USDA Natural Resources
Conservation Service

Ecological site R034BY206UT
Semidesert Gravelly Sandy Loam (Wyoming Big Sagebrush)

Last updated: 3/05/2022
Accessed: 05/13/2025

General information

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

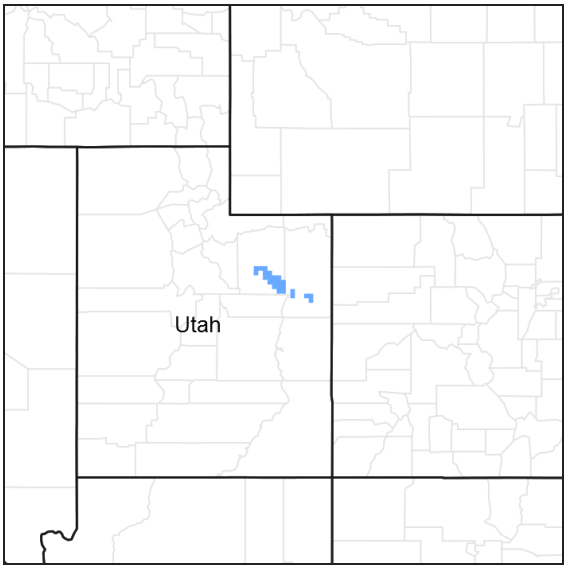


Figure 1. Mapped extent

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): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.

The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

Characteristic soils in this site are moderately deep to deep and well-drained. They formed in alluvium and eolian deposits derived mainly from sandstone and shale. Soils are in the coarse-loamy textural family and usually have a sandy loam, very channery sandy loam to gravelly sandy loam surface texture. Permeability is moderate to moderately rapid and runoff is low to medium. The water supplying capacity is 2.1 to 4 inches. If disturbed, these soils are susceptible to wind erosion.

Associated sites

R034BY227UT	**Semidesert Shallow Loam (Black Sagebrush)** This site occurs on adjacent ridge tops with soils of higher rock content
R034BY247UT	**Semidesert Stony Loam (Utah Juniper-Pinyon)** This site occurs on adjacent ridge tops with soils of higher rock content

Similar sites

R034BY212UT	**Semidesert Loam (Wyoming Big Sagebrush)** This site has a similar plant community but occurs on loamy textured soils with low rock fragment volumes.
R034BY205UT	**Semidesert Gravelly Loam (Wyoming Big Sagebrush)** This site has a similar plant community but occurs on loamy textured soils, and contains horsebrush and greasewood components, and does not contain bud sagebrush

Table 1. Dominant plant species

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

Physiographic features

This site occurs in drainage ways, hills and plateaus. Slopes are mostly 2 to 8 percent. Elevations range from 5,000 to 6,400 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Hill (3) Plateau
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,524–1,951 m
Slope	2–8%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is 8 to 12 inches. Approximately 65% occurs as rain from March through September. On the average, November through February are the driest months and July through October are the wettest months. The mean annual air temperature is 48 degrees Fahrenheit and the soil temperatures are in the mesic regime. The average frost free days are 125 to 147 and freeze free days are 148 to 170. In average years, plants begin growth around March 30 and end growth around September 30.

Table 3. Representative climatic features

Frost-free period (characteristic range)	125-147 days
Freeze-free period (characteristic range)	148-170 days
Precipitation total (characteristic range)	203-305 mm
Frost-free period (average)	136 days
Freeze-free period (average)	159 days
Precipitation total (average)	254 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

Characteristic soils in this site are moderately deep to deep and well-drained. They formed in alluvium and eolian deposits derived mainly from sandstone and shale. Soils are in the coarse-loamy textural family and usually have a sandy loam, very channery sandy loam to gravelly sandy loam surface texture. Permeability is moderate to moderately rapid and runoff is low to medium. The water supplying capacity is 2.1 to 4 inches. If disturbed, these soils are susceptible to wind erosion.

Modal Soil: Gilston SL 2-8% — coarse-loamy, mixed, calcareous, mesic Ustic Torriorthents

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Eolian deposits–sandstone and shale
Surface texture	(1) Sandy loam (2) Gravelly sandy loam (3) Very channery sandy loam
Family particle size	(1) Coarse-loamy

Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	51–152 cm
Soil depth	51–152 cm
Surface fragment cover <=3"	8–37%
Surface fragment cover >3"	2–5%
Available water capacity (Depth not specified)	5.33–10.16 cm
Calcium carbonate equivalent (Depth not specified)	1–15%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–5
Soil reaction (1:1 water) (Depth not specified)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	6–33%
Subsurface fragment volume >3" (Depth not specified)	3–8%

Ecological dynamics

It is impossible to determine in any quantitative detail the historic climax plant community (HCPC) for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). Although there is evidence of Native Americans passing through southern extent of this ecological site, there has been no evidence of permanent inhabitance. The northern extent of this ecological site did have signs of permanent inhabitants for a short time (Spangler 1995), then became similar to the southern extent of this site. The first Europeans came to eastern Utah in 1765 as a Spanish expedition, however it wasn't until approximately 1870 that the first Europeans brought livestock to the area (Watt 1997). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

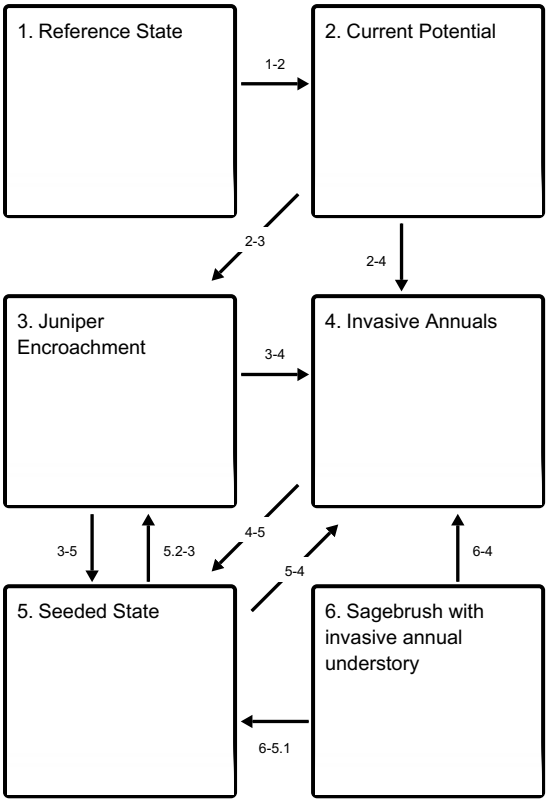
Below is a State and Transition Model diagram to illustrate the "phases" (common plant communities), and "states" (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, etc. Reference State 1 illustrates the common plant communities that probably existed just prior to European settlement.

The major successional pathways within states, ("community pathways") are indicated by arrows between phases. "Transitions" are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion. When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

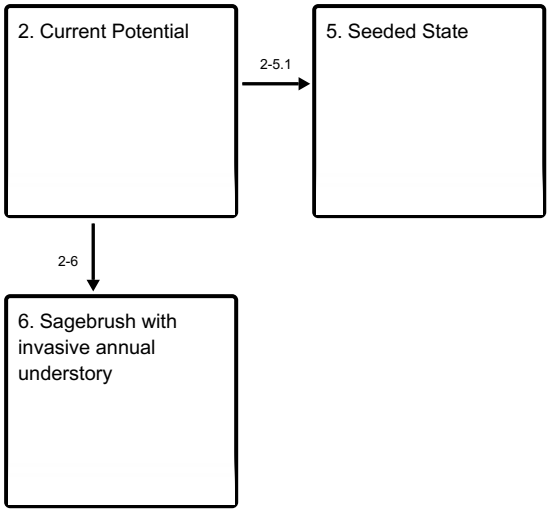
The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and/or new ones may be added. Desired plant communities should be determined by the decision-makers from the options in this model. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State and transition model

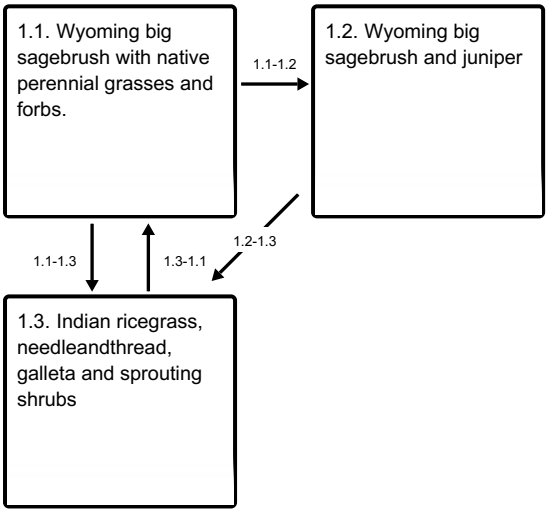
Ecosystem states



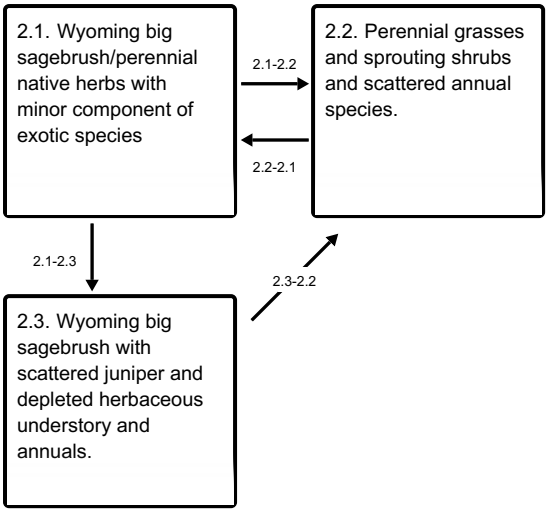
States 2, 5 and 6 (additional transitions)



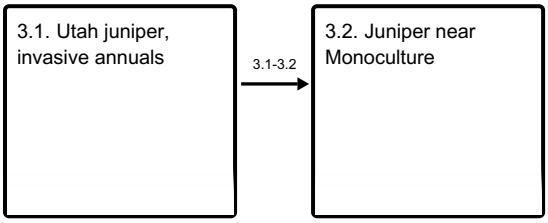
State 1 submodel, plant communities



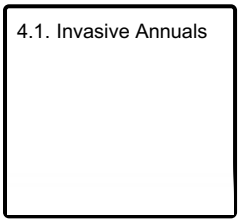
State 2 submodel, plant communities



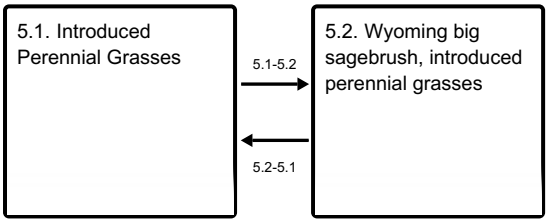
State 3 submodel, plant communities



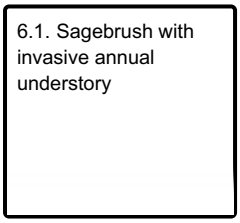
State 4 submodel, plant communities



State 5 submodel, plant communities



State 6 submodel, plant communities



State 1
Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The Reference State for this site would have been a shrub steppe characterized by Wyoming big sagebrush and associated native perennial forbs and grasses. A more complete list of species by lifeform for the Reference State is available in the accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document.

Community 1.1
Wyoming big sagebrush with native perennial grasses and forbs.

This community is dominated by Wyoming big sagebrush, Indian ricegrass and galleta. Shadscale and winterfat are also commonly present in the shrub layer. Indian ricegrass and galleta are the principle perennial grasses. Bottlebrush squirreltail is also commonly present. Scarlet globemallow is an abundant forb. Natural fire frequency is estimated to be 10 to 70 years (USDA-FS).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	176	303	387
Grass/Grasslike	50	168	252
Forb	26	90	146
Total	**252**	**561**	**785**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	25-35%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	30-45%
Surface fragments >0.25" and <=3"	0-35%
Surface fragments >3"	1-5%
Bedrock	0%
Water	0%
Bare ground	30-45%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	–	25-35%	5-10%
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Wyoming big sagebrush and juniper

Wyoming big sagebrush and shadscale increases significantly in percent composition. Winterfat and yellow

rabbitbrush may increase also. Shrubs become decadent due to age. Perennial grasses and forbs lose vigor and juniper may have begun to encroach on the site. With the plant interspaces becoming larger from the reduction of rhizomatous grasses, soil erosion may accelerate because of the increased bare ground. Water flow patterns and pedestals become more abundant. Although the overall functionality of the site is still intact, it is at risk with further degradation.

Community 1.3
Indian ricegrass, needleandthread, galleta and sprouting shrubs

Native perennial bunchgrasses dominate this community phase. Wyoming big sagebrush and shadscale decrease in the community. Winterfat has the ability to re-sprout and re-establish following a fire. Yellow rabbitbrush and horsebrush species 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. Indian ricegrass and other cool season bunchgrasses flourish.

Pathway 1.1-1.2
Community 1.1 to 1.2

Extended period of time without a major disturbance such as fire; insect damage; or prolonged drought. Fire frequency extends well beyond the 10 to 70 year average for the site

Pathway 1.1-1.3
Community 1.1 to 1.3

Recent fire occurrence, lightning or human caused, eliminating sagebrush and other non-sprouting species from the community. Site is properly grazed.

Pathway 1.2-1.3
Community 1.2 to 1.3

This pathway occurs from the occurrence of a natural or human induced fire. Site is properly grazed.

Pathway 1.3-1.1
Community 1.3 to 1.1

This represents the time following a fire with good grazing management, with a normal fire return interval of 10-70 years. Site is properly grazed.

State 2
Current Potential

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 70 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. Once junipers become a dominant feature, they are a permanent part of the plant community until a fire or management action removes them. The understory is depleted (lack of both living plants and seed bank) so that a return to State 2 is not possible.

Community 2.1
Wyoming big sagebrush/perennial native herbs with minor component of exotic species

Figure 7. 2.1

Figure 8. 2.1

This community is dominated by Wyoming big sagebrush, Indian ricegrass and galleta. Shadscale and winterfat are also commonly present in the shrub layer. Indian ricegrass and galleta are the principle perennial grasses. Bottlebrush squirreltail is also commonly present. Abundant forbs including longleaf phlox and scarlet globemallow. Naturalized and invasive non-native species also exist. Natural fire frequency is estimated to be 10 to 70 years.

Figure 9. Plant community growth curve (percent production by month). UT0002, Current Potential. Community Phase 2.1.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	9	17	22	19	12	8	5	3	2	1

Community 2.2
Perennial grasses and sprouting shrubs and scattered annual species.

Wyoming big sagebrush and Shadscale decrease in the community. Winterfat resprouts following the fire. Yellow rabbitbrush and horsebrush 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. The abundance of invasive annuals prior to the disturbance will dictate their abundance post disturbance.

Community 2.3
Wyoming big sagebrush with scattered juniper and depleted herbaceous understory and annuals.

Figure 10. 2.3

Figure 11. 2.3

Figure 12. 2.3

Wyoming big sagebrush and shadscale increase significantly in percent composition. Winterfat and yellow rabbitbrush may increase also. Shrubs become decadent due to age. Indian ricegrass, needleandthread 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. Galleta 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.

Pathway 2.1-2.2
Community 2.1 to 2.2

Fire or brush management or excessive browsing removes non-sprouting shrubs from the community.

Pathway 2.1-2.3
Community 2.1 to 2.3

Wyoming big sagebrush/perennial native herbs with minor component of exotic species

Wyoming big sagebrush with scattered juniper and depleted herbaceous understory and annuals.

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 10 – 70 year average for the site. Utah juniper will often invade the site if a seed source is available.

Pathway 2.2-2.1
Community 2.2 to 2.1

Site is properly grazed for an extended period of time without disturbance. Plant community succession results in an increase of non-sprouting shrubs such as sagebrush.

Pathway 2.3-2.2
Community 2.3 to 2.2

Fire, brush management or excessive browsing removes non-sprouting shrubs from the community. Yellow rabbitbrush and/or horsebrush species may become dominant.

State 3
Juniper Encroachment

Native shrubs such as Wyoming big sagebrush or rabbitbrush dominate the site. The occurrence of fire extends well beyond the normal period for the site. This state typically has invasive grasses and/or forbs as the dominant understory species. Utah junipers increase to occupy a significant portion of the over story. Wyoming big sagebrush dominates the shrub layer and may be decadent due to completion with junipers. Indian ricegrass and other native bunchgrasses are significantly reduced due to increased shrub and tree competition and/or heavy grazing pressure.

Community 3.1
Utah juniper, invasive annuals

Utah juniper has invaded, Wyoming big sagebrush and other shrubs decline. 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. typically dominate the understory.

Community 3.2
Juniper near Monoculture

Figure 13. 3.2

The number and size of trees has increased with the absence of fire. The understory shrub and herbaceous vegetation has become very decadent or absent. A few scattered shrubs may still exist with the herbaceous component nearly nonexistent. Exposed soil results in increased runoff and erosion.

Pathway 3.1-3.2
Community 3.1 to 3.2

Lengthening of the fire return interval.

State 4
Invasive Annuals

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. Indian ricegrass and other native bunchgrasses are significantly reduced from increased annuals competition and/or heavy grazing pressure and shortened fire return interval. Only remnant perennial species remain. Highly combustible fine fuels from invasive annuals dominate the community. Reoccurring fire is common. Fire frequency is 5 – 30 years. Cheatgrass dominance prevents reestablishment of sagebrush due to competition.

Community 4.1
Invasive Annuals

Figure 14. 4.1

Invasive annuals dominate this community phase. If shrubs are present, yellow rabbitbrush dominates the shrub layer. Remaining winterfat is mostly dead. Horsebrush species 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 State

This state is seeded to rangeland species that are composed of mostly introduced species. Unwanted trees and/or shrubs are reduced but they will occupy a portion of the site through natural succession. Invasive annual grasses and weedy forb species primarily, cheatgrass and various annual forbs, may be present in the seeding, but do not dominate. The introduced perennial grasses prevent the reestablishment of native herbaceous species due to competition, and can persist indefinitely.

Community 5.1
Introduced Perennial Grasses

This plant community is the result of a seeding of introduced grasses. Although there may be some native species present, however the introduced species will dominate the site. Shrubs are sparse to absent. Range seedings, when healthy, are usually resistant to fire.

Community 5.2
Wyoming big sagebrush, introduced perennial grasses

This community shows where sagebrush and other shrubs have slowly reestablished in the area and have become dominate or codominant with the herbaceous component.

Pathway 5.1-5.2
Community 5.1 to 5.2

Over time Wyoming big sagebrush and other shrubs gradually move back into the site. The rate of this re-colonization may depend on external factors such as climate, management and grazing (both domestic and wildlife). Re-colonization of non-sprouting shrubs requires 10-70 years without fire.

Pathway 5.2-5.1
Community 5.2 to 5.1

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

State 6
Sagebrush with invasive annual understory

This state is characterized by a decadent sagebrush overstory with scattered other shrubs and the understory that is dominated by cheatgrass with scattered native grasses and forbs, caused by long-term improper grazing (including season long, overstocking, wrong season, etc.). Sagebrush and native herbaceous species cannot reestablish due to competition with cheatgrass.

Community 6.1
Sagebrush with invasive annual understory

Figure 15. 6.1

Cheatgrass and other invasive annuals dominate the understory of a decadent stand of Wyoming big sagebrush. A component of other shrubs is typically present and remnant populations of native grasses and forbs may still be present. This community phase is very susceptible to wildfire due to the high amounts of fine fuels produced from the invasive annuals.

Transition 1-2
State 1 to 2

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

Transition 2-3
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 2-4
State 2 to 4

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

Transition 2-5.1
State 2 to 5

Disturbance such as a fire or brush management followed by a rangeland seeding.

Transition 2-6
State 2 to 6

Sustained, long-term improper grazing and/or the lack of fire.

Transition 3-4
State 3 to 4

Fire, with long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought.

Restoration pathway 3-5
State 3 to 5

Fire or brush management with the seeding of introduced species with prescribed grazing.

Restoration pathway 4-5
State 4 to 5

Seeding of introduced species with prescribed grazing.

Transition 5.2-3
State 5 to 3

Invasion of the site by junipers, long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; lengthened fire frequency allows the site to be invaded by juniper.

Transition 5-4
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.

Transition 6-4
State 6 to 4

Fire, with long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought.

Restoration pathway 6-5.1
State 6 to 5

Disturbance such as a fire or brush management followed by a rangeland seeding.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			185–280	
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	106–179	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	17–39	–
	spiny hopsage	GRSP	*Grayia spinosa*	17–39	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	13–28	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	13–22	–
	Nuttall's horsebrush	TENU2	*Tetradymia nuttallii*	13–22	–
3	**Sub-Dominant Shrubs**			50–84	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	10–20	–
	black sagebrush	ARNO4	*Artemisia nova*	0–17	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	8–17	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	8–17	–
	spiny greasebush	GLSPM	*Glossopetalon spinescens var. meionandrum*	8–17	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–17	–

	winterfat	KRLA2	*Krascheninnikovia lanata*	8–17	–
Grass/Grasslike					
0	**Dominant Grasses**			50–95	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	squirreltail	ELEL5	*Elymus elymoides*	11–28	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–28	–
1	**Sub-Dominant Grasses**			56–123	
	Grass, perennial	2GP	*Grass, perennial*	17–39	–
	needle and thread	HECO26	*Hesperostipa comata*	9–22	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	9–22	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	9–22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	9–22	–
Forb					
0	**Dominant Forbs**			4–11	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	3–17	–
2	**Sub-Dominant Forbs**			67–123	
	Forb, annual	2FA	*Forb, annual*	17–45	–
	Forb, perennial	2FP	*Forb, perennial*	11–39	–
	western tansymustard	DEPI	*Descurainia pinnata*	4–11	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	4–11	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	4–11	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	4–11	–
	cleftleaf wildheliotrope	PHCRC	*Phacelia crenulata var. corrugata*	4–11	–
	longleaf phlox	PHLO2	*Phlox longifolia*	4–11	–

Animal community

This site provides proper grazing for sheep, cattle and sometimes horses during late fall, winter, and early spring. This site provides food and cover for wildlife. Wildlife using this site include snake, jackrabbit, coyote, mule deer, and hawk.

Hydrological functions

The soil is in hydrologic group b. The runoff curve numbers are 61 through 79 depending on the condition of the watershed.

Recreational uses

Recreation opportunities and scenic vistas are limited on this site.

Wood products

Utah juniper may invade this site making available firewood or posts.

Inventory data references

Galatowitsch, S.M. 1990. Using the original land survey notes to reconstruct pre-settlement landscapes in the American West. Great Basin Naturalist: 50(2): 181-191. Keywords: [Western U.S., conservation, history, human impact]

Spangler, J.D. 1995. Paradigms and Perspectives: A Class I Overview of Cultural Resources in the Uintah Basin and Tavaputs Plateau. Contract No. 1422J910C4014.

USDA-FS. 2006. Fire Effects Information System (FEIS).

USDA-NRCS. 2003. National Range and Pasture Handbook, in USDA, editor, USDA-Natural Resources Conservation Service-Grazing Lands Technology Institute. Keywords: [Western US, Federal guidelines, Range pasture management]

Watt, R.G. 1997. A History of Carbon County. Utah State Historical Society.

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Approval

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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	04/27/2012
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Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None. Some very minor rill development may be evident following significant thunderstorm or snow melt events but should mostly heal during the following growing season. The presence of rills may also be apparent where run-on from adjacent upland sites or exposed bedrock concentrate flows. Any rill development present should be less than 1 inch deep, moderately short (< 6') and spaced 10 to 12 feet apart.

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2. **Presence of water flow patterns:** A very few stable overland flow patterns may be present and wind around plant

bases. They should show no evidence of current erosion or deposition. Flow patterns present are normally 15 to 20 feet long, follow natural contours, and are typically spaced at least 10 to 15 feet apart. A slight increase in flow activity may be observed immediately following significant weather events such as thunderstorms or spring run-off events.

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3. **Number and height of erosional pedestals or terracettes:** None. There should be no evidence of pedestals or terracettes caused by accelerated water erosion. One to 2 inches of elevational mounding under Wyoming big sagebrush and other shrub canopies, and within biological soil crusts, is normal for this site and is not caused by water erosion. There are no exposed roots around perennial grasses and shrubs.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 30% - 45%. Soil surface may be covered by up to 50% gravels and/or channers. Bare ground openings should not be greater than 2 to 3 feet in diameter and should normally not be connected.

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5. **Number of gullies and erosion associated with gullies:** None at site level. Scattered landscape level gully channels, however, are a normal component of desert environments. Where landscape gullies are present, they should be stable, partially vegetated on their sides and bottoms, with no evidence of head-cutting. Some slight increase in disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Minor evidence of wind generated soil movement may be present. Slight depositional mounding within perennial grass crowns, under Wyoming big sagebrush and other shrub canopies, and within biological soil crusts is normal for this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** The majority of litter accumulates in place at the base of plants canopies. Slight movement of the finest material (< 1/8 inch) may move 1 to 2 feet in the direction of prevailing winds or down slope if being transported by water. Little accumulation is observed behind obstructions.

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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):** This site should have a soil stability rating of 5 or 6 under plant canopies, and a 4 to 5 in the interspaces. Average should be a 5. Surface textures are typically gravelly sandy loams, fine sandy loams, and sandy loams containing up to 50% coarse fragments.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Gilston) Soil surface is typically 0 to 4 inches deep. Surface texture is a sandy loam and structure is weak thin platy parting to weak fine granular. The A-horizon color is pale brown (10YR 6/3). Soils have an Ochric epipedon that extends 4 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy stands of perennial grasses and shrubs, as well as the presence of

biological crusts, provide for good infiltration, help break raindrop impact, and reduce runoff from storm events. Bare spaces are expected to be fairly small (< 3 feet) should be irregular in shape and usually not connected. Vegetative structure is adequate to capture snow and and allow snowmelt to occur in a controlled manner.

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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. Soils are deep.

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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: Non-sprouting shrubs (Wyoming big sagebrush, spiny hopsage) >> Perennial bunchgrasses (Indian ricegrass, bottlebrush squirreltail > Perennial forbs (scarlet globemallow).

    Sub-dominant: Sprouting shrubs (rubber rabbitbrush, winterfat) > = Warm season grasses (James galleta, sand dropseed).

    Other: A wide variety of other grasses and both perennial and annual forbs can be expected to occur in the plant community.

    Additional: Moss and lichen communities will normally be found under plant canopies while the cyanobacteria may be found throughout the site. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species. Perennial and annual 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):** All age classes of perennial grasses should be present during years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought or insect infestations up to 20% of the winterfat may die. There may be partial mortality of individual bunchgrasses and other shrubs during severe drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 30 to 45%. Depth should be 1 leaf thickness in the interspaces and from 1/2 to 3/4 inches under perennial plant canopies.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 500 pounds per acre on an average year. Production could vary from 200 to 700 pounds per acre during drought or above-average years.

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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:** Russian thistle, annual bromes and halogeton are most likely to invade this site.

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17. **Perennial plant reproductive capability:** All perennial plant species have the ability to reproduce in most years except drought years. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species may be present during average or above average years.
