USDA Natural Resources
Conservation Service

Ecological site R024XY045NV
ERODED SLOPE 6-10 P.Z.

Last updated: 3/06/2025
Accessed: 05/21/2025

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): 024X–Humboldt Basin and Range Area

Major land resource area (MLRA) 24, the Humboldt Area, covers an area of approximately 8,115,200 acres (12,680 sq. mi.). It is found in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. Elevations range from 3,950 to 5,900 feet (1,205 to 1,800 meters) in most of the area, some mountain peaks are more than 8,850 feet (2,700 meters).
A series of widely spaced north-south trending mountain ranges are separated by broad valleys filled with alluvium washed in from adjacent mountain ranges. Most valleys are drained by tributaries to the Humboldt River. However, playas occur in lower elevation valleys with closed drainage systems. Isolated ranges are dissected, uplifted fault-block mountains. Geology is comprised of Mesozoic and Paleozoic volcanic rock and marine and continental sediments. Occasional young andesite and basalt flows (6 to 17 million years old) occur at the margins of the mountains. Dominant soil orders include Aridisols, Entisols, Inceptisols and Mollisols. Soils of the area are generally characterized by a mesic soil temperature regime, an aridic soil moisture regime and mixed geology. They are generally well drained, loamy and very deep.
Approximately 75 percent of MLRA 24 is federally owned, the remainder is primarily used for farming, ranching and mining. Irrigated land makes up about 3 percent of the area; the majority of irrigation water is from surface water sources, such as the Humboldt River and Rye Patch Reservoir. Annual precipitation ranges from 6 to 12 inches (15 to 30 cm) for most of the area, but can be as much as 40 inches (101 cm) in the mountain ranges. The majority of annual precipitation occurs as snow in the winter. Rainfall occurs as high-intensity, convective thunderstorms in the spring and fall.

Ecological site concept

This ecological site is on hills and rock pediments. Soils are shallow to a restrictive layer, well drained and formed in residuum/colluvium derived from mixed parent material. The soil profile is characterized by an ochric epipedon and strong effervescence, increasing with depth.
Important abiotic factors contributing to the presence of this ecological site include slopes typically greater than 30 percent and shallow soils resulting in droughty soil-site conditions.

Associated sites

R024XY005NV	**LOAMY 8-10 P.Z.** Important abiotic factors contributing to the presence of this ecological site include limited precipitation and the presence of the argillic horizon that helps retain soil moisture. The fine-textured/clay rich horizons, lying beneath the coarser-textured horizons become impermeable as the swelling matrix closes following wetting.

Similar sites

R024XY026NV	**STONY SLOPE 8-10 P.Z.** Wyoming big sagebrush (ARTRW)-Shadscale sagebrush (ATCO) codominant; Thurber's needlegrass (ACTH7) minor species.
R024XY020NV	**DROUGHTY LOAM 8-10 P.Z.** Thurber's needlegrass (ACTH7)- Indian ricegrass (ACHY) codominant grasses.
R024XY005NV	**LOAMY 8-10 P.Z.** Thurber's needlegrass (ACTH7) dominant grass; more productive site.
R024XY047NV	**SHALLOW LOAM 8-10 P.Z.** Wyoming big sagebrush (ARTRW); Less productive site.

Table 1. Dominant plant species

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

Physiographic features

This site is on steep hill side slopes and pediments on all aspects. Slopes range from 4 to 50 percent, but slope gradients of 15 to 50 percent are typical. Elevations are 4200 to 8200 feet (1280 to 2499 m).

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Pediment (3) Hillside
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	4,200–8,200 ft
Slope	4–50%
Water table depth	72 in
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The climate associated with this site is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is (6)8 to 10 inches (20 to 25cm). Mean annual temperatures are 45 to 53 degrees F. The average growing season is about 90 to 130 days.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	
Precipitation total (average)	10 in

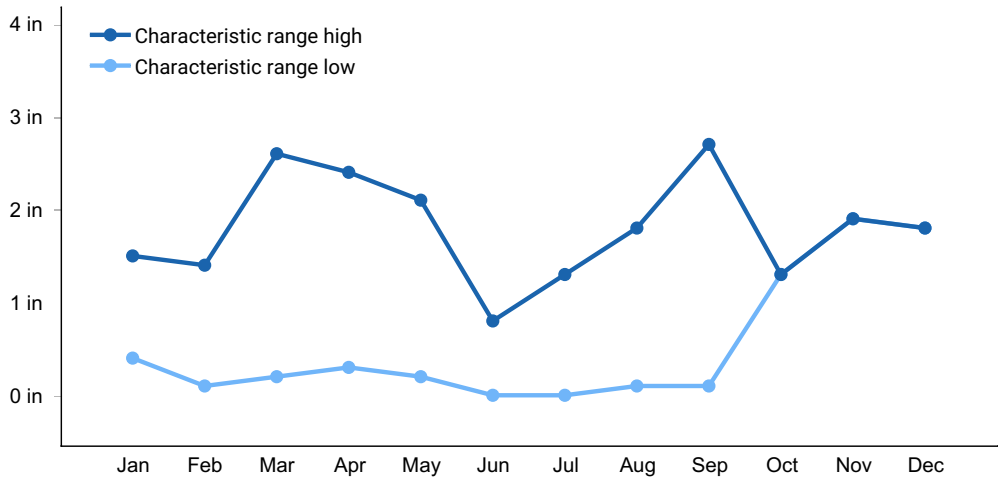


Figure 1. Monthly precipitation range

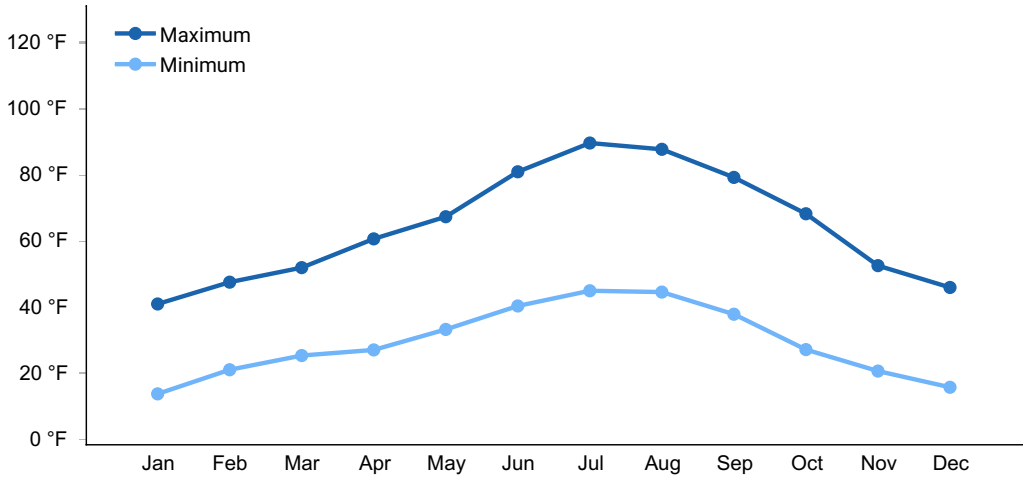


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site are shallow to a restrictive layer, well drained and formed in residuum/colluvium derived from mixed parent material. The soil profile is characterized by an ochric epipedon and is strongly effervescent, increasing with depth. The available water capacity is very low to moderate. Runoff is very high and the permeability is very slow to moderately rapid. Rock fragments on the soil surface reduce surface erosion. The soil series associated with this site include: Oxcorel, Puett, and Spike.

Table 4. Representative soil features

Parent material	(1) Residuum (2) Colluvium
Surface texture	(1) Very gravelly fine sandy loam (2) Sandy loam (3) Very gravelly clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderately rapid
Soil depth	10–84 in
Surface fragment cover <=3"	15–46%
Surface fragment cover >3"	1–12%
Available water capacity (0-40in)	0.9–3.3 in

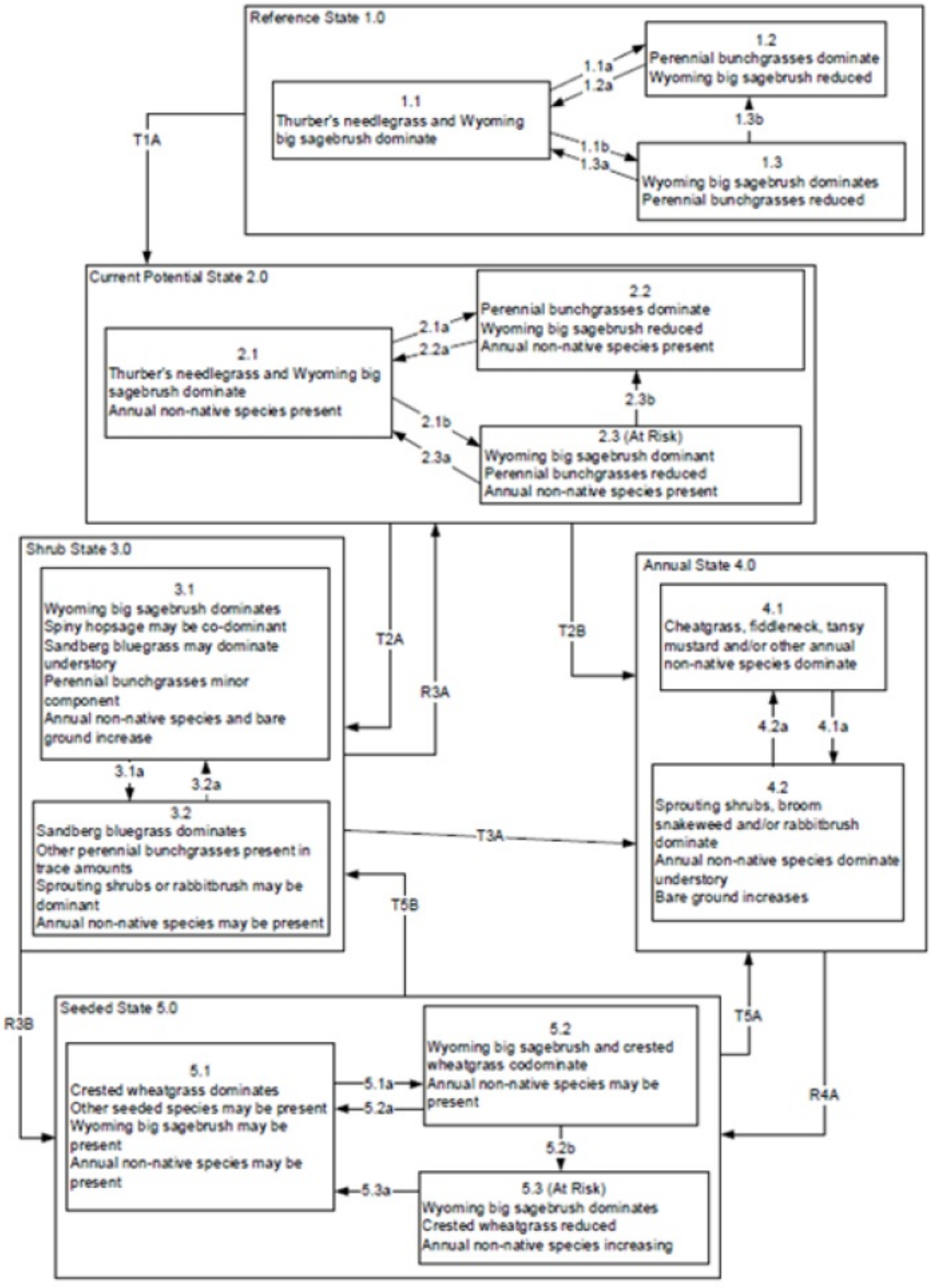
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–8 mmhos/cm
Sodium adsorption ratio (0-40in)	0–45
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	8–62%
Subsurface fragment volume >3" (Depth not specified)	2–12%

Ecological dynamics

As ecological condition declines and where management results in abusive grazing use by livestock or feral horses, Indian ricegrass and Thurber's needlegrass decrease in the understory and are eventually replaced by Sandberg's bluegrass and bottlebrush squirreltail. Wyoming big sagebrush and rabbitbrush increase and become the dominant vegetation as conditions continue to decline. Cheatgrass is the species most likely to invade this site.

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. 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. Shadscale is fire intolerant and it does not readily recover from fire, except for establishment through seed. 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. 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.

State and transition model


Reference State 1.0
1.1
Thurber's needlegrass and Wyoming big sagebrush dominate
1.2
Perennial bunchgrasses dominate
Wyoming big sagebrush reduced
1.3
Wyoming big sagebrush dominates
Perennial bunchgrasses reduced
1.1a
1.2a
1.3b
1.1b
1.3a
T1A
Current Potential State 2.0
2.1
Thurber's needlegrass and Wyoming big sagebrush dominate
Annual non-native species present
2.2
Perennial bunchgrasses dominate
Wyoming big sagebrush reduced
Annual non-native species present
2.3 (At Risk)
Wyoming big sagebrush dominant
Perennial bunchgrasses reduced
Annual non-native species present
2.1a
2.2a
2.3b
2.1b
2.3a
Shrub State 3.0
3.1
Wyoming big sagebrush dominates
Spiny hopsage may be co-dominant
Sandberg bluegrass may dominate understory
Perennial bunchgrasses minor component
Annual non-native species and bare ground increase
3.2
Sandberg bluegrass dominates
Other perennial bunchgrasses present in trace amounts
Sprouting shrubs or rabbitbrush may be dominant
Annual non-native species may be present
3.1a
3.2a
T2A
R3A
T2B
T3A
T5B
Annual State 4.0
4.1
Cheatgrass, fiddleneck, tansy mustard and/or other annual non-native species dominate
4.2
Sprouting shrubs, broom snakeweed and/or rabbitbrush dominate
Annual non-native species dominate understory
Bare ground increases
4.2a
4.1a
R3B
T5A
R4A
Seeded State 5.0
5.1
Crested wheatgrass dominates
Other seeded species may be present
Wyoming big sagebrush may be present
Annual non-native species may be present
5.2
Wyoming big sagebrush and crested wheatgrass codominate
Annual non-native species may be present
5.3 (At Risk)
Wyoming big sagebrush dominates
Crested wheatgrass reduced
Annual non-native species increasing
5.1a
5.2a
5.2b
5.3a

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. A severe infestation of Aroga moth could also reduce sagebrush cover.
1.1b: Time and lack of disturbance such as fire or drought. Excessive herbivory may also reduce 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 or Aroga moth significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native species.

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. A severe infestation of Aroga moth could also reduce sagebrush cover.
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 treatment with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.
2.3b: High severity fire or Aroga moth significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T2A: Inappropriate grazing management favoring shrub dominance and reducing perennial bunchgrasses will lead to phase 3.1. Soil disturbing treatments and/or fire will lead to phase 3.2.
Transition T2B: Catastrophic fire and/or soil disturbing treatments (to 4.1); inappropriate cattle/horse grazing management that removes bunchgrasses, favors shrubs and promotes the presence of non-native annual species (to 4.2).

Shrub State 3.0 Community Phase Pathways
3.1a: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Brush treatment with minimal soil disturbance; late-fall/winter grazing causing mechanical damage to sagebrush.
3.2a: Time and lack of disturbance may allow for sagebrush to re-establish.

Restoration R3A: Brush management and seeding of native deep rooted bunchgrasses (probability of success is low).
Restoration R3B: Brush management and seeding of crested wheatgrass and/or other non-native desirable species.

Transition T3A: Fire and/or soil disturbing treatments.

Annual State 4.0 Community Phase Pathways
4.1a: Time and lack of disturbance. Wyoming big sagebrush is unlikely to reestablish and may take many years.
4.2a: High-severity fire.

Restoration R4A: Application of herbicide and seeding of desired species (probability of success best immediately following fire).

Seeded State 5.0 Community Phase Pathways
5.1a: Inappropriate grazing management facilitates shrub reestablishment. Time and lack of disturbance/management would also allow for shrubs to establish and increase.
5.2a: Fire, brush management, or Aroga moth infestation reduces shrub component.
5.2b: Inappropriate grazing management decreases perennial bunchgrass understory and facilitates sagebrush overstory.
5.3a: High severity fire, Aroga moth or brush management reduces sagebrush cover leading to a early/mid seral community.

Transition T5A: Catastrophic fire (coming from 5.3).
Transition T5B: Inappropriate grazing management favoring shrub dominance and reducing perennial bunchgrasses will lead to phase 3.1. Soil disturbing treatments and/or fire will lead to phase 3.2.

Animal community

Livectock Interpretations:
This site has limited value for livestock grazing, due to the low forage production. Grazing management should be keyed to dominant grasses or palatable shrubs production. 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. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of livestock. Shadscale provides good browse for domestic sheep. Shadscale leaves and seeds are an important component of domestic sheep and cattle winter diets. Indian ricegrass is highly palatable to all classes of livestock in both green and cured condition. It supplies a source of green feed before most other native grasses have

produced much new growth. 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.

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 heavily. 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. Shadscale is a valuable browse species, providing a source of palatable, nutritious forage for a wide variety of wildlife particularly during spring and summer before the hardening of spiny twigs. It supplies browse, seed, and cover for birds, small mammals, rabbits, deer, and pronghorn antelope. 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. Thurber needlegrass is valuable forage for wildlife. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. 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.

Hydrological functions

Runoff is very high. Permeability is very slow to moderately rapid. Hydrologic soil groups are B and D. Rills are rare to few. Occurrence is limited to steeper slopes in areas subjected to summer convection storms or rapid spring snowmelt. Water flow patterns are rare to few and limited to steeper slopes in areas subjected to summer convection storms or rapid snowmelt. Pedestals are none to rare. Should pedestals occur, they are confined to areas of water flow. Frost heaving of shallow rooted plants should not be considered as pedestalling. Gullies are none to 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 and the colorful flowering of wild flowers and shrubs during the spring and early summer. This site offers rewarding opportunities to photographers and for nature study. This site is used for camping and hiking and has potential for upland and big game hunting.

Other products

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. Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. Seeds of shadscale were used by Native Americans for bread and mush. Indian ricegrass was traditionally eaten by some Native Americans. 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. 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.

Inventory data references

NASIS soil component data.

Type locality

Location 1: Lander County, NV	
Township/Range/Section	T22N R43E S1
UTM zone	N
UTM northing	4405960
UTM easting	492513
Latitude	39° 48′ 12″
Longitude	117° 5′ 14″

General legal description	NW¼ Approximately 6 miles north of Austin on NvHwy 305 (8A), along both sides of Reese River drainage from about Silver Creek to Boon Creek, Lander County, Nevada. This site also occurs in Humboldt County, Nevada.
Location 2: Eureka County, NV	
Township/Range/Section	T31N R48E S17
UTM zone	N
UTM northing	4490090
UTM easting	534978
Latitude	40° 33′ 39″
Longitude	116° 35′ 12″
General legal description	SW¼SW¼ About 9 air miles southwest of Beowawe, Crescent Valley area, Eureka County, Nevada. This site also occurs in Humboldt and Lander, Counties, Nevada.

Other references

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

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

Contributors

CP/GKB
TK Stringham

Approval

Kendra Moseley, 3/06/2025

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)	Patti Novak-Echenique

Contact for lead author	State Rangeland Management Specialist
Date	03/19/2010
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are rare to few. Occurrence is limited to 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 rare to few and limited to steeper slopes 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 none to rare. Should pedestals occur, they are confined to areas of water flow. Frost heaving of shallow rooted plants should not be considered as pedestalling.

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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 up to 70% depending on amount of surface rock fragments.

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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) 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 2 to 5 on most soil textures found on this site. (This will be field tested.)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface structure is typically medium platy. Soil surface colors are pale brown and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1 to 2 percent dropping off quickly below. Organic matter content can be more or less depending on micro-topography.

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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.

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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. Subsoil argillic horizons are not to be interpreted as compacted 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: Tall shrubs (Wyoming big sagebrush) > deep-rooted, cool season, perennial bunchgrasses

    Sub-dominant: associated shrubs > shallow-rooted, cool season, perennial bunchgrasses > deep-rooted, cool season, perennial forbs > fibrous, shallow-rooted, cool season, perennial forbs = annual forbs.

    Other:

    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 25% of total woody canopy; some of the mature bunchgrasses (<20%) have dead centers.

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (±10%) and depth (±¼ in.).

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (thru June) ± 200 lbs/ac; Favorable years± 350 lbs/ac and unfavorable years ± 100 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, and annual mustards.

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 extreme or extended drought years.