USDA Natural Resources
Conservation Service

Ecological site R028AY215UT
Semidesert Gravelly Loam (Wyoming Big Sagebrush) North

Accessed: 04/18/2024

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.

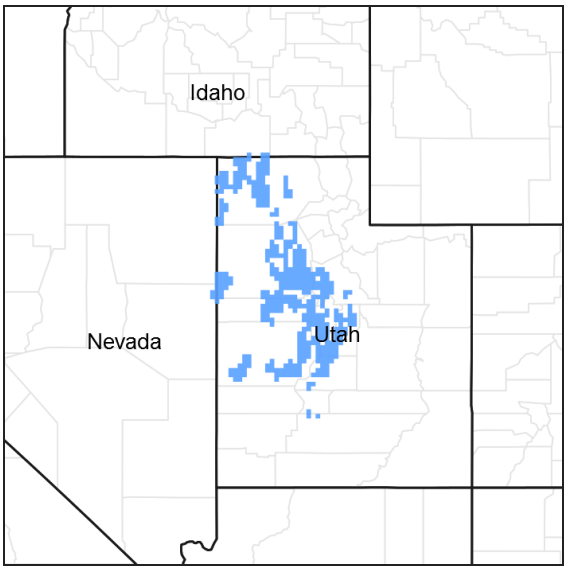


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82%), Nevada (16%), and Idaho (2%). It makes up about 36,775 square miles (95,246 square kilometers). A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,204 to 2000 meters) in the basins and from 6,560 to 11,150 ft (1996 to 3398 meters) in the mountains. Much of the MLRA has alluvial valley fill and playa lakebed deposits at the surface from pluvial Lake Bonneville, which dominated this MLRA 13,000 years ago. A level line of remnant lake terraces on some mountain slopes indicates the former extent of this glacial lake. The Great Salt Lake is what remains of the pluvial lake.

Mountains in the interior of this MLRA consist of tilted blocks of marine sediments from Cambrian to Mississippian age. Scattered outcrops of Tertiary continental sediments and volcanic rocks are throughout the area. The average annual precipitation is 5 to 12 inches (13 to 30 cm). in the valleys and is as much as 49 inches (124 cm) in the mountains. Most of the rainfall in the southern LRU occurs as high-intensity, convective thunderstorms during the growing season (April through September). The driest period is from midsummer to early autumn in the northern LRU. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F (4 to 12 °C). The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. The soils in the area dominantly have a mesic or frigid soil temperature regime, an aridic or xeric soil moisture regime, and mixed mineralogy. They generally are well drained, loamy or loamy-skeletal, and very deep.

Land Resource Unit (LRU): Basin and Range North

Notes: The Basin and Range North LRU exhibits dry summer with stronger xeric patterns than the Basin and Range South LRU. Ranges in the north LRU are about 50 percent Paleozoic sedimentary/metasedimentary (limestone/quartzite dominant) and about 10 percent Tertiary volcanics. The basin floors are between 4,200 and 5,100 feet (1280 to 1554 meters) in elevation. Pinyon and juniper sites have a greater percentage of Utah juniper (Juniperus osteosperma) in the plant community than pinyon pine (Pinus edulis or monophylla). The Basin and Range North have few semidesert ecological sites with Utah juniper. Cool season grasses, such as bluebunch wheatgrass (Pseudoroegneria spicata), are dominant in the plant community, while warm season grasses are largely absent or a small component of the plant community.

Classification relationships

MLRA: 28A, Great Salt Lake Area> LRU Basin and Range North> Ecological Zone Semidesert> Semidesert Gravelly Loam (Wyoming big sagebrush)

EPA Ecoregions: North American Deserts> Cold Deserts> Central Basin and Range> Shadscale-Dominated Saline Basins, Sagebrush Basins and Slopes, Woodland- and Shrub-Covered Low Mountains

Ecological site concept

The reference state is typically dominated by Wyoming big sagebrush and bluebunch wheatgrass. This site would cycle between three dominant plant community phases. One community phase would occur soon after a fire, with rabbitbrush as the perennial bunch grasses as the dominant plants and the other community would develop in the absence of fire, with Wyoming big sagebrush cover increasing and reduced herbaceous cover.

Associated sites

R028AY220UT	**Semidesert Loam (Wyoming Big Sagebrush)** This site does not have a gravelly soil and it often found in association with site R028AY215UT.

Similar sites

R028AY028NV	**DROUGHTY LOAM 8-10 P.Z.** This site is similar in soil and plant characteristics that has been developed for Nevada.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata subsp. wyomingensis*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This site it typically found between 4400 and 6500 feet on fan terraces, fan remnants and alluvial fans. The slope is typically between 2 and 15%. There is no flooding or ponding on this site and the runoff is very low to low.

As the site continues downslope, its occurrence ends when it meets the basin floor. The upslope occurrence ends when the fans end and meet the hill landform (see Block Diagram 1A).

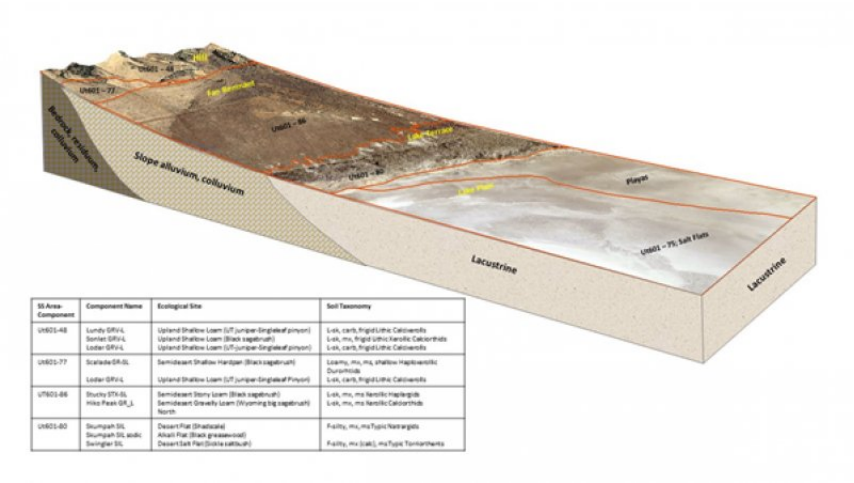


Figure 2. Block Diagram

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Terrace (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	4,400–6,000 ft
Slope	2–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate is semi-arid and characterized by cold snowy winters and warm dry summers. The average annual precipitation is 8 to 12 inches. Approximately 70 percent comes as rain from March through October. On the average, June through September are the driest months and March through May are the wettest months.

Mean Annual Air Temperature: 45-50
Mean Annual Soil Temperature: 50-53

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	145 days
Precipitation total (average)	12 in

Climate stations used

- (1) OAK CITY [USC00426357], Delta, UT
- (2) SIGURD U P & L [USC00427800], Richfield, UT
- (3) ELBERTA [USC00422418], Cedar Valley, UT
- (4) GROUSE CREEK [USC00423486], Grouse Creek, UT
- (5) VERNON [USC00429133], Vernon, UT

Influencing water features

This site is not directly influenced by any water features.

Soil features

The soils on this iste were formed in mixed alluvium. These soils are well to somewhat excessively drained. The soils are deep with typically over 15% gravels the surface and subsurface. These soils typically have a layer of carbonate accumulation above 20 inches. The main limiting soil factor that influences plant growth are high percentage of rock fragments and the zone of carbonate accumulation. The soil moisture regime is xeric and the soil temperature is mesic.

This site has been used in the following soil surveys and has been correlated to the following components:

NV779-Hiko Peak
UT601-Collard Acana, Brobett, Hiko Peak, Darkbull, Sitar
UT602-Sanpete
UT608-Hiko Peak, Orcky, Sanpete
UT611-Hiko Peak
UT617-Hiko Peak, Sanpete
UT618-Escalante, Hiko Peak, Pober
UT627 and 628-Torrifluvents, Thorriorthents
UT636-Broncho

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone, sandstone, and shale
Surface texture	(1) Gravelly loam (2) Stony sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	60 in
Surface fragment cover <=3"	11–28%
Surface fragment cover >3"	0–3%
Available water capacity (0-40in)	3.1–4.4 in
Calcium carbonate equivalent (0-40in)	1–30%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–13
Soil reaction (1:1 water) (0-40in)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	32–36%
Subsurface fragment volume >3" (Depth not specified)	0–12%

Ecological dynamics

This site is typically dominated by Wyoming big sagebrush and bluebunch wheatgrass in the reference state. In the reference state, this site would cycle between three dominant plant community phases. One community phase would occur soon after a fire, with rabbitbrush as the dominant shrub and the other community would develop in the abscence of fire, with Wyoming big sagebrush cover increasing.

The introduction on non-native species altered the trajectory of this site. Non-native species, such as cheatgrass and annual forbs, can increase the fire recurrence interval once they become dominant in the understory. Increasing the fire return interval continues to promote the annual state.

This site has been successfully seeded back to non-native bunchgrasses, reducing the fire return interval and allowing native shrubs to return to the system.

State and transition model

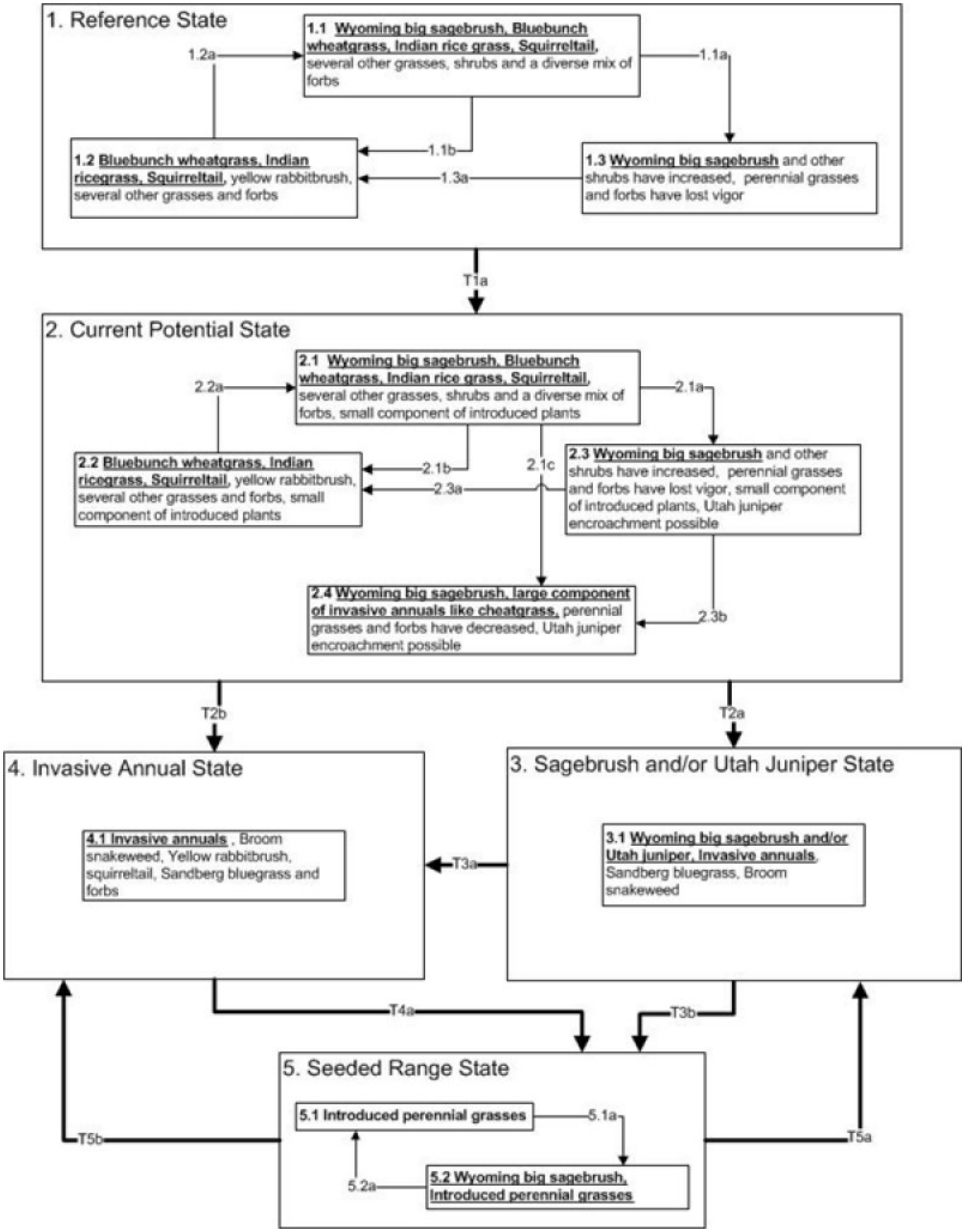


Figure 7. R028AY215UT State and Transition Model

State 1
Reference State

This state includes plant communities dominated by a diverse mixture of perennial grasses, a mixture of Wyoming

big sagebrush and perennial grasses, and a community dominated by Wyoming big sagebrush. These community phases occur depending on the time since a disturbance that kills Wyoming big sagebrush has occurred, such as fire, insects, or drought, and grazing that provides adequate duration, timing, and intensity that maintain plant vigor and health of the plant community. Plant communities in this state only include native species.

Community 1.1
Wyoming big sagebrush, bluebunch wheatgrass, Indian ricegrass

This community is dominated by Wyoming big sagebrush and bluebunch wheatgrass. Shadscale and winterfat are also commonly present in the shrub layer. Bluebunch wheatgrass and Indian ricegrass are the principle perennial grasses. Bottlebrush squirreltail is commonly present. Abundant forbs include carpet phlox and scarlet globemallow. Percent composition by air-dry weight is 45% grass, 10% forbs, and 45% shrubs. Natural fire frequency is estimated to be 40 to 50 years.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	203	349	450
Shrub/Vine	203	349	450
Forb	45	78	100
Total	**451**	**776**	**1000**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	15-30%
Forb foliar cover	2-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	–
>1 <= 2	–	–	25-35%	0-10%
>2 <= 4.5	–	35-45%	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 9. Plant community growth curve (percent production by month). UT2151, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Community 1.2
Bluebunch wheatgrass, Indian ricegrass, squirreltail

Native perennial bunchgrasses dominate this community phase. Wyoming big sagebrush and Shadscale decrease in the community. Winterfat has the ability to resprout and re-establish following a fire. Yellow rabbitbrush and horsebrush species (Nuttall, Smooth and/or Spiny) may increase significantly following fire and much of the excess fine fuel accumulation is removed. Fire tolerant shrubs typically persist as dominants in the community for 30 years or longer. Bluebunch wheatgrass and other cool season bunchgrasses flourish. Western wheatgrass increases in herbaceous cover.

Community 1.3
Wyoming big sagebrush

Wyoming big sagebrush and shadscale increases significantly in percent composition. Winterfat and yellow rabbitbrush may increase also. Shrubs become decadent due to age. Bluebunch wheatgrass, Indian ricegrass and other cool season bunchgrasses begin to lose vigor because of increased shrub competition and become dense with old vegetation. Western wheatgrass increases in herbaceous cover. Percent composition by air-dry weight is 30% grass, 10% forbs, and 60% shrubs.

Pathway 1.1b
Community 1.1 to 1.2

Recent fire occurrence, lightning or human caused (1 – 30 years). Site is properly grazed.

Pathway 1.1a
Community 1.1 to 1.3

Extended period of time without a major disturbance such as fire; insect damage; or prolonged drought. Fire frequency extends well beyond the 40 to 50 year average for the site.

Pathway 1.2a
Community 1.2 to 1.1

Normal fire frequency of 40 – 50 years returns on the site.

Pathway 1.3a
Community 1.3 to 1.2

Recent fire occurrence (1 – 30 years).

State 2
Current Potential State

This state includes plant communities dominated by a diverse mixture of perennial grasses, a mixture of Wyoming big sagebrush and perennial grasses, and a community dominated by Wyoming big sagebrush. These community phases occur depending on the time since a disturbance that kills Wyoming big sagebrush has occurred, such as fire, insects, or drought, and grazing that provides adequate duration, timing, and intensity that maintain plant vigor and health of the plant community. Plant communities in this state can include native, acclimatized, naturalized and invasive non-native species. This state is irreversibly changed from the reference state because these non-native species will now remain a permanent part of the community. This plant community has the composition, structure

and cover present that facilitates the capture, storage, and safe release of precipitation, nutrients are being cycled through deep rooted perennial grasses, forbs, and evergreen shrubs, and cool season energy capture throughout the entire growing season (March to October) such that this plant community and site resiliency is maintained. With a lengthened fire return interval (greater than 60 years), an increase in sagebrush canopy occurs until sagebrush dominates resource use. This results in a decrease in vigor, cover and reproduction of perennial bunch grasses, and results in an increase in invasive annuals such as cheatgrass. This leads into transition T2b. With increased sagebrush cover, bare ground increases, resulting in a reduction in the capture, storage, and safe release of precipitation, a reduction in the amount of nutrient cycling and energy capture.

Community 2.1
Wyoming big sagebrush, bluebunch wheatgrass, Indian ricegrass

Figure 10. Ground cover photo

This community is dominated by Wyoming big sagebrush. Shadscale and Winterfat are also commonly present in the shrub layer. Bluebunch wheatgrass and Indian ricegrass are the principle perennial grasses. Bottlebrush squirreltail is commonly present. Abundant forbs include Carpet phlox and Scarlet globemallow. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Percent composition by air-dry weight is 45% grass, 10% forbs, and 45% shrubs. Natural fire frequency is estimated to be 40 to 50 years.

Community 2.2
Bluebunch wheatgrass, Indian ricegrass

Figure 11. Bluebunch wheatgrass dominated phase

Wyoming big sagebrush and Shadscale decrease in the community. Winterfat resprouts following the fire. Yellow rabbitbrush and horsebrush species (Nuttall, Smooth and/or Spiny) may increase significantly in the community following fire. Several native grasses dominate the understory. Fire tolerant shrubs typically persist as dominants in the community for 30 years or longer. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species.

Community 2.3
Wyoming big sagebrush

Figure 12. Wyoming big sagebrush dominated

Figure 13. Site located in Ibapah, UT before a harrow treatme

Figure 14. Wyoming sagebrush dominated with some Utah juniper

Figure 15. Some juniper encroachment on the site

Figure 16. Low grass cover

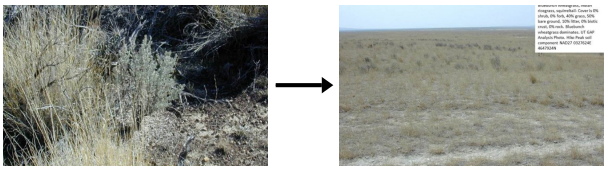
Figure 17. More juniper encroachment

Wyoming big sagebrush and shadscale increase significantly in percent composition. Winterfat and Yellow rabbitbrush may increase also. Shrubs become decadent due to age. Bluebunch wheatgrass, Indian ricegrass and other cool season bunchgrasses begin to lose vigor because of improper grazing (including, season long overstocking, wrong season, etc.) and/or increased shrub competition and become dense with old vegetation. Western wheatgrass increases in herbaceous cover. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Utah Juniper can encroach in this community phase and is small and low in cover. Percent composition by air-dry weight is 30% grass, 10% forbs, and 60% shrubs.

Community 2.4
Wyoming big sagebrush, native grasses, invasive annual grasses

At risk community. Sagebrush is increasing in dominance and capturing site resources, reducing opportunity for perennial bunchgrasses to thrive. Fire frequency extends beyond the 40 – 50 year average for the site. A few Utah juniper may invade the site if a seed source is available in the upper precipitation ranges (10-12). Sagebrush canopies begin to dominate site processes and resource use at near 15% cover in the lower precipitation ranges (8-10), and near 20% cover in the upper precipitation ranges (10-12). An increase in sagebrush canopy until sagebrush dominates resource use, resulting in a decrease in vigor, cover and reproduction of perennial bunch grasses resulting in an increase in invasive annuals such as cheatgrass.

Pathway 2.1b
Community 2.1 to 2.2

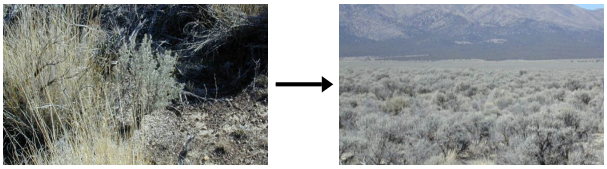


Wyoming big sagebrush, bluebunch wheatgrass, Indian ricegrass

Bluebunch wheatgrass, Indian ricegrass

Fire removes non-sprouting shrubs from the community. Yellow rabbitbrush and/or horsebrush species become dominant. Recent fire occurrence (1 to 30 years).

Pathway 2.1a
Community 2.1 to 2.3



Wyoming big sagebrush, bluebunch wheatgrass, Indian ricegrass

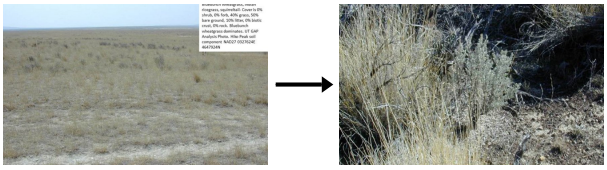
Wyoming big sagebrush

Improper grazing (including season long, overstocking, wrong season, etc.) and/or drought remove annual and perennial fine fuels from the site lessening the potential for fire to occur. Fire frequency extends beyond the 40 – 50 year average for the site. Utah juniper may invade the site if a seed source is available and typically only in drainages.

Pathway 2.1c
Community 2.1 to 2.4

Improper grazing (including season long, overstocking, continual spring grazing, etc.) and/or drought remove perennial grass facilitating an increase in invasive annual species.

Pathway 2.2a
Community 2.2 to 2.1



Bluebunch wheatgrass, Indian ricegrass

Wyoming big sagebrush, bluebunch wheatgrass, Indian ricegrass

Site is properly grazed for an extended period of time. Native perennial vegetation is recovering. Fire frequency returns to within the normal range for the state. 40 to 50 years or more without a fire occurrence (normal fire frequency).

Pathway 2.3a
Community 2.3 to 2.2

Wyoming big sagebrush

Bluebunch wheatgrass, Indian ricegrass

Fire removes non-sprouting shrubs from the community. Yellow rabbitbrush and/or horsebrush species become dominant. Recent fire occurrence (1 to 30 years).

Pathway 2.3b
Community 2.3 to 2.4

Continued lack of fire or other disturbance to reduce sagebrush cover. Continued grazing pressure on native bunch grasses.

State 3
Native Shrub/Invasive Annual State

Native shrubs such as Wyoming big sagebrush or rabbitbrush dominate the site. The dominance depends on time since fire. Wyoming big sagebrush is non-sprouting and will be killed by fire. Rabbitbrush can sprout after a fire and can become the dominant shrub. This state typically has invasive grasses and/or forbs as the dominant understory species. There may be a few native species remaining, but they do not dominate. Utah junipers may increase to occupy a significant portion of the over story, if a seed source is present. Wyoming big sagebrush dominates the shrub layer and may be decadent due to age. Bluebunch wheatgrass and other native bunchgrasses are significantly reduced due to increased shrub competition and/or heavy grazing pressure. Western wheatgrass may increase. The threshold is crossed when invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory. The occurrence of fire extends well beyond the normal period for the site.

Community 3.1
Wyoming big sagebrush and/or Utah juniper, invasive annuals

Figure 18. Wyoming sagebrush dominated phase

Figure 19. Utah juniper encroachment

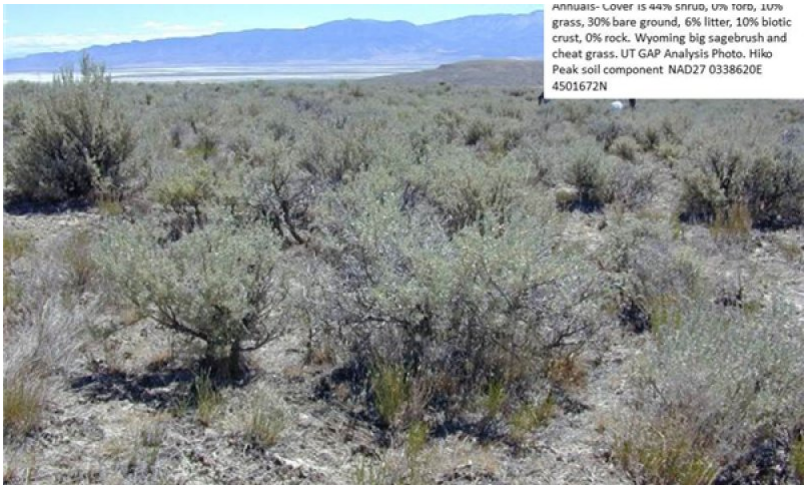


Figure 20. Wyoming big sagebrush and cheatgrass dominated pha

Figure 21. Wyoming big sagebrush and cheatgrass dominated pha

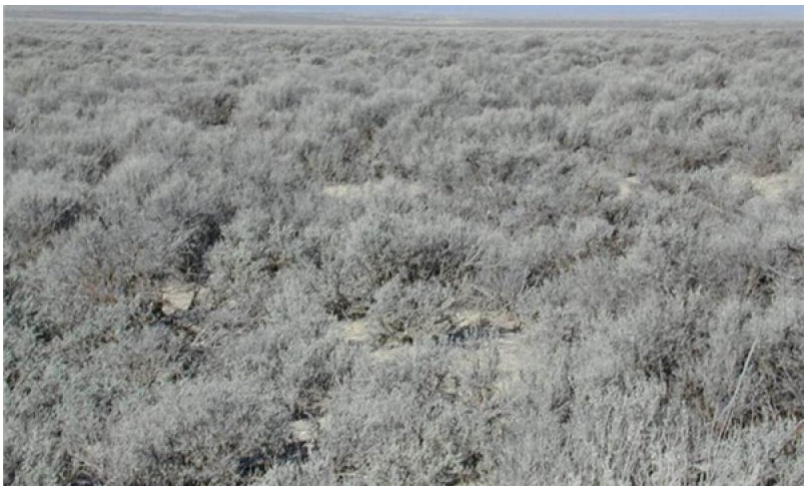


Figure 22. Wyoming big sagebrush dominated phase

Figure 23. Unburned Oak City watershed

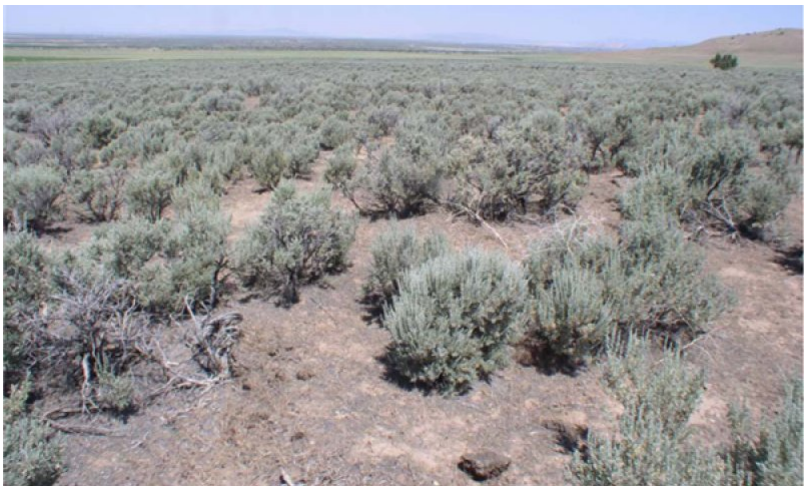


Figure 24. Unburned Oak City watershed

Wyoming sagebrush is typically the dominant shrub in this community pahse. Where Utah juniper has invaded, Wyoming big sagebrush and other shrubs decline, otherwise they dominate the community. Winterfat is dead or dying. Remaining perennial herbaceous vegetation is mostly found only in protected locations under shrubs. Invasive, non-native grasses and weeds including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory.

State 4
Invasive Annual State

Invasive grasses and forbs dominate this state. This may occur under a shortend fire return cycle which excludes native shrubs by frequent burning or this may occur with repeated improper grazing, or a combination of the two. Bluebunch wheatgrass and other native bunchgrasses are significantly reduced due to increased shrub competition

and/or heavy grazing pressure. Western wheatgrass may increase. Only remnant perennial species remain. Highly combustible fine fuels from invasive annuals to dominate the community. Reoccurring fire is common. Fire frequency is 10 – 30 years.

Community 4.1
Invasive annuals

Figure 25. Broom snakeweed dominated after a fire

Figure 26. Invasive annual dominated phase

Figure 27. Invasive annuals dominated phase

Figure 28. Invasive annuals and broom snakeweed dominated sit

Figure 29. Cheatgrass and redstem storks bill dominated site

Figure 30. Invasive annual forbs and grasses dominated site

Invasive annuals dominate this community phase. If shrubs are present, yellow rabbitbrush dominates the shrub layer. Remaining Winterfat is mostly dead. Horsebrush species (Nuttall, Smooth & Spiny) can also be plentiful if conditions are right. Fire tolerant shrubs may persist as dominants with fire periods reoccurring at intervals of 5 - 30 years. Broom snakeweed may be a dominant episodic species when conditions are favorable. Only remnant perennial bunchgrasses remain, if any; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory.

State 5
Seeded Range State

This state is seeded to rangeland species that are composed of mostly introduced species. Unwanted trees and/or shrubs are reduced but they may occupy a portion of the site through natural regeneration. Invasive annual grasses

and weedy forb species primarily, cheatgrass and various annual mustards, may be present in the seeding, but do not dominate.

Community 5.1
Introduced perennial grasses

Figure 31. Crested wheatgrass seeded site

This community is seeded to rangeland species that is composed of mostly introduced species. Unwanted trees and/or shrubs are reduced but they may occupy a portion of the site through natural regeneration. Invasive annual grasses and weedy forb species primarily, cheatgrass and various annual mustards, may be present in the seeding, but do not dominate. Range seedings, when healthy, are usually resistant to fire.

Community 5.2
Wyoming big sagebrush, introduced perennial grasses

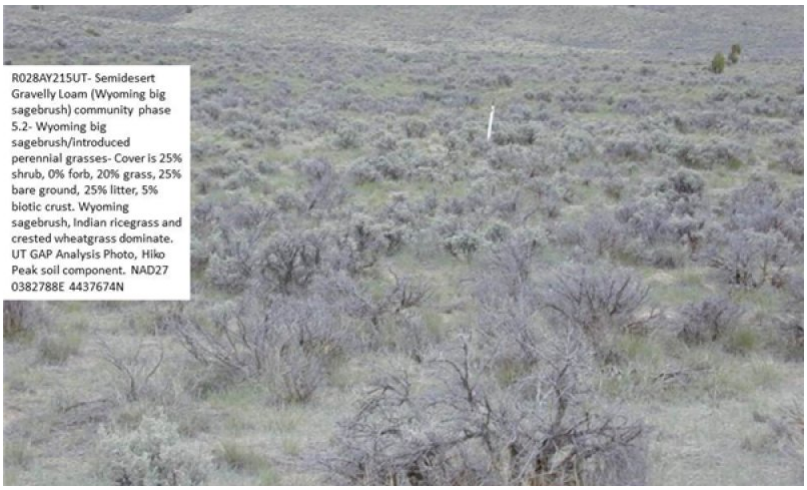


Figure 32. Wyoming big sagebrush and introduced perennial gra

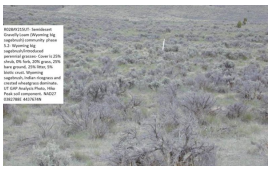
Figure 33. Ground cover photo of phase

Figure 34. Mature Wyoming big sagebrush dominated site with i

This community includes the dominance of introduced perennial understory. Native shrubs are re-establishing.

Pathway 5.1a
Community 5.1 to 5.2

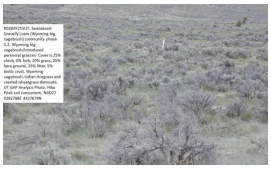
Introduced perennial grasses



Wyoming big sagebrush, introduced perennial grasses

Seeding is not well established; continued improper grazing (including season long, overstocking, wrong season, etc.); and/or drought reduces any perennial grasses established. Highly combustible fine fuels from invasive annuals shorten the fire frequency.

Pathway 5.2a
Community 5.2 to 5.1



Wyoming big sagebrush, introduced perennial grasses

Introduced perennial grasses

Site receives good grazing management. Mechanical, chemical, biological or fire disturbances reduce the woody vegetation components of the community. Perennial herbaceous vegetation very slowly recovers.

Transition T1a
State 1 to 2

The threshold is crossed when there is an introduction of non-native species, primarily cheatgrass and various annual mustards, that become established in the community.

Transition T2a
State 2 to 3

Sustained, long-term improper grazing (including season long, overstocking, wrong season, etc.); and/or prolonged drought. Lengthening of the fire return interval.

Transition T2b
State 2 to 4

Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency

Transition T3a
State 3 to 4

Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency

Transition T3b
State 3 to 5

Seeding of mostly introduced species.

Transition T4a
State 4 to 5

Seeding of introduced, native or a combination rangeland species.

Transition T5a
State 5 to 3

Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; lengthened fire frequency

Transition T5b
State 5 to 4

Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows the understory vegetation on the site to be dominated by invasive annuals.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			224–360	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	160–240	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	40–80	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	24–40	–
3	**Secondary Shrubs**			40–80	
	black sagebrush	ARNO4	*Artemisia nova*	8–24	–
	spiny hopsage	GRSP	*Grayia spinosa*	8–24	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	8–24	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	8–24	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	8–24	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	8–24	–
	Nuttall's horsebrush	TENU2	*Tetradymia nuttallii*	8–24	–
Grass/Grasslike					
0	**Primary Grasses**			224–360	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	160–240	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	40–80	–
	squirreltail	ELEL5	*Elymus elymoides*	24–40	–
1	**Secondary Grasses**			40–80	
	Grass, perennial	2GP	*Grass, perennial*	8–24	–
	needle and thread	HECO26	*Hesperostipa comata*	8–24	–
	western wheatgrass	PASM	*Pascopyrum smithii*	8–24	–
	Sandberg bluegrass	POSE	*Poa secunda*	8–24	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–24	–
Forb					
2	**Forbs**			40–80	
	Forb, annual	2FA	*Forb, annual*	0–50	–
	Forb, perennial	2FP	*Forb, perennial*	0–50	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	8–24	–
	roundspike cryptantha	CRHU2	*Cryptantha humilis*	8–24	–
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	8–24	–
	granite prickly phlox	LIPU11	*Linanthus pungens*	8–24	–
	spiny phlox	PHHO	*Phlox hoodii*	8–24	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	8–24	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	8–24	–

Animal community

This site is suited for grazing by cattle and sheep during fall, winter, and spring.

Wildlife using this site include rabbit, coyote, fox, badger, pronghorn antelope, mule deer, and dove.

This is a short list of the more common species found. Many other species are present as well and migratory birds are present at times.

Hydrological functions

The soils are in hydrologic group B with runoff curves ranging from 61 to 79 depending on hydrologic condition.

Recreational uses

Resources that have special aesthetic and landscape values are wildflowers. Some recreation uses of this site are hiking and hunting.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Inventory data references

NW ¼ of NW ¼ Section 22, Township 9N, Range 11W; SW ¼ of SW ¼ Section 24, Township 9N, Range 19W.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T9N R11W S22
General legal description	NW 1/4 of NW 1/4
Location 2: Box Elder County, UT	
Township/Range/Section	T9N R19W S24
General legal description	SW 1/4 of SW 1/4

Other references

Utah Division of Wildlife Resources, Range Trend Data, Kelton, UT.

Rogers, G. 1982. Then and Now: A photographic history of vegetation change in the central Great Basin Desert. University of Utah Press, SLC, 179 p.

Contributors

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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.

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Date	02/08/2010
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** No rills present. Very minor rill development may occur in sparsely vegetated areas. If rills are present, they should be widely spaced and not connected. Rill development may increase following large storm events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from adjacent sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop). Site is essentially level and rills typically do not form.

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2. **Presence of water flow patterns:** Water flow patterns will be short (2-5'), narrow (<1'), and meandering; interrupted by plants and exposed rocks. Slight to no evidence of erosion or deposition associated with flow patterns.

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3. **Number and height of erosional pedestals or terracettes:** Plants may have small pedestals where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-2") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

   Well-developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-35% bare ground (soil with no protection from raindrop impact). Herbaceous communities are most likely to have lower values. As species composition by shrubs increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to raindrop splash erosion should be recorded as bare ground. Very few if any bare spaces of greater than 1 square foot.

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5. **Number of gullies and erosion associated with gullies:** No gullies present.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust. Gravel or desert pavement protects the site from wind scour.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water and wind movement. Very minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some leaves, stems, and small twigs may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface is moderately stable (average soil stability score of 3.5 -5). Litter, rock, and biological crusts all contribute to the surface soil resistance to erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** This description is based on the modal soil (Hiko Peak GR-L, soil survey area: 611, Tooele). This site has 3 correlated soils, resulting in variation of each of these attributes. Unless working on a location with the modal soil, it is critical to supplement this description with the soil-specific information from the published soil survey.

   Soil surface horizon is typically 2 to 6 inches deep. Structure is typically weak thin platy. Color is typically brownish gray (10YR 6/2), dark brown (10YR 3/3) moist. An ochric horizon extends to a depth of 6 inches. An ochric horizon typically extends to a depth of 2 to 10 inches. The ochric horizon is a surface horizon lacking fine stratification and which is either light colored, or thin, or has an low organic carbon content, or is massive and (very) hard when dry. The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Bunchgrasses and shrubs equally important for increasing infiltration and reducing runoff. Litter plays a role in increasing infiltration and decreasing runoff. Plants provide microhabitat for seedlings, catch litter and soil, and slow raindrops and runoff. Vascular plants and/or well-developed biological soil crusts (where present) will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Interspaces between plants and any well-developed biological soil crusts (where present) may serve as water flow patterns during episodic runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced. Shrubs catch snow, slow wind evaporation, and provide microhabitat for seedling establishment.

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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):** None. Naturally occurring soil horizons may be harder than the surface because of an accumulation of calcium carbonate and should not be considered as compaction 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: Bluebunch wheatgrass, Wyoming big sagebrush

    Sub-dominant: Indian ricegrass, Shadscale saltbush

    Other: other grasses = forbs = other shrubs

Additional: Functional /structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. crested wheatgrass and Russian wildrye may substitute for mid stature cool season perennial native bunchgrasses.). Biological soil crust is variable in its expression on this site and is measured as a component of ground cover. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. Some bunchgrass and shrub mortality may occur during severe droughts, particularly on the shallower and coarser soils associated with this site.

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14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 15-25% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 700-775#/acre.
    Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.

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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:** Cheatgrass, halogeton, green rabbitbrush, annual forbs, broom snakeweed, Utah juniper, purple threeawn, medusahead rye.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
