maturation in the spring also reduces fire damage, since it is dormant when most fires occur.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Perennial Grasses**			143-286	
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	63-126	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	63-84	–
	Webber needlegrass	ACWE3	*Achnatherum webberi*	9-43	–
	Sandberg bluegrass	POSE	*Poa secunda*	9-34	–
2	**Secondary Perennial Grasses**			9-21	
	squirreltail	ELEL5	*Elymus elymoides*	2-9	–

Forb					
3	**Perennial**			25-76	
	aster	ASTER	*Aster*	2-9	–
	milkvetch	ASTRA	*Astragalus*	2-9	–
	Hooker's balsamroot	BAHO	*Balsamorhiza hookeri*	2-9	–
	buckwheat	ERIOG	*Eriogonum*	2-9	–
	phlox	PHLOX	*Phlox*	2-9	–
Shrub/Vine					
4	**Primary Shrubs**			85-168	
	little sagebrush	ARAR8	*Artemisia arbuscula*	84-147	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	1-21	–
5	**Secondary Shrubs**			9-34	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	4-9	–
	spiny hopsage	GRSP	*Grayia spinosa*	4-9	–

Animal community

Livestock Interpretations: This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass production. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for livestock. Although bluebunch wheatgrass can be a crucial source of forage, it is not necessarily the most highly preferred species. 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. Webber’s needlegrass is desired forage in the spring and undesired the rest of the year for livestock. 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. Domestic sheep and to a much lesser degree cattle consume low sagebrush, particularly during the spring, fall and winter. Antelope bitterbrush is important browse for livestock. Domestic livestock and mule deer may compete for antelope bitterbrush in late summer, fall, and/or winter. Cattle prefer antelope bitterbrush from mid-May through June and again in September and October. 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: 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. 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. Pronghorn antelope, mule deer, elk, and bighorn sheep utilize antelope bitterbrush extensively. Mule deer use of antelope bitterbrush peaks in September, when antelope bitterbrush may compose 91 percent of the diet. Winter use is greatest during periods of deep snow. Antelope bitterbrush seed is a large part of the diets of rodents, especially deer mice and kangaroo rats. Bluebunch wheatgrass is considered one of the most important forage grass species on western rangelands for wildlife. Bluebunch wheatgrass does not generally provide sufficient cover for ungulates, however, mule deer are frequently found in bluebunch-dominated grasslands. Thurber needlegrass is valuable forage for wildlife. Webber’s needlegrass is desired forage in the spring and undesired the rest of the year for wildlife. 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 very high. Permeability is slow. Hydrologic soil group is D. There are no rills or waterflow patterns. High amount of cobbles and stones on soil surface provide a stabilizing affect on the surface soil. Pedestals are none to rare. Frost heaving of shallow rooted plants and shrink-swell activity of soil are not indicators of erosion. Low density of perennial herbaceous plants offers minimal impact on surface runoff or infiltration conditions. Sparse shrub canopy provides little protection from raindrop impact.

Recreational uses

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

Other information

Low sagebrush can be successfully transplanted or seeded in restoration. Antelope bitterbrush has been used extensively in land reclamation. Antelope bitterbrush enhances succession by retaining soil and depositing organic material and in some habitats and with some ecotypes, by fixing nitrogen.

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

CP

Approval

Kendra Moseley, 4/10/2025

Rangeland health reference sheet

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

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

Indicators

1. **Number and extent of rills:** **None. High amount of cobbles and stones on soil surface provide a stabilizing affect on the surface soil.**

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2. **Presence of water flow patterns:** **None.**

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3. **Number and height of erosional pedestals or terracettes:** **Pedestals are none to rare. Frost heaving of shallow rooted plants and shrink-swell activity of soil are not indicators of 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 15 to 30%; surface rock fragments (mostly cobbles) typically =50%; shrub canopy 15 to 25%; basal area for perennial herbaceous plants =5%.**

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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**

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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 large rainfall 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 3 to 6 on most 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 soil structure is massive. Soil surface colors are grayish browns and the soils are typified by a mollic epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 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:** **Low density of perennial herbaceous plants offers minimal impact on surface runoff or infiltration conditions. Sparse shrub canopy provides little protection from raindrop impact.**

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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 none. Massive sub-surface horizons, subsoil argillic horizons, or duripans 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 (low sagebrush) (By above ground production)

Sub-dominant: Deep-rooted, cool season, perennial forbs = fibrous, shallow-rooted, cool season, annual and perennial forbs = shallow-rooted, cool season, perennial bunchgrasses = associated shrubs. (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 common and standing dead shrub canopy material may be as much as 25% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.**

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14. **Average percent litter cover (%) and depth (in):** **Between plant interspaces (15-25%) and depth (± ¼ in.)**

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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, ± 375 lbs/ac; Spring moisture significantly affects total production. Favorable years ±500 lbs/ac and 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 on this site include cheatgrass, Russian thistle, annual mustards, and medusahead.**

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