

Ecological site R023XY051NV SANDY 8-12 P.Z.

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Ecological site concept

Currently there is only a draft of the initial concept for this ecological site. The initial concept for this site places it within the Clayey Mesic Plateaus 8-14 PZ Wyoming Big Sagebrush and Thurber's Needlegrass Ecological Site Group. To view the General STM and other information available for this ESG please go to <https://edit.jornada.nmsu.edu/catalogs/esg/023X/R023XY909OR>

This site occurs on lower fan remnants, lake terraces, and lake plains that have been covered with a surface layer of sand. Soils are deep to very deep and excessively drained. The coarse textured surface soils are usually at least 20 inches in depth. Because of rapid intake and deep percolation of water, the loss of soil moisture due to evaporation is reduced and runoff is negligible. These conditions allow deep rooted plants to grow vigorously under arid climatic conditions. The soils are extremely susceptible to wind erosion and small "blow-out" spots are common. The plant community is dominated by Indian ricegrass, needleandthread, and basin and Wyoming big sagebrush. Annual production ranges from 600-100 lb/ac with 800 lb/ac in normal years. This site's STM is similar to the group modal site with 5 stable states.

Associated sites

R023XY006NV	LOAMY 8-10 P.Z.
R023XY011NV	DUNES 8-10 P.Z.
R023XY020NV	LOAMY 10-12 P.Z.
R023XY038NV	DROUGHTY LOAM 8-10 P.Z.

Similar sites

R024XY066NV	SODIC DUNES SAVE4 dominant shrub; less productive site
R023XY011NV	DUNES 8-10 P.Z. occurs on sand hills; slopes more than 8 percent; HECO26 not codominant grass
R023XY038NV	DROUGHTY LOAM 8-10 P.Z. less productive site; ARTRW8-GRSP codominant shrubs

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i>
Herbaceous	(1) <i>Achnatherum hymenoides</i> (2) <i>Hesperostipa comata</i>

Physiographic features

This site occurs on pediment alluvial fans, beach terraces and lake plains that have been covered with a surface layer of sand. Slope gradients of 2 to 15 percent are typical. Elevations are 3900 to 5800 feet.

Table 2. Representative physiographic features

Landforms	(1) Pediment (2) Beach terrace (3) Lake plain
Elevation	1,189–1,768 m
Slope	2–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate associated with this site is semiarid and characterized by cool, moist winters and warm, dry summers. Average annual precipitation is 8 to 12 inches. Mean annual air temperature is 47 to 53 degrees F. The average growing season is about 60 to 210 days.

Nevada's climate is predominantly arid, with large daily ranges of temperature, infrequent severe storms, heavy snowfall in the higher mountains, and great location variations with elevation. Three basic geographical factors largely influence Nevada's climate: continentality, latitude, and elevation. Continentality is the most important factor. The strong continental effect is expressed in the form of both dryness and large temperature

variations. Nevada lies on the eastern, lee side of the Sierra Nevada Range, a massive mountain barrier that markedly influences the climate of the State. The prevailing winds are from the west, and as the warm moist air from the Pacific Ocean ascend the western slopes of the Sierra Range, the air cools, condensation occurs and most of the moisture falls as precipitation. As the air descends the eastern slope, it is warmed by compression, and very little precipitation occurs. The effects of this mountain barrier are felt not only in the West but throughout the state, with the result that the lowlands of Nevada are largely desert or steppes. The temperature regime is also affected by the blocking of the inland-moving maritime air. Nevada sheltered from maritime winds, has a continental climate with well-developed seasons and the terrain responds quickly to changes in solar heating. Nevada lies within the mid-latitude belt of prevailing westerly winds which occur most of the year. These winds bring frequent changes in weather during the late fall, winter and spring months, when most of the precipitation occurs. To the south of the mid-latitude westerlies, lies a zone of high pressure in subtropical latitudes, with a center over the Pacific Ocean. In the summer, this high-pressure belt shifts northward over the latitudes of Nevada, blocking storms from the ocean. The resulting weather is mostly clear and dry during the summer and early fall, with scattered thundershowers. The eastern portion of the state receives significant summer thunderstorms generated from monsoonal moisture pushed up from the Gulf of California, known as the North American monsoon. The monsoon system peaks in August and by October the monsoon high over the Western U.S. begins to weaken and the precipitation retreats southward towards the tropics (NOAA 2004).

Average annual precipitation is 16 to over 20 inches. Mean annual air temperature is 41 to 44 degrees F. The average growing season is about 50 to 70 days.

Mean annual precipitaion at the Bear Creek, Nevada SNOTEL station (170501020301) is 37.69 inches.

monthly mean precipitation is:

January 3.84; February 3.75; March 4.38; April 4.9;
May 3.99; June 2.82; July .95; August 1.66;
September 1.22; October 2.12;
November 3.67; December 4.38.

Table 3. Representative climatic features

Frost-free period (average)	135 days
Freeze-free period (average)	
Precipitation total (average)	254 mm

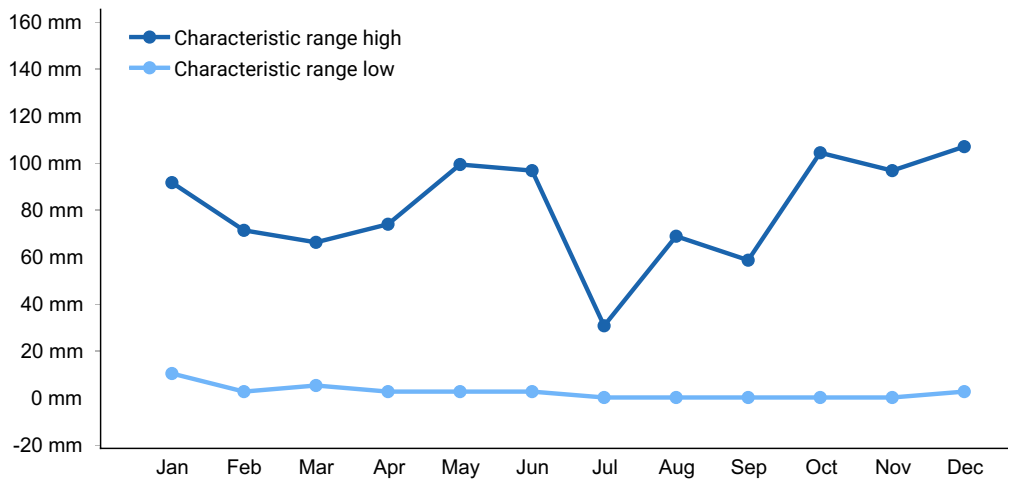


Figure 1. Monthly precipitation range

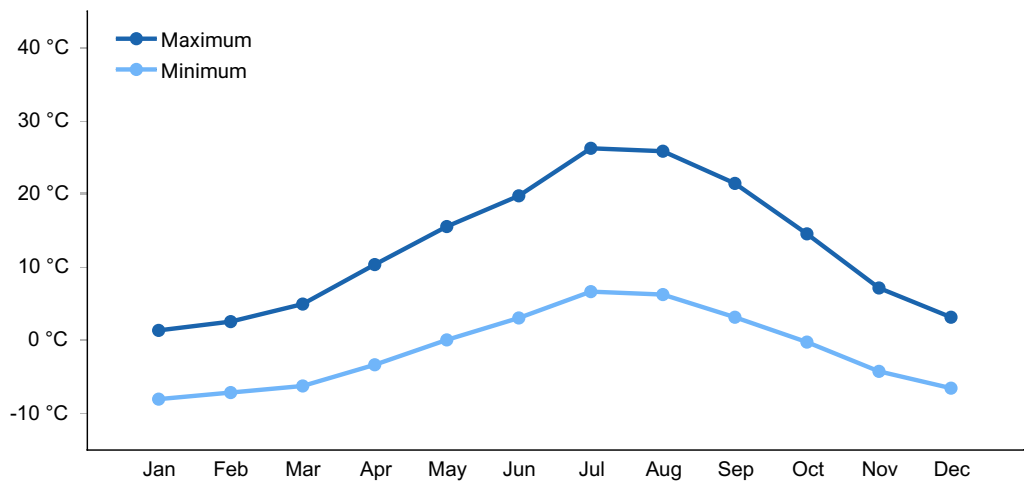


Figure 2. Monthly average minimum and maximum temperature

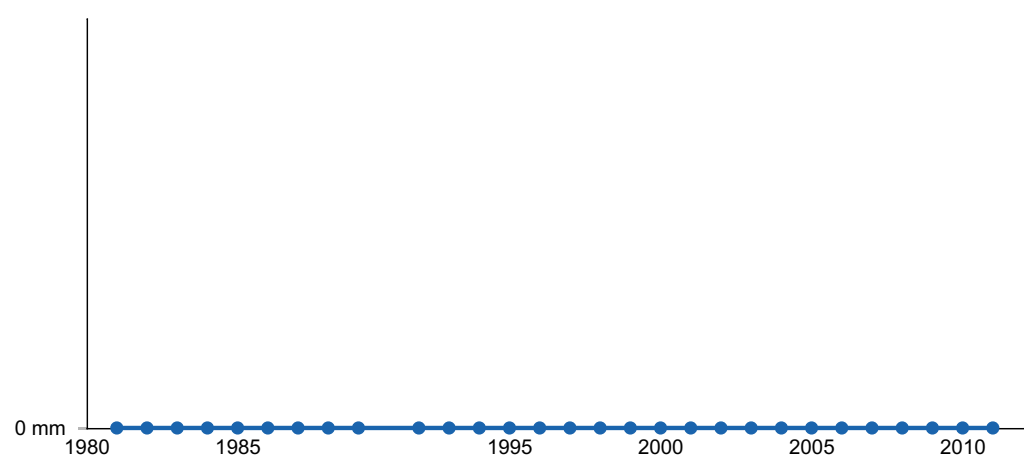


Figure 3. Annual precipitation pattern

Influencing water features

There are no influencing water features associated with this site.

Soil features

The soils associated with this site have formed in moderately coarse to coarse textured alluvium or aeolian deposits from mixed rock sources. These soils are shallow to very deep and well to somewhat excessively drained. The coarse textured surface soils are usually at least 20 inches in depth. Because of rapid intake and deep percolation of water, the loss of soil moisture due to evaporation is reduced and runoff is very low to very high. These conditions allow deep rooted plants to grow vigorously under arid climatic conditions. The soils are extremely susceptible to wind erosion and small "blow-out" spots are common, and, collectively, may represent as much as 2 percent of the total surface area for the site. The soil series associated with this site include: Corral, Davey, and Langston.

Table 4. Representative soil features

Surface texture	(1) Loamy fine sand (2) Gravelly loamy sand
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderately rapid
Soil depth	30–213 cm
Surface fragment cover ≤3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.08–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–12
Soil reaction (1:1 water) (0-101.6cm)	6.6–9
Subsurface fragment volume ≤3" (Depth not specified)	4–65%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

Where management results in abusive grazing use by livestock and/or feral horses, Indian

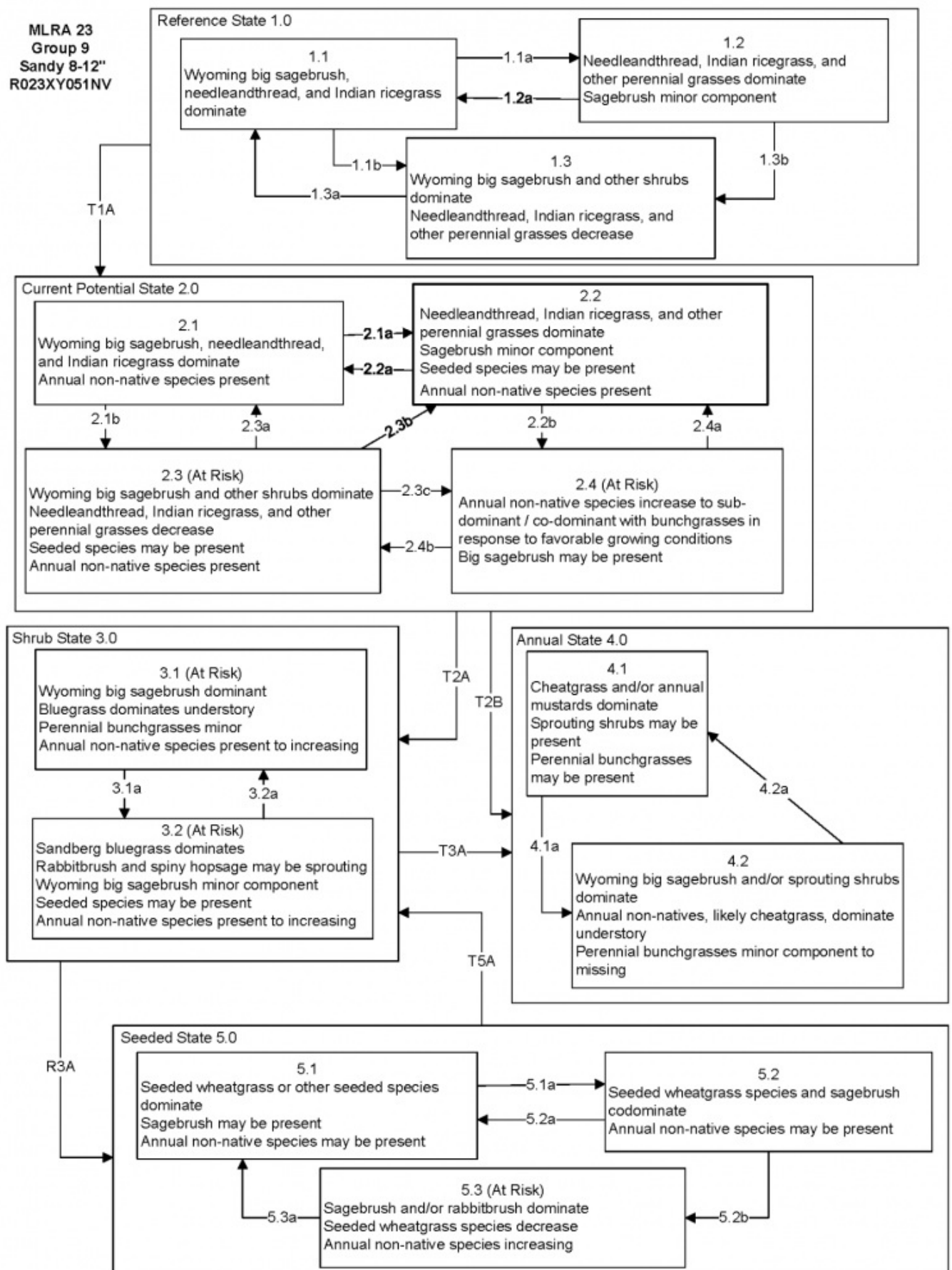
ricegrass and Thurber's needlegrass decrease in abundance as unpalatable shrubs increase. Cheatgrass, Russian-thistle, and annual mustards are species likely to invade this site. Should this site burn, grazing use should be curtailed until perennial grass species are well established and the site is protected from wind erosion.

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. Basin big sagebrush is readily killed when aboveground plant parts are charred by fire. Prolific seed production from nearby unburned plants coupled with high germination rates enables seedlings to establish rapidly following fire. 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. Ephedra generally sprouts vigorously from the roots or woody root crown after fire and rapidly produces aboveground biomass from surviving meristematic tissue. Needleandthread is top-killed by fire. It may be killed if the aboveground stems are completely consumed. Needleandthread is classified as slightly to severely damaged by fire. Needleandthread sprouts from the caudex following fire, if heat has not been sufficient to kill underground parts. Recovery usually takes 2 to 10 years. 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. Early season burning is more damaging to this needlegrass than late season burning. Basin wildrye is top-killed by fire. Older basin wildrye plants with large proportions of dead material within the perennial crown can be expected to show higher mortality due to fire than younger plants having little debris. Basin wildrye is generally tolerant of fire but may be damaged by early season fire combined with dry soil conditions. Thickspike wheatgrass is quite tolerant of fire. Subsurface growing points and primarily rhizomatous reproduction may explain its ability to increase rapidly (within 2-5 years) following burning.

State and transition model

MLRA 23
Group 9
Sandy 8-12"
R023XY051NV



**MLRA 23
Group 9
Sandy 8-12"
R023XY051NV
KEY**

Reference State 1.0 Community Phase Pathways

- 1.1a: Low severity fire and/or Aroga moth infestation creates grass/sagebrush mosaic.
- 1.1b: Time and lack of disturbance such as fire. Excessive herbivory and/or drought will reduce perennial bunchgrasses.
- 1.2a: Time and lack of disturbance and/or herbivory that allows for shrub regeneration.
- 1.3a: Low severity fire or Aroga moth infestation resulting in a mosaic pattern.
- 1.3b: High severity fire and/or severe Aroga moth infestation significantly reduces sagebrush cover leading to early/mid-seral community.

Transition T1A: Introduction of non-native species such as cheatgrass.

Current Potential State 2.0 Community Phase Pathways

- 2.1a: Low severity fire and/or Aroga moth infestation creates grass/sagebrush mosaic; non-native annual species present.
- 2.1b: Time and lack of disturbance such as fire. Inappropriate grazing and/or drought will reduce perennial bunchgrasses.
- 2.2a: Time and lack of disturbance allows for regeneration of sagebrush.
- 2.2b: Fall and spring growing conditions that favors the germination and production of non-native, annual grasses. Pathway typically occurs 3 to 5 years post-fire and 2.4 may be a transitory plant community.
- 2.3a: Low severity fire or Aroga moth infestation creates sagebrush/grass mosaic. Brush management (aerial herbicide application), late-fall/winter grazing causing mechanical damage to sagebrush.
- 2.3b: High severity fire and/or severe Aroga moth infestation significantly reduces sagebrush cover leading to early mid-seral community.
- 2.3c: Fall and spring growing season conditions that favors the germination and production of non-native annual grasses. 2.4 may be a transitory plant community.
- 2.4a: Growing season conditions favoring perennial bunchgrass production and reduced cheatgrass production.
- 2.4b: Growing season conditions favoring perennial bunchgrass production and reduced cheatgrass production.

Transition T2A: Inappropriate grazing management favoring shrub dominance and reducing perennial bunchgrasses and/or drought (3.1) Fire (3.2).

Transition T2B: Fire (4.1) or inappropriate grazing management in the presence on non-native annual species (4.2).

Shrub State 3.0 Community Phase Pathways

- 3.1a: Fire, Aroga moth, brush management (aerial herbicide application), and/or late-fall/winter grazing causing mechanical damage to sagebrush.
- 3.2a: Time and lack of disturbance (an unlikely/slow transition).

Annual State 4.0 Community Phase Pathways

- 4.1a: Time and lack of disturbance (an unlikely/slow transition).
- 4.2a: Fire.

Transition T3A: Fire (4.1) or inappropriate grazing management (4.2).

Restoration R3A: Brush management, combined with seeding of desired species.

Seeded State 5.0 Community Phase Pathways

- 5.1a: Time and lack of disturbance may be coupled with inappropriate grazing management.
- 5.2a: Low severity fire.
- 5.2b: Inappropriate grazing management reduces bunchgrasses and increases density of sagebrush; usually a slow transition.
- 5.3a: Fire or brush treatment with minimal soil disturbance.

Transition T5A: 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.

State 1 Reference Plant Community

Community 1.1

Reference Plant Community

The reference plant community is dominated by Indian ricegrass, needleandthread, and basin big sagebrush. Potential vegetative composition is about 60% grasses, 10% forbs and 30% shrubs. Approximate ground cover (basal and crown) is about 20 to 35 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	404	538	673
Shrub/Vine	202	269	336
Forb	67	90	112
Total	673	897	1121

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Perennial Grasses			368–834	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	179–359	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	135–224	–
	Thurber's needlegrass	ACTH7	<i>Achnatherum thurberianum</i>	18–135	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	18–72	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus</i> ssp. <i>lanceolatus</i>	18–45	–
2	Secondary Perennial Grasses			18–45	
	squirreldtail	ELEL5	<i>Elymus elymoides</i>	4–18	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	4–18	–
	bluebunch wheatgrass	PSSPS	<i>Pseudoroegneria spicata</i> ssp. <i>spicata</i>	4–18	–
Forb					
3	Perennial			18–135	

	buckwheat	ERIOG	<i>Eriogonum</i>	4–27	–
	common starlily	LEMO4	<i>Leucocrinum montanum</i>	4–27	–
	lupine	LUPIN	<i>Lupinus</i>	4–27	–
4	Annual			9–27	
	evening primrose	OENOT	<i>Oenothera</i>	4–27	–
Shrub/Vine					
5	Primary Shrubs			117–269	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	45–90	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata</i> ssp. <i>wyomingensis</i>	45–90	–
	jointfir	EPHED	<i>Ephedra</i>	9–45	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	18–45	–
6	Secondary Shrubs			18–90	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	9–27	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	9–27	–
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>nauseosa</i>	9–27	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	9–27	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	9–27	–
	horsebrush	TETRA3	<i>Tetradymia</i>	9–27	–

Animal community

Livestock Interpretations:

This site is suitable for livestock grazing. Grazing management should be keyed to perennial grass production. 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. 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. The early growth and abundant

production of basin wildrye make it a valuable source of forage for livestock. It is important forage for cattle and is readily grazed by cattle and horses in early spring and fall. Though coarse-textured during the winter, basin wildrye may be utilized more frequently by livestock and wildlife when snow has covered low shrubs and other grasses. Thickspike wheatgrass is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses, and elk in spring and is considered a desirable feed for deer and antelope in spring. It is considered a desirable feed for cattle, sheep, and horses in summer, fall, and winter. Thickspike wheatgrass's extensive rhizome system allows established stands to withstand heavy grazing and trampling. 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. 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:

Wyoming big sagebrush is preferred browse for wild ungulates. Pronghorn usually browse Wyoming big sagebrush heavily. Basin big sagebrush is the least palatable of all the subspecies of big sagebrush. Basin big sagebrush is browsed by mule deer from fall to early spring, but is not preferred. Sagebrush-grassland communities provide critical sage-grouse breeding and nesting habitats. Meadows surrounded by sagebrush may be used as feeding and strutting grounds. Sagebrush is a crucial component of their diet year-round, and sage-grouse select sagebrush almost exclusively for cover. Sage-grouse prefer mountain big sagebrush and Wyoming big sagebrush communities to basin big sagebrush communities. 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. Ephedra is an important browse species for big game animals. Ephedra is heavily used by wildlife on winter ranges. Needleandthread is moderately important spring forage for mule deer, but use declines considerably as more preferred forages become available. 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. Thurber needlegrass is valuable forage for wildlife. Basin wildrye provides winter forage for mule deer, though use is often low compared to other native grasses. Basin wildrye provides summer forage for black-tailed jackrabbits. Because basin wildrye remains green throughout early summer, it remains available for small mammal forage for longer time than other grasses. In the spring, thickspike wheatgrass is a preferred feed for elk and is considered desirable feed for deer and

antelope. It is desirable feed for elk during summer, fall, and winter. Thickspike wheatgrass is also a component of black-tailed jackrabbit diets. Thickspike wheatgrass provides some cover for small mammals and birds.

Hydrological functions

Runoff is very low to very high. Permeability is moderately slow to moderately rapid. Hydrologic soil group is A, B, and C.

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 used the bark of big sagebrush to make rope and baskets. Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used the seed as a reserve food source. Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand.

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. Basin big sagebrush shows high potential for range restoration and soil stabilization. Basin big sagebrush grows rapidly and spreads readily from seed. 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. 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. Ephedra establishes readily through direct seeding, transplants, and stem cuttings. Needleandthread is useful for stabilizing eroded or degraded sites. Basin wildrye is useful in mine reclamation, fire rehabilitation and stabilizing disturbed areas. Its usefulness in range seeding, however, may be limited by initially weak stand establishment. Thickspike is a good revegetation species because it forms tight sod under dry rangeland conditions, has good seedling strength, and performs well in low fertility or

eroded sites. It does not compete well with aggressive introduced grasses during the establishment period, but are very compatible with slower developing natives, bluebunch wheatgrass (*Pseudoroegneria spicata*), western wheatgrass (*Pascopyrum smithii*), and needlegrass (*Achnatherum* spp.) species. It's drought tolerance combined with rhizomes, fibrous root systems, and good seedling vigor make these species ideal for reclamation in areas receiving 8 to 20 inches annual precipitation. Thickspike wheatgrass can be used for hay production and will make nutritious feed, but is more suited to pasture use.

Type locality

Location 1: Washoe County, NV	
Township/Range/Section	T37N R22E S9
UTM zone	N
UTM northing	289422
UTM easting	4553101
Latitude	41° 6' 6"
Longitude	119° 30' 27"
General legal description	About ¼ mile south of Grass Valley Ranch, Washoe County, Nevada. This site also occurs in Humboldt County, Nevada.
Location 2: Washoe County, NV	
Township/Range/Section	T43N R20E S25
UTM zone	N
UTM northing	276130
UTM easting	4610952
Latitude	41° 37' 8"
Longitude	119° 41' 13"
General legal description	E 1/2, About 3½ miles north of County Road 8A, enclosure north of Painted Rock, Long Valley area, Washoe County, Nevada. This site also occurs in Humboldt County, 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>).

Great Basin Ecological Site Development Project: State and Transition Models for Major Land Resource Area 23, Nevada and portions of California (Online; <https://naes.agnt.unr.edu/PMS/Pubs/2019-4060.pdf>)

Contributors

SW

T Stringham (UNR under contract with BLM)

Approval

Kendra Moseley, 4/10/2025

Rangeland health reference sheet

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

Author(s)/participant(s)	P Novak-Echenigue
Contact for lead author	State Rangeland Management Specialist
Date	08/19/2010
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None

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

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare with occurrence typically limited to areas affected by wind scouring.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen,**

moss, plant canopy are not bare ground): Bare ground 30-40%

5. **Number of gullies and erosion associated with gullies:** None

6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight.

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 1 to 4 on most soil textures found on this site. (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 weak medium platy or moderate thin platy. Soil surface colors are gray and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 4 inches is typically 1 to 3 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:** Deep-rooted perennial herbaceous bunchgrasses slow runoff and increase infiltration. Shrub canopy and associated litter break raindrop impact and provide opportunity for snow catch and moisture 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.

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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: Deep-rooted, cool season, perennial bunchgrasses

Sub-dominant: tall shrubs (big sagebrush) > associated shrubs > deep-rooted, cool season perennial forbs > shallow-rooted, cool season, perennial bunchgrasses = fibrous, shallow-rooted, cool season, perennial and annual forbs

Other: rhizomatous grasses

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; mature bunchgrasses may have dead centers (<20%).
-

14. **Average percent litter cover (%) and depth (in):** Between plant interspaces (20-30%) and litter depth is $\pm 1/4$ inch.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** For normal or average growing season (through mid-June) ± 800 lbs/ac; Favorable years 1000 lbs/ac and unfavorable years 600 lbs/ac. Spring moisture significantly affects total production
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Potential invaders include cheatgrass, Russian thistle and annual mustards.

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