USDA Natural Resources Conservation Service

Ecological site R024XY041NV
GRAVELLY FAN

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General information

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

MLRA notes

Major Land Resource Area (MLRA): 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 lake plains and basin floor remnants. Soils are very deep, well drained and formed in a thin layer of loess and alluvium derived from mixed parent material influenced by volcanic ash over lacustrine sediments. Soils are characterized by a very low infiltration, an ochric epipedon, moderate to very strong alkalinity, and SAR greater than 45 in the upper profile. The soil temperature regime is mesic, and the soil moisture regime is typic aridic.
Dominant Plants Spiny hopsage (GRSP) and basin wildrye (LECI4)

Associated sites

R024XY005NV	**LOAMY 8-10 P.Z.** Limited precipitation and the presence of the argillic horizon that helps retain soil moisture. This moisture is important for deep-rooted perennial bunchgrasses, such as Thurber’s needlegrass (ACTH7)
R024XY013NV	**LOAMY 10-12 P.Z.** Soils are deep, well drained, and formed in residuum and colluvium derived from mixed parent material. The presence of the mollic epipedon is indicative of greater than 10" of precipitation this site is receiving.

R024XY020NV	**DROUGHTY LOAM 8-10 P.Z.** The presence of this site includes limited available soil moisture due to texture and precipitation zone. Plant available water is influenced by soil texture, presence and abundance of rock fragments, soil depth, aspect, elevation and landscape position.

Similar sites

R024XY020NV	**DROUGHTY LOAM 8-10 P.Z.** Vegetative cover is less than 25% and is dominated by deep-rooted, cool season perennial bunchgrasses and drought tolerant shrubs. Dominant species include Thurber's needlegrass (ACTH7), Indian ricegrass (ACHY), Wyoming big sagebrush (ARTRW8), and spiny hopsage (GRSP).
R024XY005NV	**LOAMY 8-10 P.Z.** This ecological site is found on alluvial fans on all exposures. Spiny hopsage GRSP minor shrub, if present.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Grayia spinosa* (2) *Artemisia tridentata subsp. wyomingensis*
Herbaceous	(1) *Leymus cinereus* (2) *Achnatherum hymenoides*

Physiographic features

This site is on inset fans and along ephemeral stream terraces that have eroded through alluvial fans. Slopes are mostly 0 to 2 percent. Elevations are 4000 to 6000 feet (1219 - 1828 m).

Table 2. Representative physiographic features

Landforms	(1) Inset fan (2) Drainageway
Runoff class	Very low
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare to occasional
Elevation	1,219–1,829 m
Slope	0–2%
Water table depth	183 cm
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 6 to 10 inches. Mean annual air temperature is 45 to 52 degrees F. The average growing season is about 90 to 130 days. There is no climate station available for this site.

Table 3. Representative climatic features

Frost-free period (average)	130 days
Freeze-free period (average)	
Precipitation total (average)	254 mm

Influencing water features

This site is along ephemeral stream terraces.

Soil features

The soils associated with this site are very deep, well drained and formed in a thin layer of loess and alluvium derived from mixed rocks influenced by volcanic ash over lacustrine sediments. The soil profile is characterized by a surface horizon with a platy soil structure, moderate to strong alkalinity and a SAR greater than 45.
Correlated soil components: Doowak and Rebel.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Cobbly sandy loam (2) Very gravelly sandy loam (3) Loam
Family particle size	(1) Loamy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid
Soil depth	183–213 cm
Surface fragment cover <=3"	5–43%
Surface fragment cover >3"	2–12%
Available water capacity (0-101.6cm)	4.57–14.73 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	0–4 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)	5–71%
Subsurface fragment volume >3" (Depth not specified)	1–12%

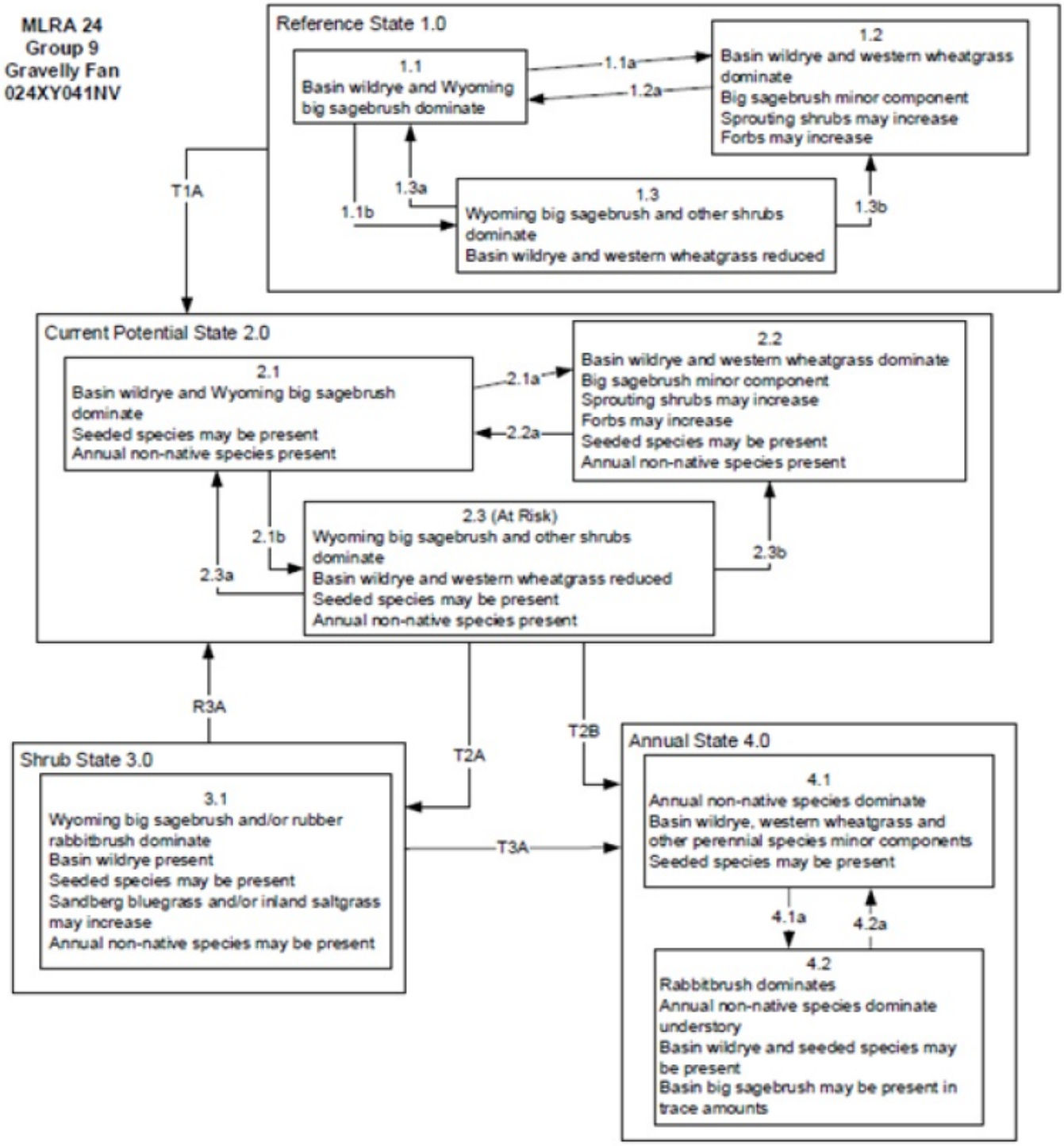
Ecological dynamics

As ecological condition declines and where management results in abusive grazing use by livestock or feral horses, basin big sagebrush, greasewood and rabbitbrush become dominant with increases of bottlebrush squirreltail and Sandberg's bluegrass in the understory. Cheatgrass is the species 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. 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. 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. Black greasewood may be killed by severe fires, but it commonly sprouts soon after low to moderate-severity fires. Desert peach is typically only top-killed by fire. Desert peach sprouts from rhizomes and/or lignotubers following fire, and becomes abundant on burned sites. Postfire seedling establishment is rare based on the limited postfire regeneration studies available. Neither aboveground stem survival nor complete shrub kill is reported following fire. 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. 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. Bottlebrush squirreltail's small size, coarse stems, and sparse leafy material aid in its tolerance of fire. Postfire regeneration occurs from surviving root crowns and from on- and off-site seed sources. Frequency of disturbance greatly influences postfire response of bottlebrush squirreltail. Undisturbed plants within a 6 to 9 year age class generally contain large amounts of dead material, increasing bottlebrush squirreltail's susceptibility to fire. Sandberg bluegrass is generally unharmed by fire. It produces little litter, and its small bunch size and sparse litter reduces the amount of heat transferred to perennating buds in the soil. Its rapid maturation in the spring also reduces fire damage, since it is dormant when most fires occur.

State and transition model


MLRA 24
Group 9
Gravelly Fan
024XY041NV
Reference State 1.0
1.1
Basin wildrye and Wyoming big sagebrush dominate
1.1a
1.2a
1.2
Basin wildrye and western wheatgrass dominate
Big sagebrush minor component
Sprouting shrubs may increase
Forbs may increase
T1A
1.1b
1.3a
1.3
Wyoming big sagebrush and other shrubs dominate
Basin wildrye and western wheatgrass reduced
1.3b
Current Potential State 2.0
2.1
Basin wildrye and Wyoming big sagebrush dominate
Seeded species may be present
Annual non-native species present
2.1a
2.2a
2.2
Basin wildrye and western wheatgrass dominate
Big sagebrush minor component
Sprouting shrubs may increase
Forbs may increase
Seeded species may be present
Annual non-native species present
2.1b
2.3a
2.3 (At Risk)
Wyoming big sagebrush and other shrubs dominate
Basin wildrye and western wheatgrass reduced
Seeded species may be present
Annual non-native species present
2.3b
R3A
T2A
T2B
Shrub State 3.0
3.1
Wyoming big sagebrush and/or rubber rabbitbrush dominate
Basin wildrye present
Seeded species may be present
Sandberg bluegrass and/or inland saltgrass may increase
Annual non-native species may be present
T3A
Annual State 4.0
4.1
Annual non-native species dominate
Basin wildrye, western wheatgrass and other perennial species minor components
Seeded species may be present
4.1a
4.2a
4.2
Rabbitbrush dominates
Annual non-native species dominate understory
Basin wildrye and seeded species may be present
Basin big sagebrush may be present in trace amounts

Gravelly Fan
024XY041NV

Reference State 1.0 Community Phase Pathways:
1.1a: Low severity fire/Aroga moth infestation 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. Drought and/or excessive herbivory may also reduce perennial understory.
1.2a: Time and lack of disturbance allows for shrub regeneration.
1.3a: A low severity fire, Aroga moth, or combinations of these will reduce some of the sagebrush overstory and allow grass species to increase.
1.3b: High severity fire significantly reduces sagebrush cover and allows grass species to dominate. A severe infestation of Aroga moth can also reduce the sagebrush overstory.

Transition T1A: Introduction of annual 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. Prolonged flooding, Aroga moth and/or brush treatment can also reduce the sagebrush overstory. Non-native annual species present.
2.1b: Time and lack of disturbance such as fire. Drought and/or inappropriate grazing management may also reduce perennial understory.
2.2a: Time and lack of disturbance allows for regeneration of sagebrush. Grazing management that favors sagebrush also allows the shrub component to recover.
2.3a: A low severity fire, Aroga moth, or combinations of these will reduce some of the sagebrush overstory and allow grass species to increase. Brush management with minimal soil disturbance or late-fall/winter grazing that causes mechanical damage to sagebrush.
2.3b: High severity fire and/or a severe Aroga moth infestation significantly reduces sagebrush cover and allows grass species to dominate.

Transition T2A: Time and lack of disturbance, may be coupled with grazing management and/or hydrologic changes that favor shrubs over perennial grasses.
Transition T2B: Severe fire likely from community phase 2.3.

Shrub State 3.0 Community Phase Pathways:
None.

Transition T3A: Severe fire.

Restoration Pathway R3A: Mechanical/chemical brush treatment coupled with herbicide. Seeding of perennial bunchgrasses may be necessary.

Annual State 4.0 Community Phase Pathways:
4.1a: Time and lack of disturbance.
4.2a: Fire.

State 1
Reference State

Community 1.1
Reference Plant Community

The reference plant community is dominated by basin wildrye, basin big sagebrush, spiny hopsage and Indian ricegrass. Potential vegetative composition is about 40% grasses, 5% forbs and 55% shrubs Approximate ground cover (basal and crown) is 15 to 35 percent.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	370	493	616
Grass/Grasslike	269	359	448
Forb	34	45	56
Total	**673**	**897**	**1120**

Community 1.2
Reference Community 1.2

This community phase is characteristic of a post-disturbance, early-seral community. Basin wildrye and other

perennial bunchgrasses dominate. Rubber rabbitbrush may be sprouting. Depending on fire severity or intensity of Aroga moth infestations, patches of intact big sagebrush may remain.

Community 1.3
Reference Community 1.3

Basin big sagebrush increases in the absence of disturbance. Decadent big sagebrush and/or rubber rabbitbrush dominates the overstory and the deep-rooted perennial bunchgrasses in the understory are reduced either from competition with shrubs and/or from herbivory. Wyoming big sagebrush and black greasewood may also be present.

Pathway 1.1a
Community 1.1 to 1.2

Fire will decrease or eliminate the overstory of big sagebrush and allow the perennial bunchgrasses to dominate the site. Fires will typically be low severity, resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth or prolonged flooding could also cause a large decrease in big sagebrush giving a competitive advantage to the perennial grasses and forbs.

Pathway 1.1b
Community 1.1 to 1.3

Time and lack of disturbance such as fire allows for sagebrush to increase and become decadent. Long term drought, herbivory, or combinations of these will cause a decline in perennial bunchgrasses and fine fuels, leading to a reduced fire frequency and allowing big sagebrush to dominate the site.

Pathway 1.2a
Community 1.2 to 1.1

Time and lack of disturbance will allow basin big sagebrush to increase.

Pathway 1.3a
Community 1.3 to 1.1

A low severity fire, Aroga moth, prolonged flooding or combinations will reduce some of the big sagebrush overstory and allow grass species to increase.

Pathway 1.3b
Community 1.3 to 1.2

Fire will decrease or eliminate the overstory of big sagebrush and allow the perennial bunchgrasses to dominate the site. Fires will typically be low severity resulting in a mosaic pattern due to low fine fuel loads. A fire following an unusually wet spring or a change in management favoring an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth or prolonged flooding could also cause a large decrease in big sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs.

State 2
Current Potential State

This state is similar to the Reference State 1.0 with three similar community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem

resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal. A site may be considered

Community 2.1
Community Phase 2.1

This community phase is similar to the Reference State Community Phase 1.1, but non-native species are present in trace amounts. Basin wildrye and basin big sagebrush dominate the site. Wyoming big sagebrush may also be present. Seeded species such as crested wheatgrass may be present and/or dominate the understory. Forbs and other shrubs and grasses make up smaller components of this site.

Community 2.2
Community Phase 2.2

This community phase is characteristic of a post-disturbance, early seral community where annual non-native species are present. Sagebrush is present in trace amounts; perennial bunchgrasses dominate the site. Depending on fire severity or intensity of Aroga moth infestations, patches of intact sagebrush may remain. Rabbitbrush may be sprouting. Seeded species such as crested wheatgrass may be present and/or dominate the understory. Perennial forbs may be a significant component after fire for several years. Annual non-native species are stable or increasing within the community.

Community 2.3
Community Phase 2.3 (At-Risk)

This community is at risk of crossing a threshold to another state. Basin big sagebrush dominates the overstory and perennial bunchgrasses in the understory are reduced, either from competition with shrubs or from inappropriate grazing, or from both. Wyoming big sagebrush and black greasewood may also be present. Rabbitbrush may be a significant component. Inland saltgrass may increase and become co-dominate with deep rooted bunchgrasses. Annual non-natives species may be stable or increasing due to lack of competition with perennial bunchgrasses. Seeded species such as crested wheatgrass (*Agropyron cristatum*) may be present. This site is susceptible to further degradation from grazing, drought, and fire.

Pathway 2.1a
Community 2.1 to 2.2

Fire reduces the shrub overstory and allows for perennial bunchgrasses to dominate the site. Fires are typically low severity resulting in a mosaic pattern due to low fuel loads. A fire following an unusually wet spring or a change in management favoring an increase in fine fuels may be more severe and reduce sagebrush cover to trace amounts. A severe infestation of Aroga moth, prolonged flooding and/or shrub treatments could also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs. Annual non-native species are likely to increase after fire.

Pathway 2.1b
Community 2.1 to 2.3

Time and lack of disturbance allows for sagebrush to increase and become decadent. Long term drought reduces fine fuels and leads to a reduced fire frequency, allowing big sagebrush to dominate the site. Inappropriate grazing management reduces the perennial bunchgrass understory; conversely Sandberg bluegrass may increase in the understory depending on grazing management.

Pathway 2.2a
Community 2.2 to 2.1

Time and lack of disturbance and/or grazing management that favors the establishment and growth of sagebrush allows the shrub component to recover. The establishment of big sagebrush can take many years.

Pathway 2.3a
Community 2.3 to 2.1

Heavy late-fall or winter grazing may cause mechanical damage and subsequent death to big sagebrush, facilitating an increase in the herbaceous understory. An infestation of Aroga moth or low severity fire will reduce some big sagebrush overstory and allow perennial grasses to increase in the community. Brush treatments with minimal soil disturbance will also decrease sagebrush and release the perennial understory. Annual non-native species are present and may increase in the community.

Pathway 2.3b
Community 2.3 to 2.2

Fire eliminates/reduces the overstory of sagebrush and allows for the understory perennial grasses to increase. Fires will typically be low severity resulting in a mosaic pattern due to low fine fuel loads. A fire that follows an unusually wet spring or change 248 in management favoring an increase in fine fuels may be more severe and reduce the shrub component to trace amounts. A severe infestation of Aroga moth will also cause a large decrease in sagebrush within the community, giving a competitive advantage to the perennial grasses and forbs. Annual non-native species respond well to fire and may increase post-burn.

State 3
Shrub State

This state is a product of many years of heavy grazing during time periods harmful to perennial bunchgrasses. Sites within this DRG with high water tables may transition to a shrub state if the hydrology of the area is affected. In both cases, basin wildrye is significantly reduced and other perennial grasses such as beardless wildrye will increase. Big sagebrush dominates the overstory and rabbitbrush may be a significant component. Big sagebrush cover exceeds site concept and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory and shallower rooted grasses dominate site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed.

Community 3.1
Community Phase 3.1

Decadent big sagebrush dominates the overstory. Rabbitbrush and black greasewood may be significant components. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Creeping wildrye is present but may be found only in patches. Annual non-native species increase. Crested wheatgrass may be a significant component in this phase if the site has a history of seeding treatments. Bare ground is significant.

State 4
Annual State

This state has two community phases. One community phase is characterized by the dominance of annual non-native species such as cheatgrass and tansy mustard in the understory. The other community phase is dominated by rabbitbrush with an understory of cheatgrass and mustards. Big sagebrush and/or rabbitbrush may dominate the overstory.

Community 4.1
Community Phase 4.1

Annual non-native plants such as tansy mustard (*Descurainia pinnata*) and cheatgrass dominate this site. Crested wheatgrass may be a significant component in this phase if the site has a history of seeding treatments.

Community 4.2
Community Phase 4.2

Annual non-native plants such as tansy mustard (*Descurainia pinnata*) and cheatgrass dominate the understory

while sprouting shrubs such as rabbitbrush dominate the overstory. Big sagebrush may be present in trace amounts. Crested wheatgrass may be a significant component in this phase if the site has a history of seeding treatments.

Pathway 4.1a
Community 4.1 to 4.2

Time and lack of disturbance allows sprouting shrubs to recover and mature. Sagebrush may re-establish in a limited extent.

Pathway 4.2a
Community 4.2 to 4.1

Fire.

Transition T1A
State 1 to 2

Introduction of annual non-native species.

Transition T2A
State 2 to 3

Time and lack of disturbance, may be coupled with grazing management and/or hydrologic changes that favor shrubs over perennial grasses.

Transition T2B
State 2 to 4

Severe fire likely from community phase 2.3.

Restoration pathway R3A
State 3 to 2

Mechanical/chemical brush treatment coupled with herbicide. Seeding of perennial bunchgrasses may be necessary.

Transition T3A
State 3 to 4

Severe fire.

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**			143–359	
	basin wildrye	LECI4	*Leymus cinereus*	90–179	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	18–90	–
	squirreltail	ELEL5	*Elymus elymoides*	18–45	–
	Sandberg bluegrass	POSE	*Poa secunda*	18–45	–
2	**Secondary Perennial Grasses**			18–45	
	sedge	CAREX	*Carex*	4–18	–
	needle and thread	HECO26	*Hesperostipa comata*	4–18	–
Forb					
3	**Perennial Forbs**			18–72	
	lupine	LUPIN	*Lupinus*	4–18	–
	phlox	PHLOX	*Phlox*	4–18	–
	globemallow	SPHAE	*Sphaeralcea*	4–18	–
	princesplume	STANL	*Stanleya*	4–18	–
Shrub/Vine					
4	**Primary Shrubs**			305–637	
	spiny hopsage	GRSP	*Grayia spinosa*	135–269	–
	desert peach	PRAN2	*Prunus andersonii*	18–72	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	18–72	–
5	**Secondary Shrubs**			18–72	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	9–18	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	9–18	–

Animal community

Livestock Interpretations:
This site is suitable for livestock grazing. Grazing management should be keyed to dominant grasses or palatable shrubs production. 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. Livestock browse Wyoming big sagebrush, but may use it only lightly when palatable herbaceous species are available. Black greasewood is an important winter browse plant for domestic sheep and cattle. It also receives light to moderate use by domestic sheep and cattle during spring and summer months. Black greasewood contains soluble sodium and potassium oxalates that may cause poisoning and death in domestic sheep and cattle if large amounts are consumed in a short time. Heavy grazing by livestock decreased the per acre stem count of desert peach. 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. 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. Bottlebrush squirreltail is very palatable winter forage for domestic sheep of Intermountain ranges. Domestic sheep relish the green foliage. Overall, bottlebrush squirreltail is considered moderately palatable to livestock. Bluegrass is a widespread forage grass. It is one of the earliest grasses in the spring and is sought by domestic livestock and several wildlife species. Sandberg bluegrass is a palatable species, but its production is closely tied to weather conditions. It produces little forage in drought years, making it a less dependable food

source than other perennial bunchgrasses.

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:
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. Wyoming big sagebrush is preferred browse for wild ungulates. Pronghorn usually browse Wyoming big sagebrush heavily. Black greasewood is an important winter browse plant for big game animals and a food source for many other wildlife species. It also receives light to moderate use by mule deer and pronghorn during spring and summer months. Use of desert peach by mule deer varies largely by location; as low as 1-5% of diet on some sites and up to 57% on other sites. Mule deer consume new desert peach growth in the early spring and frequent desert peach habitat. Numerous small mammals gather and consume desert peach fruits and seeds and/or browse desert peach stems. White-tailed antelope squirrels, Great Basin pocket mice, deer mice, and Panamint kangaroo rats utilize desert peach fruits and seeds. Black-tailed jackrabbits seasonally utilize desert peach as forage. 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. 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. Bottlebrush squirreltail is a dietary component of several wildlife species. Bottlebrush squirreltail may provide forage for mule deer and pronghorn. 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.

Hydrological functions

Runoff is very low. Permeability is moderately rapid. Hydrologic soil groups are A & B. Rills are none to rare. Rock fragments armor the soil surface. Water flow patterns are none to rare. Rock fragments armor the soil surface. Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a normal condition. Gullies are none to rare in areas of this site that occur on stable landforms. Perennial herbaceous plants (especially deep-rooted bunchgrasses [i.e., basin wildrye]) 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

Some Native American peoples traditionally ground parched seeds of spiny hopsage to make pinole flour. 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. The leaves, seeds and stems of black greasewood are edible. Native Americans near desert peach habitats utilized fruits, leaves, and twigs. The Paiute of the Great Basin boiled twigs and leaves into a tea to treat colds and rheumatism. Desert peaches could be boiled, sweetened with sugar and preserved as jelly. Basin wildrye was used as bedding for various Native American ceremonies, providing a cool place for dancers to stand. Indian ricegrass was traditionally eaten by some Native Americans. The Paiutes used seed as a reserve food source.

Other information

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. 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. Black greasewood is useful for stabilizing soil on wind-blown areas. It successfully revegetates eroded areas and sites too saline for most plant species. Desert peach is effective in revegetation or rehabilitation projects on disturbed sites within its range due to high survival rates of transplanted seedlings. 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. Bottlebrush squirreltail is tolerant of disturbance and is a suitable species for revegetation.

Inventory data references

NASIS soil component data.

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
TK Stringham

Approval

Kendra Moseley, 3/07/2025

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 none to rare. Rock fragments armor the soil surface.

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2. **Presence of water flow patterns:** Water flow patterns are none to rare. Rock fragments armor the soil surface.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are none to rare. Occurrence is usually limited to areas of water flow patterns. Frost heaving of shallow rooted plants should not be considered a normal condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare Ground 10-20%.

5. **Number of gullies and erosion associated with gullies:** Gullies are none to rare in areas of this site that occur on stable landforms.

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

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 catastrophic 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 thick platy. Soil surface colors are light and soils are typified by an ochric epipedon. Organic matter of the surface 2 to 3 inches is typically 1.5 to 2 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., basin wildrye]) 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 not typical. Subangular blocky or 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: Reference Plant Community: Tall shrubs (spiny hopsage & Wyoming big sagebrush)

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

Other:

Additional:

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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.

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14. **Average percent litter cover (%) and depth (in):** Within plant interspaces (± 15%) and depth of litter is ±¼ 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 (end of May) ± 800 lbs/ac.

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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:** Increasers include rabbitbrush. Invaders include cheatgrass, halogeton, Russian thistle, bassia, 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.
