USDA Natural Resources Conservation Service

Ecological site R029XY049NV
SANDY LOAM 8-12 P.Z.

Last updated: 2/20/2025
Accessed: 05/11/2025

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.

MLRA notes

Major Land Resource Area (MLRA): 029X–Southern Nevada Basin and Range

The Southern Nevada Basin and Range MLRA (29) represents the transition from the Mojave Desert to the Great Basin. It is cooler and wetter than the Mojave. It is warmer and typically receives more summer precipitation than the Great Basin. This area is in Nevada (73 percent), California (25 percent), and Utah (2 percent). It makes up about 26,295 square miles (68,140 square kilometers). Numerous national forests occur in the area, including the San Bernardino, Angeles, Sequoia, Inyo, Humboldt-Toiyabe, and Dixie National Forests. Portions of Death Valley National Monument, the Nuclear Regulatory Commission's Nevada Test Site, the Hawthorne Ammunition Depot, and the Nellis Air Force Range in Nevada and the China Lake Naval Weapons Center in California also are in this MLRA. The northeast part of the Paiute Indian Reservation and the southern third of the Walker River Indian Reservation are in the part of this MLRA in Nevada, and the Lone Pine, Fort Independence, and Big Pine Indian Reservations are in the part in California.
Physiography:
The entire area is in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The area of broad, nearly level, aggraded desert basins and valleys between a series of mountain ranges trending north to south. The basins are bordered by sloping fans and pluvial lake terraces. The mountains are uplifted fault blocks with steep side slopes and not well dissected due to limited annual precipitation. Most of the valleys in this MLRA are closed basins or bolsons containing sinks or playa lakes.
Geology:
The mountains are dominated by Pliocene and Miocene andesite and basalt rocks, Paleozoic and Precambrian carbonate rocks prominent in some areas. Scattered outcrops of older Tertiary intrusives and very young tuffaceous sediments (Pliocene and Miocene) are in the western and eastern thirds of this MLRA. The valleys consist mostly of alluvial fill and playa deposits at the lowest elevations in the closed basins.
Climate:
The average annual precipitation is 3 to 12 inches (75 to 305 millimeters) in most of this area. It may be as high as 29 inches (735 millimeters), on the higher mountain slopes. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. Summers are dry, but sporadic storms are common in July and August.
Water Resources:
Water resources are scarce. Ground water and surface water sources are limited. Streams are small and intermittent. Quality of surface water in naturally degraded as streams cross area of valley fill effected by dissolved salts. Irrigation water may raise the levels of dissolved salts and suspended sediments causing contamination.
Soils:
Dominant soil orders include Entisols and Aridisols.

Ecological site concept

The Sandy Loam 8-12 P.Z. site occurs on inset fans, fan remnants and alluvial fans on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 2 to 15 percent are most typical. Elevations are 4,300 to about 7,800 feet. The soils are very deep, well to somewhat excessively well drained, and typically formed in mixed alluvium. Soil surface textures are moderately coarse and there are high amounts of gravels on the surface.

Associated sites

F029XY065NV	**PIMO-JUOS/ARTRW8** This site occurs on sideslopes and summits of hills and low mountains on all aspects. Slopes range from 4 to over 50 percent, but slope gradients of 30 to 50 percent are typical. Elevations are 5500 to about 7200 feet. This site is typically found on shallow, rocky hills and is associated with areas of rock outcrop (ignimbrites, volcanic tuffs, etc.). The soils associated with this site are shallow and well drained. They are formed in residuum and colluvium derived from volcanic rocks. These soils are skeletal with 35 to over 50 percent gravels, cobbles or stones, by volume, distributed throughout their profile. Available water capacity is very low to low, but trees and shrubs extend their roots into fractures in the bedrock allowing them to utilize deep moisture.
R029XY006NV	**LOAMY 8-10 P.Z.** The site is on fan remnants. Soils associated with this site are well drained, shallow to a duripan, and formed in alluvium derived from volcanic parent material. The soil profile is characterized by an ochric epipedon, a cemented duripan within 50 cm and an argillic horizon with no abrupt textural change.
R029XY008NV	**SHALLOW CALCAREOUS LOAM 8-12 P.Z.** This site is on fan remnants, inset fans, and mountains on all exposures. Slopes range from 0 to 75 percent, but slope gradients of 4 to 30 percent are most typical. Elevations are 4,200 to 8,000 feet. The soils associated with this site are very shallow to very deep or they have a restrictive layer within the main rooting depth. These soils are moderately to strongly calcareous and soil reaction increases with soil depth. The soils are often modified with high amounts of gravels, cobbles or stones on the surface.

Similar sites

R029XY010NV	**LOAMY SLOPE 8-10 P.Z.** Less productive site
R029XY006NV	**LOAMY 8-10 P.Z.** Less productive site
R029XY114NV	**LOAMY FAN 8-12 P.Z.** LECI4-ACHY codominant grasses

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata var. wyomingensis*
Herbaceous	(1) *Achnatherum hymenoides*

Physiographic features

The Sandy Loam 8-12 P.Z. site occurs on inset fans, fan remnants and alluvial fans on all exposures. Slopes range from 0 to 30 percent, but slope gradients of 2 to 15 percent are most typical. Elevations are 4,300 to about 7,800 feet.

Table 2. Representative physiographic features

Landforms	(1) Inset fan (2) Alluvial fan (3) Fan remnant
Runoff class	Very low to medium
Elevation	4,300–7,800 ft
Slope	0–30%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is semiarid with cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 12 inches. Mean annual air temperature is 45 to 55 degrees F. The average growing season is about 130 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	85 days
Freeze-free period (characteristic range)	131 days
Precipitation total (characteristic range)	6 in
Frost-free period (actual range)	85 days
Freeze-free period (actual range)	131 days
Precipitation total (actual range)	6 in
Frost-free period (average)	85 days
Freeze-free period (average)	131 days
Precipitation total (average)	6 in

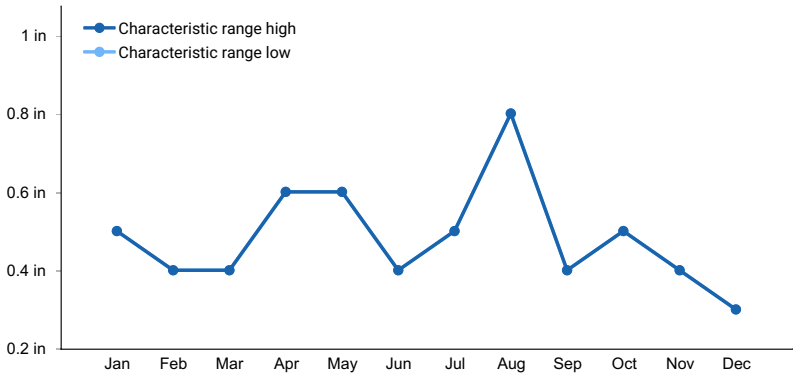

Figure 1. Monthly precipitation range

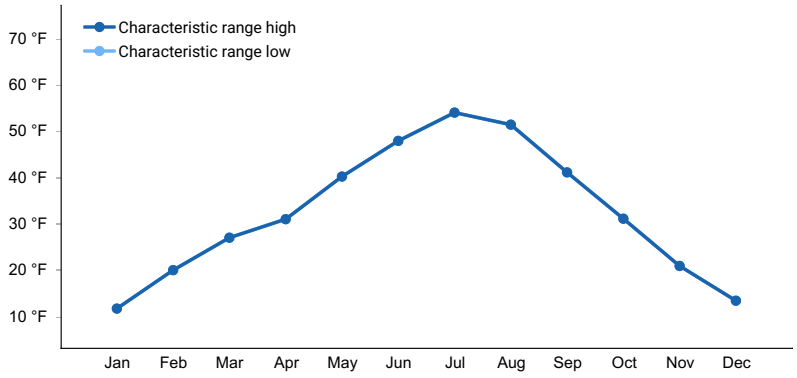

Figure 2. Monthly minimum temperature range

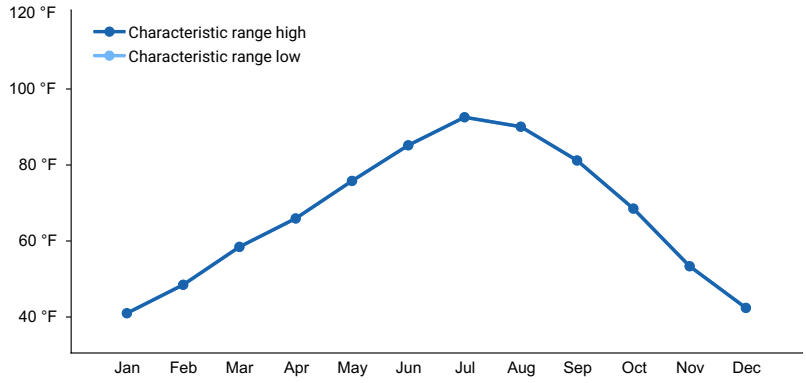

Figure 3. Monthly maximum temperature range

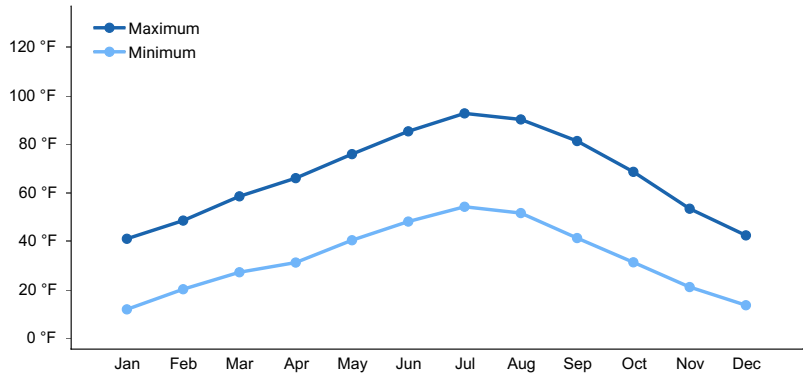

Figure 4. Monthly average minimum and maximum temperature

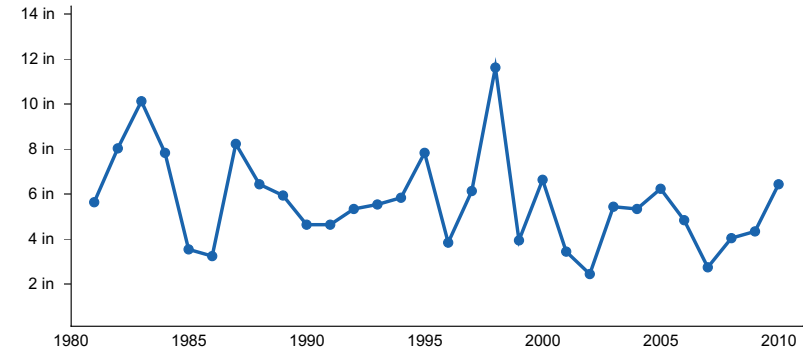

Figure 5. Annual precipitation pattern

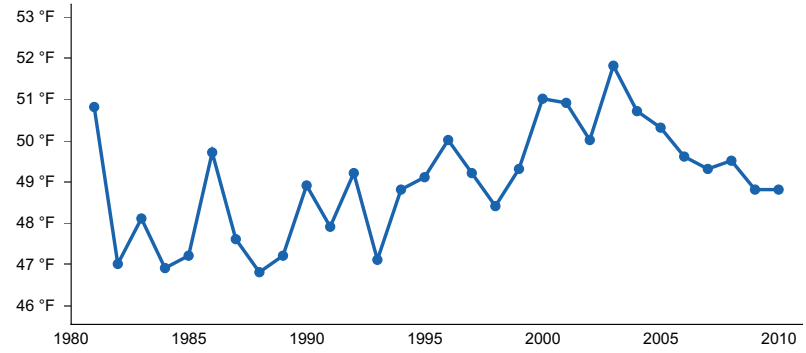

Figure 6. Annual average temperature pattern

Climate stations used

- (1) TWIN SPRING FALLINI [USC00268443], Tonopah, NV

Influencing water features

Influencing water features are not associated with this site.

Soil features

The soils are very deep, well to somewhat excessively well drained, and typically formed in mixed alluvium. Soil surface textures are moderately coarse and there are high amounts of gravels on the surface. These soils have moderately slow to moderately rapid permeability and very low to medium runoff. The available water holding capacity of these soils is very low to low. Sheet and rill erosion potential is moderate. Soil series associated with this site include: Acana family, Candelaria, Carwalker, Crunker, Crunkvar, Deadyon, Devildog, Heist, Hunewill, Mezzer, Qwynn, Ratleflat, Sheeprock family, Veet, Watoopah, Wedlar, and Wellsed.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Alluvium–granite (3) Alluvium–welded tuff (4) Alluvium–volcanic rock
Surface texture	(1) Very gravelly sandy loam (2) Gravelly loamy sand (3) Gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	72–84 in
Surface fragment cover <=3"	15–64%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	0.9–4.2 in
Calcium carbonate equivalent (0-40in)	1–60%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	8–45%
Subsurface fragment volume >3" (Depth not specified)	0–12%

Ecological dynamics

As ecological site declines, Wyoming big sagebrush, galleta, and Douglas rabbitbrush increase. Following wildfire, galleta, spiny hopsage and ephedra increase with rabbitbrush, horsebrush, and other fire tolerant shrubs. Species likely to invade this site are annuals such as mustards and cheatgrass. Where this site occurs adjacent to juniper or pinyon woodlands, Utah juniper or singleleaf pinyon readily increase on this site. Tree canopy cover is 5 percent or less within the reference plant community. In the absence of natural fire, tree density can dramatically increase and, over time, eliminate most understory vegetation.

Fire Ecology:
The fire return interval for Wyoming big sagebrush communities ranges from 10 to 70 years. Fire is the principal means of renewal for decadent stands of Wyoming big sagebrush.

Wyoming big sagebrush is killed by fire and establishes after fire from a seedbank; from seed produced by remnant plants that escaped fire; and from plants adjacent to the burn that seed in. Fires in spiny hopsage sites generally occur in late summer when plants are dormant, and sprouting generally does not occur until the following spring. Spiny hopsage is considered to be somewhat fire tolerant and often survives fires that kill sagebrush. Mature spiny hopsage generally sprout after being burned. Spiny hopsage is reported to be least susceptible to fire during summer dormancy. Fire top-kills or kills fourwing saltbush, depending upon ecotype. Fourwing saltbush may sprout after top-kill. Fourwing saltbush probably establishes primarily from seed after fire, with some populations also regenerating vegetatively. Winterfat is either killed or top-killed by fire, depending on fire severity. Severe fire can kill the perennating buds located several inches above the ground surface and thus kills the plant. In addition, severe fire usually destroys seed on the plant. Low-severity fire scorches or only partially consumes the aboveground portions of winterfat and thus does not cause high mortality. Indian ricegrass can be killed by fire, depending on severity and season of burn. Indian ricegrass reestablishes on burned sites through seed dispersed from adjacent unburned areas. Galleta is a rhizomatous perennial which can resprout after top-kill by fire. Needlegrasses are damaged by burning due to the dense plant material that can burn slowly and long, charring to the growing points. Late summer and early fall fires are least harmful. Needle and thread grass is top-killed by fire. It may be killed if the aboveground stems are completely consumed. Needle and thread grass is classified as slightly to severely damaged by fire. Needle and thread grass sprouts from the caudex following fire, if heat has not been sufficient to kill underground parts. Recovery usually takes 2 to 10 years.

Community Phase 1.1 is dominated by Wyoming big sagebrush and Indian ricegrass. Potential vegetative composition is about 50 percent grasses, 5 percent forbs, and 45 percent shrubs. Approximate ground cover (basal and crown) is 15 to 25 percent.

State and transition model

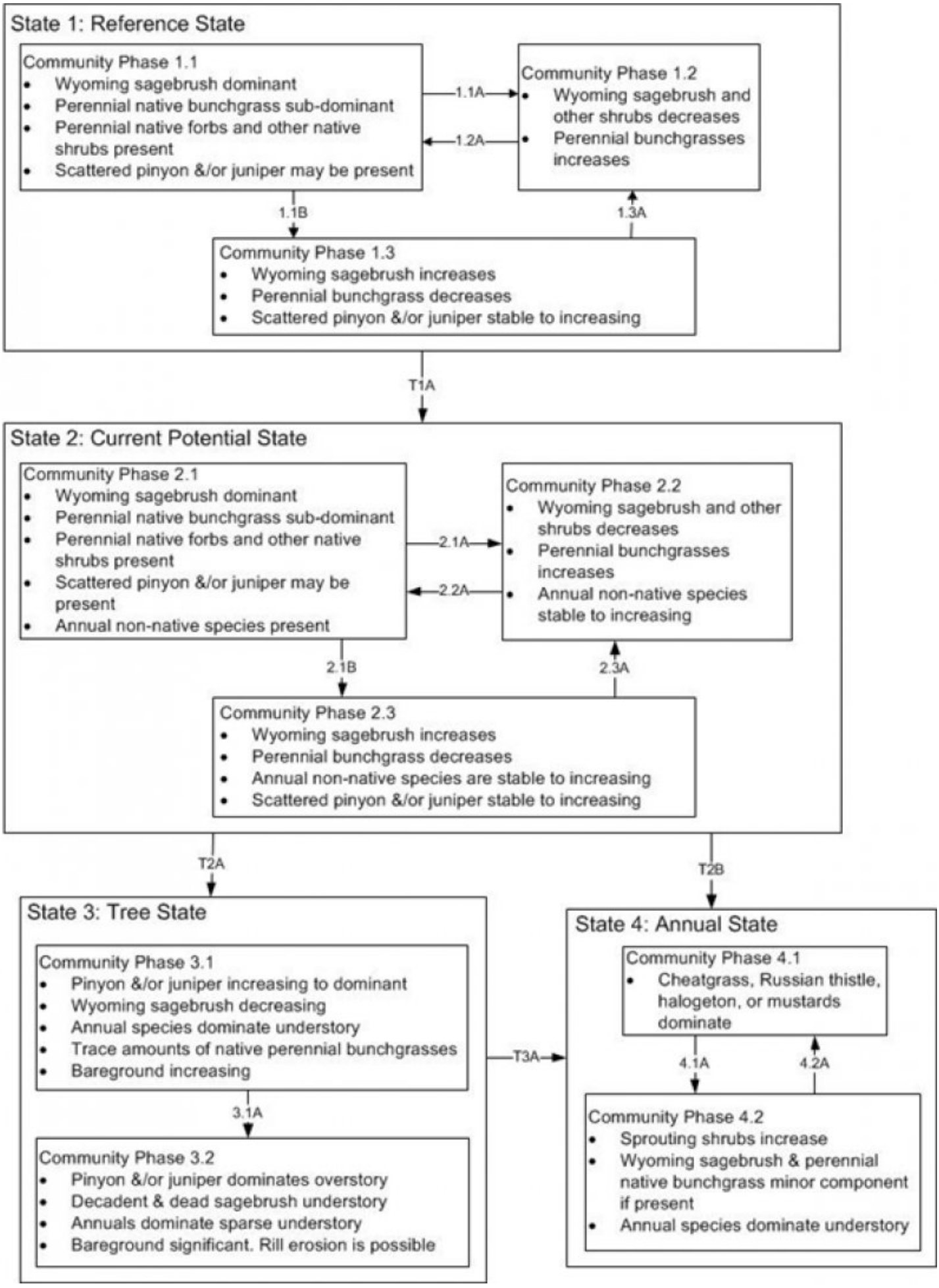

Figure 7. DRAFT STM

State 1: Representative of the reference conditions prior to Euro-American settlement in the west.
1.1A: fire or other disturbance that removes sagebrush canopy
1.1B: absence of disturbance and natural regeneration over time

1.2A: absence of disturbance and natural regeneration over time

1.3A: fire or other disturbance that removes sagebrush canopy

T1A: introduction of non-native species

State 2: Representative of the current potential with the presence of non-native annuals. Non-native annuals have the ability to significantly change disturbance regimes and nutrient cycling dynamics.
2.1A: fire or other disturbance that removes sagebrush canopy
2.1B: absence of disturbance and natural regeneration over time, may be coupled with inadequate rest and recovery from defoliation

2.2A: absence of disturbance and natural regeneration over time

2.3A: fire or other disturbance that removes sagebrush canopy

T2A: long term absence of fire and natural regeneration of pinyon & juniper trees
T2B: reoccurring severe fire

State 3: Dominated by pinyon and/or juniper trees. Changes in disturbance return intervals over the long term allows for pinyon and/or juniper to dominate the site by controlling site resources.
3.1A: absence of disturbance and natural regeneration over time

T3A: reoccurring severe fire

State 4: Dominated by non-native annuals. Changes in disturbance return intervals and nutrient dynamics creating a positive feedback loop.
4.1A: absence of disturbance and natural regeneration over time
4.2A: fire or other disturbance that removed shrub canopy

Figure 8. DRAFT STM LEGEND

Animal community

Livestock Interpretations:
This site is suited to livestock grazing. Grazing management should be keyed to indian ricegrass, galleta, desert needlegrass, and needleandthread grass production. Indian ricegrass has good forage value for domestic sheep, cattle and horses. It supplies a source of green feed before most other native grasses have produced much new

growth. When actively growing, galleta provides good to excellent forage for cattle and horses and fair forage for domestic sheep. Although not preferred, all classes of livestock may use galleta when it is dry. Domestic sheep show greater use in winter than summer months and typically feed upon central portions of galleta tufts, leaving coarser growth around the edges. Galleta may prove somewhat coarse to domestic sheep. Desert needlegrass provides a palatable and nutritious feed for livestock during the spring and early summer. Needleandthread provides highly palatable forage, especially in the spring before fruits have developed. Needlegrasses are grazed in the fall only if the fruits are softened by rain. Livestock browse Wyoming big sagebrush, but may use it only lightly when palatable herbaceous species are available. Spiny hopsage provides a palatable and nutritious food source for livestock, particularly during late winter through spring. Domestic sheep browse the succulent new growth of spiny hopsage in late winter and early spring. Fourwing saltbush is one of the most palatable shrubs in the West. Its protein, fat, and carbohydrate levels are comparable to alfalfa. It provides nutritious forage for all classes of livestock. Palatability is rated as good for domestic sheep and domestic goats; fair for cattle; fair to good for horses in winter, poor for horses in other seasons. Winterfat is an important forage plant for livestock, especially during winter when forage is scarce. Abusive grazing practices have reduced or eliminated winterfat on some areas even though it is fairly resistant to browsing. Effects depend on severity and season of grazing.

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:
Wyoming big sagebrush is preferred browse for wild ungulates. Pronghorn usually browse Wyoming big sagebrush in the winter. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Open Wyoming sagebrush communities are preferred nesting habitat. 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.
Spiny hopsage provides a palatable and nutritious food source for big game animals. Spiny hopsage is used as forage to at least some extent by domestic goats, deer, pronghorn, and rabbits.Fourwing saltbush provides valuable habitat and year-round browse for wildlife. Fourwing saltbush also provides browse and shelter for small mammals. Additionally, the browse provides a source of water for black-tailed jackrabbits in arid environments. Granivorous birds consume the fruits. Wild ungulates, rodent and lagomorphs readily consume all aboveground portions of the plant. Palatability is rated good for deer, elk, pronghorn and bighorn sheep. Winterfat is an important forage plant for Wildlife, especially during winter when forage is scarce. Winterfat seeds are eaten by rodents. Winterfat is a staple food for black-tailed jackrabbit. Mule deer and pronghorn antelope browse winterfat. Winterfat is used for cover by rodents. It is potential nesting cover for upland game birds, especially when grasses grow up through its crown. Indian ricegrass is eaten by pronghorn in "moderate" amounts whenever available. In Nevada it is consumed by desert bighorns. A number of heteromyid rodents inhabiting desert rangelands show preference for seed of Indian ricegrass. Indian ricegrass is an important component of jackrabbit diets in spring and summer. In Nevada, Indian ricegrass may even dominate jackrabbit diets during the spring through early summer months. Indian ricegrass seed provides food for many species of birds. Doves, for example, eat large amounts of shattered Indian ricegrass seed lying on the ground. Desert bighorn sheep of the Mojave Desert utilize galleta as forage. Galleta provides moderately palatable forage when actively growing and relatively unpalatable forage during dormant periods. Galleta provides poor cover for most wildlife species. Desert needlegrass provides a palatable and nutritious feed for wildlife during the spring and early summer. Needleandthread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available.

Hydrological functions

Number and Extent of Rills:
Rills and waterflow patterns are rare. A few can be expected on steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt. Pedestals are rare. Ocurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered. Gullies are rare in areas of this site that occur on stable landforms. Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass] slow runoff and increase infiltration. 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. 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

Native Americans made tea from big sagebrush leaves. They used the tea as a tonic, an antiseptic, for treating colds, diarrhea, and sore eyes and as a rinse to ward off ticks. Big sagebrush seeds were eaten raw or made into meal. Fourwing saltbush is traditionally important to Native Americans. They ground the seeds for flour. The leaves, placed on coals, impart a salty flavor to corn and other roasted food. Top-growth produces a yellow dye. Young leaves and shoots were used to dye wool and other materials. The roots and flowers were ground to soothe insect bites. Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. Indian ricegrass was traditionally eaten by some Native American peoples. The Paiutes used seed as a reserve food source.

Other information

Wyoming big sagebrush is used for stabilizing slopes and gullies and for restoring degraded wildlife habitat, rangelands, mine spoils and other disturbed sites. It is particularly recommended on dry upland sites where other shrubs are difficult to establish. Winterfat adapts well to most site conditions, and its extensive root system stabilizes soil. However, winterfat is intolerant of flooding, excess water, and acidic soils. Fourwing saltbush is widely used in rangeland and riparian improvement and reclamation projects, including burned area recovery. It is probably the most widely used shrub for restoration of winter ranges and mined land reclamation. Spiny hopsage has moderate potential for erosion control and low to high potential for long-term revegetation projects. It can improve forage, control wind erosion, and increase soil stability on gentle to moderate slopes. Spiny hopsage is suitable for highway plantings on dry sites in Nevada. Needleandthread grass is useful for stabilizing eroded or degraded sites.

Inventory data references

NASIS data used for abiotic narratives and tables.

Type locality

Location 1: Nye County, NV	
Township/Range/Section	T6N R48E S13
General legal description	East side of Stone Cabin Valley, Nye County, Nevada.
Location 2: Nye County, NV	
Township/Range/Section	T2S R54E S21
General legal description	About 4 miles west of Queen City Summit, along road to Cedar Pipeline Ranch, south end of Railroad Valley, Nye County, Nevada. This site also occurs in Esmeralda County, Nevada.

Other references

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

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

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

Contributors

TJW/VWM/GKB

Approval

Kendra Moseley, 2/20/2025

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	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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3. **Number and height of erosional pedestals or terracettes:** Pedestals are rare. Occurrence is usually limited to areas of water flow patterns.

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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 ± 45 percent; surface rock fragments less than 25 percent; shrub canopy 15 to 25 percent.

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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:** Wind-scour areas are rare but may occur after severe wildfires.

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7. **Amount of litter movement (describe size and distance expected to travel):** Fine litter (foliage from grasses and annual and 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. Areas of this site occurring on soils that have a physical crust will probably have stability values less than 3. (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 thin platy or subangular blocky. Soil surface colors are pale browns and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 1.5 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., Indian ricegrass] slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and accumulation on site.

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

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 (Indian ricegrass) > evergreen shrubs (Wyoming big sagebrush)

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

    Other: warm-season bunchgrasses, evergreen trees

    Additional:

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 35 percent of total woody canopy; some of the mature bunchgrasses (less than 20 percent) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces 20-30% and litter depth is

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through June) ± 800 lbs/ac; Favorable years ± 1100 lbs/ac and unfavorable years ± 500 lbs/ac.

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