USDA Natural Resources Conservation Service

Ecological site R026XF007CA
Sodic Meadow

Last updated: 4/10/2024
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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): 026X–Carson Basin and Mountains

The area lies within western Nevada and eastern California, with about 69 percent being within Nevada, and 31 percent being within California. Almost all this area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Isolated north-south trending mountain ranges are separated by aggraded desert plains. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are drained by three major rivers flowing east across this MLRA. A narrow strip along the western border of the area is in the Sierra Nevada Section of the Cascade-Sierra Mountains Province of the Pacific Mountain System. The Sierra Nevada Mountains are primarily a large fault block that has been uplifted with a dominant tilt to the west. This structure leaves an impressive wall of mountains directly west of this area. This helps create a rain shadow affect to MLRA 26. Parts of this eastern face, but mostly just the foothills, mark the western boundary of this area. Elevations range from about 3,806 feet (1,160 meters) on the west shore of Pyramid Lake to 11,653 feet (3,552 meters) on the summit of Mount Patterson in the Sweetwater Mountains.

Valley areas are dominantly composed of Quaternary alluvial deposits with Quaternary playa or alluvial flat deposits often occupying the lowest valley bottoms in the internally drained valleys, and river deposited alluvium being dominant in externally drained valleys. Hills and mountains are dominantly Tertiary andesitic flows, breccias, ash flow tuffs, rhyolite tuffs or granodioritic rocks. Quaternary basalt flows are present in lesser amounts, and Jurassic and Triassic limestone and shale, and Precambrian limestone and dolomite are also present in very limited amounts. Also of limited extent are glacial till deposits along the east flank of the Sierra Nevada Mountains, the result of alpine glaciation.

The average annual precipitation in this area is 5 to 36 inches (125 to 915 millimeters), increasing with elevation. Most of the rainfall occurs as high-intensity, convective storms in spring and autumn. Precipitation is mostly snow in winter. Summers are dry. The average annual temperature is 37 to 54 degrees F (3 to 12 degrees C). The freeze-free period averages 115 days and ranges from 40 to 195 days, decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols and Mollisols. The soils in the area dominantly have a mesic soil temperature regime, an aridic or xeric soil moisture regime, and mixed or smectitic mineralogy. They generally are well drained, are clayey or loamy and commonly skeletal, and are very shallow to moderately deep.

This area supports shrub-grass vegetation characterized by big sagebrush. Low sagebrush and Lahontan sagebrush occur on some soils. Antelope bitterbrush, squirreltail, desert needlegrass, Thurber needlegrass, and Indian ricegrass are important associated plants. Green ephedra, Sandberg bluegrass, Anderson peachbrush, and several forb species also are common. Juniper-pinyon woodland is typical on mountain slopes. Jeffrey pine, lodgepole pine, white fir, and manzanita grow on the highest mountain slopes. Shadscale is the typical plant in the drier parts of the area. Sedges, rushes, and moisture-loving grasses grow on the wettest parts of the wet flood plains and terraces. Basin wildrye, alkali sacaton, saltgrass, buffaloberry, black greasewood, and rubber rabbitbrush grow on the drier sites that have a high concentration of salts.

Some of the major wildlife species in this area are mule deer, coyote, beaver, muskrat, jackrabbit, cottontail, raptors, pheasant, chukar, blue grouse, mountain quail, and mourning dove. The species of fish in the area include trout and catfish. The Lahontan cutthroat trout in the Truckee River is a threatened and endangered species.

LRU notes

The Mono-Adobe-Long Valleys LRU is comprised of the basins surrounding Mono Lake, Adobe Valley, and Long Valley to the southeast. Pleistocene and Holocene age alluvium and lacustrine deposits predominate. Ash layers occur from eruptions of the numerous volcanic domes that are mostly in adjacent LRUs. Soil temperature regimes are mesic and soil moisture regimes are aridic. Elevations range from 1310 to 2680 meters and slopes are typically less than 10 percent, however there are some ecological sites within the Mono-Adobe-Long Valleys LRU that are greater than 10 percent. Frost free days (FFD) range from 97-125.

Ecological site concept

The Sodic Meadow site occurs on valley floors near thermal seeps and springs and is influenced by salt. Elevations are 4300 to 7000 feet. Slopes range from 0 to 2 percent. The soils very deep and are somewhat poorly drained. Surface textures are fine sandy loams. Water tables are 36 to 60 inches in spring and summer. The plant community is dominated by inland saltgrass (Distichlis spicata), Douglas sedge (Carex douglasii), and Sandberg bluegrass (Poa secunda).

Associated sites

R026XF016CA	**Wet Sodic Meadow** Site occurs on wetter soils.
R026XF017CA	**Moist Floodplain** Site found on flood plains and is not influenced by salts.
R026XF010CA	**Wet Meadow** Site is found on soils not influenced by salts and has a shallow water table.

Similar sites

R026XF016CA	**Wet Sodic Meadow** Site has a water table less than 24 inches below the soil surface.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Distichlis spicata* (2) *Carex douglasii*

Physiographic features

This site occurs on valley floors near thermal seeps and springs. Slopes range from 0 to 2 percent.

Table 2. Representative physiographic features

Landforms	(1) Valley floor
Runoff class	Very low to low
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	4,300–7,000 ft

Slope	0–2%
Water table depth	36–60 in
Aspect	Aspect is not a significant factor

Climatic features

The climate on this site is characterized by cold winters (20 to 45 degrees F) and warm, mostly dry summers (40 to 85 degrees F). The average annual precipitation ranges from 6 to 12 inches, with most falling as snow from November to March.

The Lee Vining climate station is the closest climate station to the site. The below climate tables below may not entirely fit within the actual range that the ecological site experiences.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	12-16 in
Frost-free period (average)	108 days
Freeze-free period (average)	135 days
Precipitation total (average)	14 in

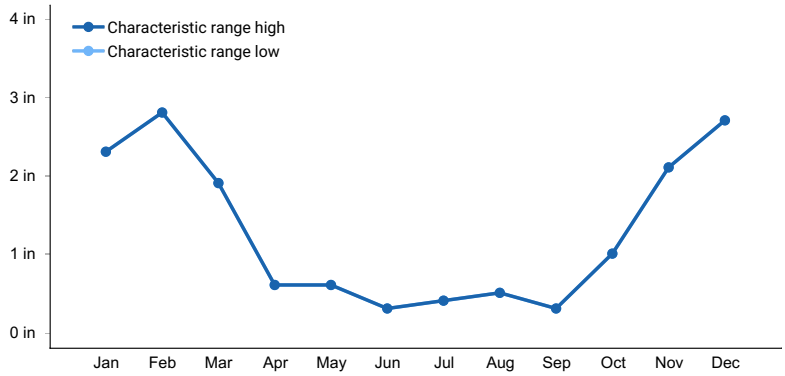


Figure 1. Monthly precipitation range

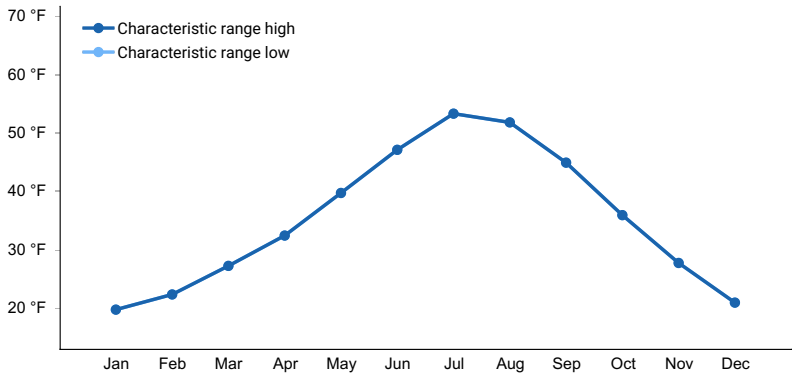


Figure 2. Monthly minimum temperature range

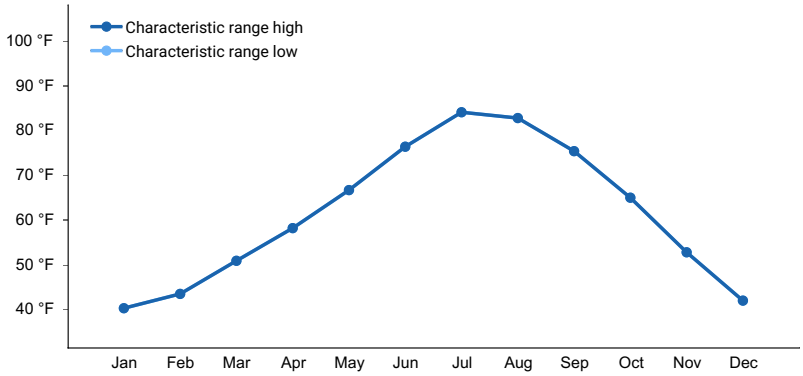


Figure 3. Monthly maximum temperature range

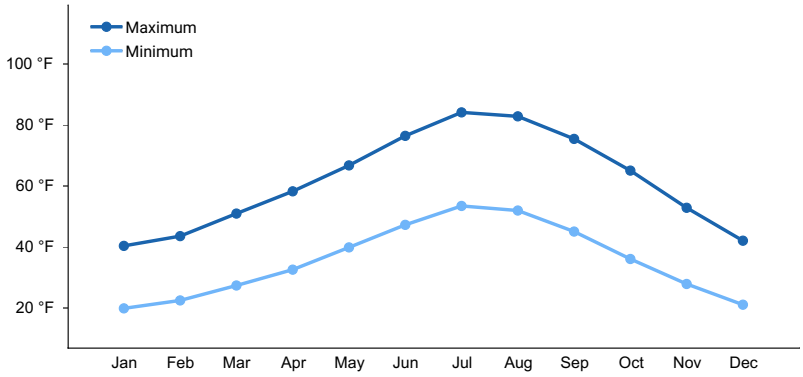


Figure 4. Monthly average minimum and maximum temperature

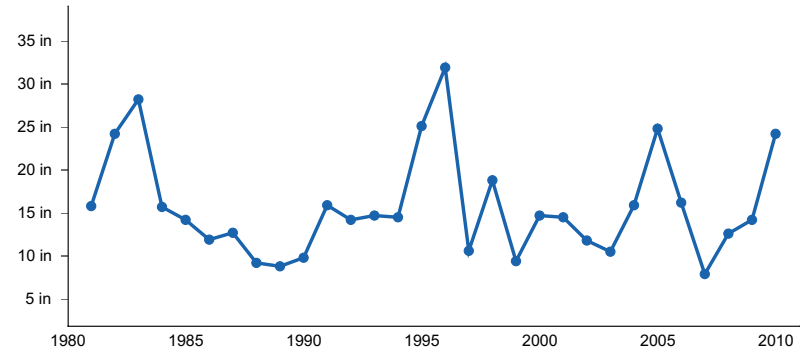


Figure 5. Annual precipitation pattern

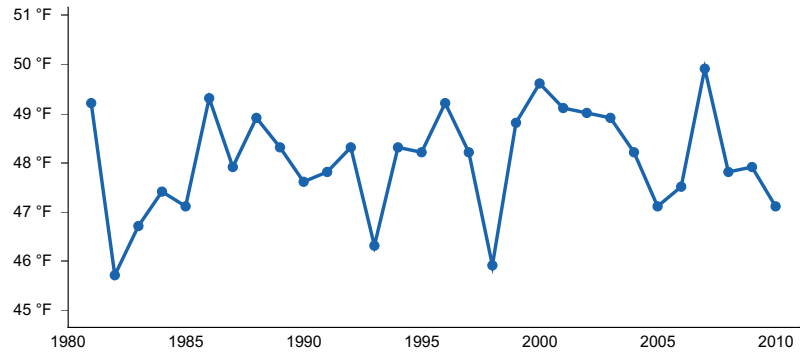


Figure 6. Annual average temperature pattern

Climate stations used

- (1) LEE VINING [USC00044881], Lee Vining, CA

Influencing water features

The Sodic Meadow site occurs on valley floors near thermal seeps and springs and may be flooded rarely to occasionally. The water table is typically between 36 and 60 inches.

Soil features

The soils that characterize this site are very deep and are somewhat poorly drained and influenced by salt. They formed in alluvium from volcanic ash and mixed rock sources. Surface textures are loams, loamy sands, and sandy loams. Available water capacity is moderate and the hazard of water erosion is slight. Wind erosion hazard is slight to moderate. Effective rooting depth is 36 to 60 inches or more. Water tables are 36 to 60 inches in spring and summer.

Soil Surveys and mapunits correlated to the Sodic Meadow site:
CA732: 111bo, 114bo, 329bo
CA763: 111bo, 113bo
CA802: 111, 112, 113, 114, 329

Table 4. Representative soil features

Parent material	(1) Volcanic ash (2) Alluvium
Surface texture	(1) Fine sandy loam
Drainage class	Somewhat poorly drained
Permeability class	Moderately slow to moderate
Surface fragment cover <=3"	0–13%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	3–4.9 in
Calcium carbonate equivalent (Depth not specified)	1–5%
Electrical conductivity (Depth not specified)	0–16 mmhos/cm
Sodium adsorption ratio (Depth not specified)	1–30
Soil reaction (1:1 water) (Depth not specified)	7.4–9.6
Subsurface fragment volume <=3" (Depth not specified)	13%
Subsurface fragment volume >3" (Depth not specified)	0%

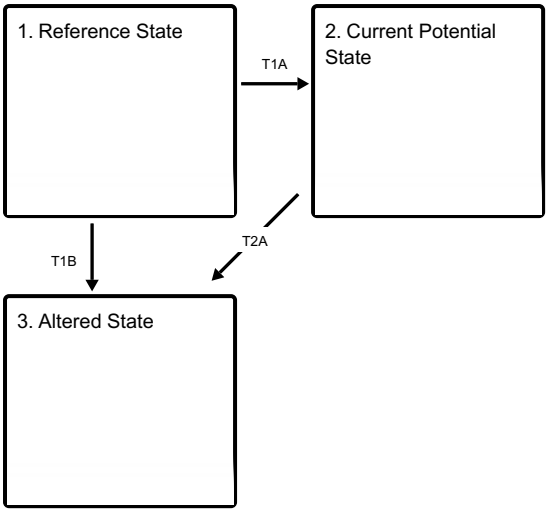
Ecological dynamics

The Sodic Meadow site is dominated plants that are adapted to moist and sodic soil conditions. The site is controlled by the natural hydrology through the fluctuation of water table depth over the growing season. Altering the natural hydrology to dry the site will cause a shift in plant community composition to drier species. Altering the hydrology may also cause soil chemistry to change.

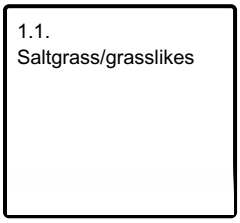
When management results in over use by livestock, the more palatable grasses and sedges decrease, and the other, less desirable grasses and grass-like plants increase. Shrubs would also increase on this site.

State and transition model

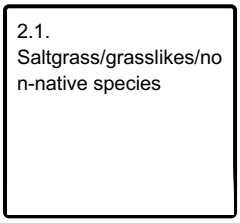
Ecosystem states



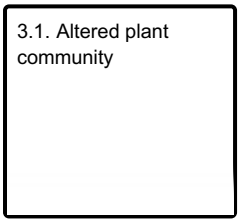
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Reference State

The Reference State represents the plant communities and ecological dynamics of sites that have a water table typically between 36 and 60 inches to the soil surface. The Reference State is generally dominated by saltgrass.

Community 1.1
Saltgrass/grasslikes

The plant community is dominated by inland saltgrass, Douglas sedge, and Sandberg bluegrass. Potential vegetation composition is about 80 percent grasses and grass-like plants, 15 percent forbs, and 5 percent shrubs.

Dominant plant species

- saltgrass (*Distichlis spicata*), grass
- Douglas' sedge (*Carex douglasii*), grass
- Sandberg bluegrass (*Poa secunda*), grass
- Lemmon's alkaligrass (*Puccinellia lemmonii*), grass

- clustered goldenweed (*Pyrrocoma racemosa*), other herbaceous
- King's mousetail (*Ivesia kingii*), other herbaceous
- slender arrowgrass (*Triglochin concinna*), other herbaceous
- Rocky Mountain iris (*Iris missouriensis*), other herbaceous

State 2
Current Potential State

The Current Potential State is similar to the Reference State, however invasive grasses and/ or forbs are now present in all community phases. This state still has the visual aspect of a saltgrass meadow. Foxtail barley, arctic rush and alkali bluegrass are other primary perennial grass or grasslike species present. Fivehorn bassia, povertyweed, and other less palatable species now make up a large portion of the herbaceous layer. Primary disturbance mechanisms include native herbivore and domestic livestock grazing. Timing of these disturbances dictates the ecological dynamics that occur. The Current Potential State is still self-sustaining; but is losing resistance to change due to lower resilience following disturbances. When disturbances occur, the rate of recovery is variable depending on severity. Indicators: A community dominated by saltgrass and arctic rush where other native perennial grasses and forbs are also present. Invasive grasses and/or forbs are present. Feedbacks: Frequent disturbances that may allow annual invasive species such as fivehook bassia to dominate. Trigger: Reoccurring disturbance that results in a dominance of annual grasses and/or forbs in the herbaceous layer.

Community 2.1
Saltgrass/grasslikes/non-native species

This community is characterized by an open grassland aspect with saltgrass, arctic rush, and foxtail still dominating the herbaceous layer. Other commonly occurring grasses and grasslikes include Kentucky bluegrass, alkali bluegrass, spikerush, and tufted hairgrass. Non-native species including fivehorn bassia, poverty weed, and/or salt cedar are also present. A stable water table is present at 30 inches or less, providing season long moisture for plant growth.

State 3
Altered State

The Altered State occurs when the natural hydrology has been altered. This can be from conversion to hayland or other uses.

Community 3.1
Altered plant community

Site is managed more intensely than under natural conditions if converted to hayland. The water table is altered.

Transition T1A
State 1 to 2

The transition from State 1 to State 2 occurs after the introduction of non-native plants.

Transition T1B
State 1 to 3

Altered hydrology.

Transition T2A
State 2 to 3

Altered hydrology.

Additional community tables

Recreational uses

This site is located on City of Los Angeles, Department of Water and Power (LADWP) and Bureau of Land Management properties, and is open to public use.

Inventory data references

NASIS data for surveys CA732, CA763, CA802

Type locality

Location 1: Mono County, CA	
Township/Range/Section	T3S R29E S21
General legal description	Near alkali lakes along Benton Crossing Road, Mono Co., CA

Contributors

V.Burlingame/J.Hanson/P.Novak

Approval

Kendra Moseley, 4/10/2024

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)	
Contact for lead author	
Date	05/10/2025
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not**

bare ground):

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**