USDA Natural Resources Conservation Service

Ecological site R029XY106NV
GRAVELLY CLAY SLOPE 10-12 P.Z.

Last updated: 2/20/2025
Accessed: 02/24/2025

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 Gravelly Clay Slope 10-12 P.Z. site is on rolling hills and lower mountain sideslopes on all exposures. Slopes range from 15 to 75 percent, but slope gradients of 30 to 50 percent are typical. Elevations are 6,200 to about 8,200 feet. The soils are shallow to moderately deep and well drained. The soils are formed in residuum and colluvium derived from volcanic rocks. Subsoils are moderately fine textured.

Associated sites

F029XY066NV	**PIMO-JUOS WSG 1R0501 12 to 16** This site is on fan remnants and on mountain sideslopes of mostly northerly aspect at the lower elevations of its range and on all aspects at higher elevations. Slopes range from 4 to over 75 percent, but are typically 15 to 50 percent. Elevations are 5,500 to 9,500 feet. The soils associated with this site are typically very shallow to very deep and well drained. These soils are skeletal with as much as 75 percent gravels, cobbles or stones, by volume, distributed throughout their profile.
R029XY104NV	**SHALLOW CLAY LOAM 10-12 P.Z.** This site is on ridges and sideslopes of upper fan remnant slopes, hills, and mountains on all exposures. Slopes range from 2 to 75 percent, but slope gradients of 2 to 30 percent are most typical. Elevations are 5,000 to about 8,300 feet. The soils associated with this site are very shallow to shallow. These soils are often modified with high amounts of gravels, cobbles, or stones on the surface that occupy plant growing space and reduce the potential soil moisture-holding capacity.

Similar sites

R029XY075NV	**LOAMY SLOPE 10-12 P.Z.** ACHY-HECO26 codominant.
R029XY073NV	**BOULDERY SLOPE 8-12 P.Z.** ACSP12 dominant grass.
R029XY006NV	**LOAMY 8-10 P.Z.** ACHY-HECO26 codominant grasses; ACTH7 absent.
R029XY057NV	**LOAMY ASH INFLUENCED SLOPE 12-14 P.Z.** PSPSI dominant grass.
R029XY049NV	**SANDY LOAM 8-12 P.Z.** ACTH7 absent.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata*
Herbaceous	(1) *Achnatherum thurberianum* (2) *Achnatherum hymenoides*

Physiographic features

The Gravelly Clay Slope 10-12 P.Z. site is on rolling hills and lower mountain sideslopes on all exposures. Slopes range from 15 to 75 percent, but slope gradients of 30 to 50 percent are typical. Elevations are 6,200 to about 8,200 feet.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill
Runoff class	High to very high
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Very rare
Ponding frequency	None
Elevation	6,200–8,200 ft
Slope	15–75%
Water table depth	72 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is arid, characterized by cold, moist winters and warm, dry summers. Average annual precipitation is 10 to 12 inches. Mean annual air temperature is 43 to 51 degrees F. The average growing season is about 90 to 120 days. There is no climate station available for this site.

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	
Precipitation total (average)	12 in

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils are shallow to moderately deep and well drained. The soils are formed in residuum and colluvium derived from volcanic rocks. Subsoils are moderately fine textured. Available water capacity is very low. Some soils are modified with high volumes of rock fragments through the soil profile, which reduce the available water capacity. Runoff is high to very high. Soil series associated with this site are Schwalbe and Starflyer.

Table 4. Representative soil features

Parent material	(1) Colluvium–welded tuff (2) Residuum–welded tuff
Surface texture	(1) Very cobbly, ashy coarse sandy loam (2) Very stony fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	14–40 in
Surface fragment cover <=3"	20–34%
Surface fragment cover >3"	17–65%
Available water capacity (0-40in)	2.5–2.8 in
Calcium carbonate equivalent (0-40in)	0–4%
Electrical conductivity (0-40in)	0–1 mmhos/cm
Sodium adsorption ratio (0-40in)	0–1
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	19–38%
Subsurface fragment volume >3" (Depth not specified)	14–20%

Ecological dynamics

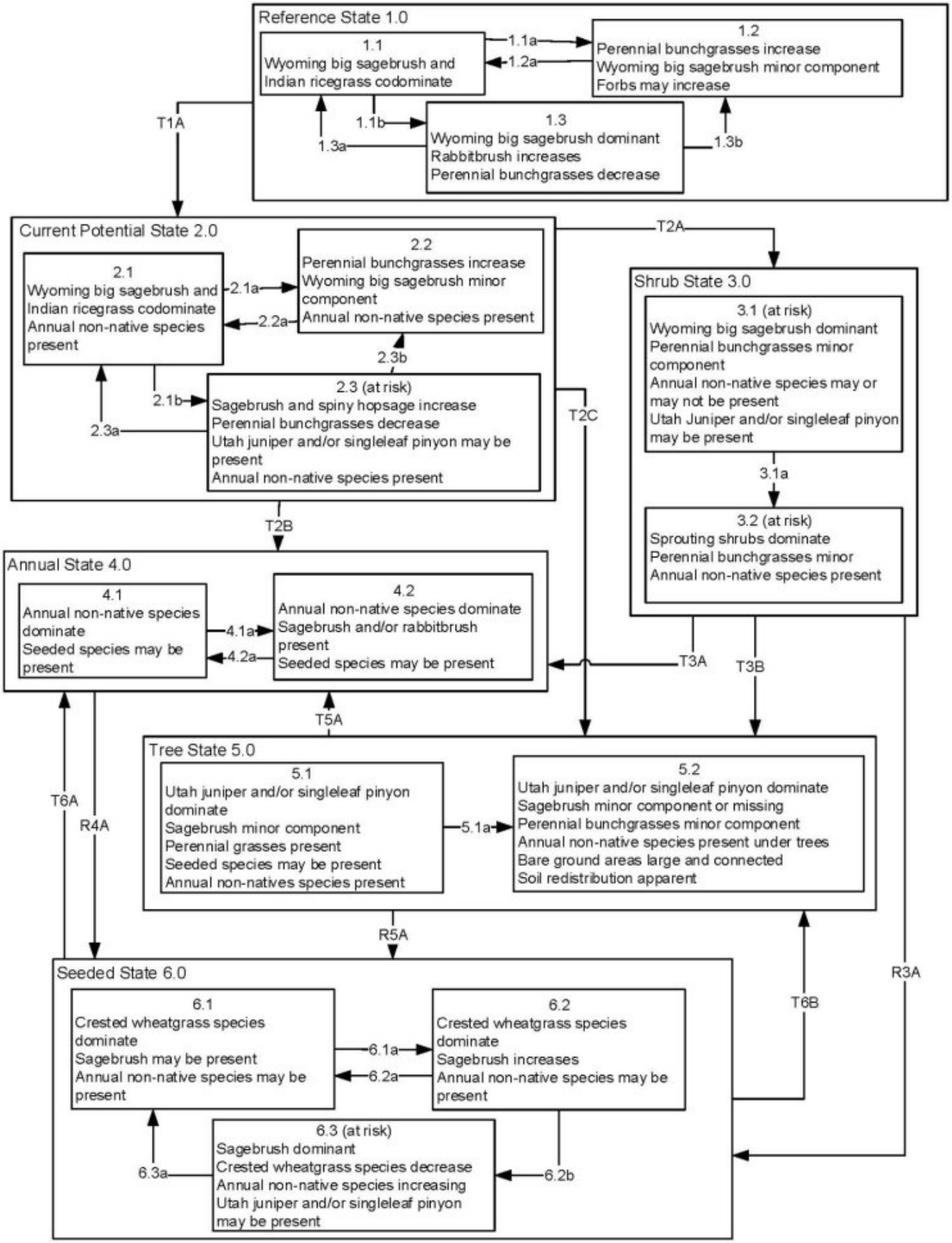
Where management results in abusive grazing use by livestock or feral horses, big sagebrush and rabbitbrush increase as Thurber's needlegrass, Indian ricegrass and muttongrass decrease. Utah juniper and singleleaf pinyon readily increase on this site where it occurs adjacent to these woodland areas. Cheatgrass and annual mustards are species likely to invade this site.

Fire Ecology:
Sagebrush steppe communities have historically been subjected to fires at varying intervals (20 to 70 years). 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. Mountain big sagebrush is highly susceptible to injury from fire. It is often top-killed by fire and will not resprout. Antelope bitterbrush is considered a weak sprouter and is often killed by summer or fall fires. Antelope bitterbrush in some areas may sprout after light-severity spring fires. High fuel consumptions increase antelope bitterbrush mortality and therefore favors seedling establishment. Green ephedra generally sprouts vigorously from the roots or woody root crown after fire and rapidly produces aboveground biomass from surviving meristematic tissue. 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. Burning has been found to decrease the vegetation and reproductive vigor. Early season burning is more damaging to this needlegrass than late season burning. 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. Needle and thread is top-killed by fire. It may be killed if the aboveground stems are completely consumed. Needle and thread is classified as slightly to severely damaged by fire. Needle and thread sprouts from the caudex following fire, if heat has not been sufficient to kill underground parts. Recovery usually takes 2 to 10 years. Muttongrass is unharmed to slightly harmed by light-severity fall fires. Muttongrass appears to be harmed by and slow to recover from severe fire. Blue grama has variable fire tolerance; it has fair tolerance when dormant but experiences some damage if burned during active growth, especially during drought. Fire generally favors blue grama, generally increasing its occurrence, production, and percent cover.

The reference plant community is dominated by big sagebrush, Thurber's needlegrass and Indian ricegrass. Antelope bitterbrush is an important species associated with this site. Potential vegetative composition is about 50 percent grasses, 5 percent forbs, and 45 percent shrubs and trees. Approximate ground cover (basal and crown) is 20 to 30 percent.

The state and transition model is from a similar site (R028AY064NV). Both sites are correlated to the soil series Starflyer.

State and transition model


Reference State 1.0
1.1
Wyoming big sagebrush and
Indian ricegrass codominate
1.2
Perennial bunchgrasses increase
Wyoming big sagebrush minor component
Forbs may increase
1.3
Wyoming big sagebrush dominant
Rabbitbrush increases
Perennial bunchgrasses decrease
1.1a
1.2a
1.1b
1.3a
1.3b
T1A
Current Potential State 2.0
2.1
Wyoming big sagebrush and
Indian ricegrass codominate
Annual non-native species present
2.2
Perennial bunchgrasses increase
Wyoming big sagebrush minor component
Annual non-native species present
2.3 (at risk)
Sagebrush and spiny hopsage increase
Perennial bunchgrasses decrease
Utah juniper and/or singleleaf pinyon may be present
Annual non-native species present
2.1a
2.2a
2.3b
2.1b
2.3a
T2A
T2B
T2C
Shrub State 3.0
3.1 (at risk)
Wyoming big sagebrush dominant
Perennial bunchgrasses minor component
Annual non-native species may or may not be present
Utah Juniper and/or singleleaf pinyon may be present
3.1a
3.2 (at risk)
Sprouting shrubs dominate
Perennial bunchgrasses minor
Annual non-native species present
Annual State 4.0
4.1
Annual non-native species dominate
Seeded species may be present
4.2
Annual non-native species dominate
Sagebrush and/or rabbitbrush present
Seeded species may be present
4.1a
4.2a
T3A
T3B
T5A
Tree State 5.0
5.1
Utah juniper and/or singleleaf pinyon dominate
Sagebrush minor component
Perennial grasses present
Seeded species may be present
Annual non-natives species present
5.2
Utah juniper and/or singleleaf pinyon dominate
Sagebrush minor component or missing
Perennial bunchgrasses minor component
Annual non-native species present under trees
Bare ground areas large and connected
Soil redistribution apparent
5.1a
T6A
R4A
R5A
T6B
R3A
Seeded State 6.0
6.1
Crested wheatgrass species dominate
Sagebrush may be present
Annual non-native species may be present
6.2
Crested wheatgrass species dominate
Sagebrush increases
Annual non-native species may be present
6.3 (at risk)
Sagebrush dominant
Crested wheatgrass species decrease
Annual non-native species increasing
Utah juniper and/or singleleaf pinyon may be present
6.1a
6.2a
6.3a
6.2b

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 may also decrease perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: Low severity fire or Aroga moth infestation resulting in a mosaic pattern.
1.3b: High severity fire significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native species such as bulbous bluegrass, cheatgrass and thistles.

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 as fire or drought. Inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for regeneration of sagebrush.
2.3a: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Brush management with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.
2.3b: High severity fire significantly reduces sagebrush cover leading to early mid-seral community.

Transition T2A: Time and lack of disturbance and/or inappropriate grazing management (3.1).
Transition T2B: High severity fire and/or soil disturbance (4.1). Inappropriate grazing that favors shrubs in the presence of non-native annual species (4.2).
Transition T2C: Time and lack of disturbance allows for an increase in tree cover; inappropriate grazing management and/or chronic drought can reduce fine fuels and lead to increased tree establishment and dominance (5.1).

Shrub State 3.0 Community Phase Pathways
3.1a: Fire.

Transition T3A: Catastrophic fire and/or soil disturbance (4.1). Inappropriate grazing management in the presence of non-native annual species (4.2).
Transition T3B: Time and a lack of fire allows for trees to dominate site; may be coupled with inappropriate grazing management (5.1).

Restoration R3A: Brush management with minimal soil disturbance, coupled with seeding of desired species. Probability of success very low (6.1).

Annual State 4.0 Community Phase Pathways
4.1a: Time and lack of fire, unlikely to occur.
4.2a: Fire.

Restoration R4A: Seeding of desired species; may be coupled with herbicide; probability of success very low (6.1).

Tree State 5.0 Community Phase Pathways
5.1a: Time and lack of disturbance allows for tree maturation

Restoration R5A: Tree removal and seeding of desired species.

Transition T5A: Catastrophic fire, inappropriate tree removal practices (5.1).

Seeded State 6.0 Community Phase Pathways
6.1a: Time and lack of disturbance may be coupled with inappropriate grazing management.
6.2a: Low severity fire.
6.2b: Inappropriate grazing management reduces bunchgrasses and increases density of sagebrush; usually a slow transition.
6.3a: Fire or brush treatment with minimal soil disturbance.

Transition T6A: Catastrophic fire and/or inappropriate grazing management.
Transition T6B: Time and a lack of fire allows for trees to dominate site; may be coupled with inappropriate grazing management (5.1).

Animal community

Livestock Interpretations:
This site has limited value for livestock grazing due to steep slopes and stony surface soils. Grazing management should be keyed to perennial grass production. 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. 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. Needle and thread 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. 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. Blue grama is valuable forage for all classes of domestic livestock, providing excellent forage for cattle and sheep. Blue grama tends to be most productive following summer rains, but it cures well and provides forage year round. Big sagebrush is eaten by domestic sheep and cattle, but has long been considered to be of low palatability to domestic livestock, a competitor with more desirable species, and a physical impediment to grazing. 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. Green ephedra is heavily browsed by livestock on winter range but only moderately or lightly browsed during other seasons.

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:
Big sagebrush is highly preferred and nutritious winter forage for mule deer. Sage grouse are also highly dependent on big sagebrush for both food and cover. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Open Wyoming sagebrush communities are preferred nesting habitat. 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. Leks are often located on low sagebrush sites, grassy openings, dry meadows, ridgetops, and disturbed sites. 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. Green ephedra is an important browse species for big game animals. Green ephedra is heavily used by wildlife on winter ranges. Thurber needlegrass and Indian ricegrass are important forage species for several livestock species. Indian ricegrass is eaten by pronghorn in moderate amounts whenever available. 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. 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. Needle and thread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available. 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. Blue grama also provides important forage for mule deer. Quail and some songbirds eat the seeds of blue grama. Small mammals also eat blue grama seeds and stems. Flower heads and seeds of blue grama are also consumed by grasshoppers, which can all but eliminate an annual seed crop.

Hydrological functions

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

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 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. Native peoples used big sagebrush leaves and branches for medicinal teas, and the leaves as a fumigant. Bark was woven into mats, bags and clothing. 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. 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. Green ephedra is listed as a successful shrub for restoring western rangeland communities and can be used to rehabilitate disturbed lands. It also has value for reducing soil erosion on both clay and sandy soils. Green ephedra establishes readily through direct seeding, transplants, and stem cuttings. Indian ricegrass is well-suited for surface erosion control and desert revegetation although it is not highly effective in controlling sand movement. Needle and thread is useful for stabilizing eroded or degraded sites. Because of its wide adaptation, ease of establishment, and economic value, blue grama is used extensively for conservation purposes, rangeland seeding, and landscaping. Blue grama is useful for reclamation and for erosion control in arid and semiarid regions.

Inventory data references

NASIS data used for abiotic narratives and tables.

Type locality

Location 1: Nye County, NV	
Township/Range/Section	T7N R46E S3
Latitude	38° 29′ 0″
Longitude	116° 47′ 21″
General legal description	NE¼ Section 3, T7N. R46E. MDBM. About 1½ miles southeast of Hunts Canyon Ranch, McCann Canyon area, Monitor Range, Toiyabe National Forest, Nye 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

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)	
Contact for lead author	
Date	02/24/2025
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:**
