USDA Natural Resources
Conservation Service

Ecological site R025XY314UT
Upland Loam (Wyoming Big Sagebrush)

Accessed: 04/26/2024

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.

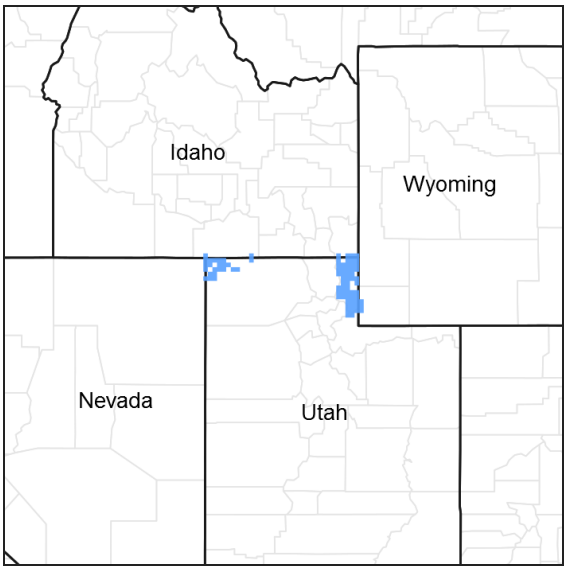

Figure 1. Mapped extent

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.

Ecological site concept

This site is located on lower benches and valley floors. The site is visualy a Wyoming big sagebrush site. The site is in the 12 to 14 inch precitation zone primarly.

Associated sites

R025XY316UT	**Upland Shallow Loam (Black Sagebrush)** This site is located on the ridge tops that run through this site.
R025XY318UT	**Upland Stony Loam (Black Sagebrush)** This site is located on ridge side slopes usally on west and South facing slopes.
R025XY322UT	**Upland Juniper Savanna (Utah Juniper)** This site is located on the broader landscape areas licated below the site.

Similar sites

R028AY309UT	**Upland Loam (Wyoming Big Sagebrush)** This site will often have a smaller number of forbs and less forb diversity.

Table 1. Dominant plant species

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

Physiographic features

This site can be found on alluvial fans, fan remnants (lower benches), on hillslopes, and mesas between slopes of 0 to 20%, but the slope range is wide and this site can be found on slopes up to 60%. It can occur at elevations between 4.900 to 7,400 feet, although this site can be found at elevations as low as 4,600. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Fan remnant (3) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	4,900–7,400 ft
Slope	0–20%

Climatic features

The climate is cold and snowy winters and warm and dry summers. The average annual precipitation is 12 -14 inches. Approximately 40 percent comes as rain from May through September. On the average, July and September are the driest months and April through June are the wettest months. In average years, grasses begin growth around May 1 and end growth around September 30.

Table 3. Representative climatic features

Frost-free period (average)	125 days
Freeze-free period (average)	154 days
Precipitation total (average)	14 in

Influencing water features

Soil features

The soils on this site were formed in colluvuim and or slope alluvium over residuum weathered from sandstone, mica schist, quartzite, limestone, conglomerate, and volcanic ash. The soil is well drained with moderate to moderately rapid permeability in the upper 10 inches of soil. The soil is also deep to moderately deep with bedrock between 20 and 60 inches beneath the soil surface for half of the mapped acreage. Restrictive layers can be found on these soil components within this site: Bluehill, Coalbank, Raftriver, and Tomsherry. The soil texture at the surface at most sites is fine sandy loam or loamy, however other surface textures can be found, such as silt loam and gravely sandy loam. Rock fragments between 2 mm and 3 inches on the surface are between 5 and 11% by cover and in the subsurface 0 to 5% by volume. Surface and subsurface rocks over 3 inches in diameter are 11 to 12% and 0 to 1% by cover and volume, respectively. Available water capacity is between 2.3 and 3.1 in the upper 40 inches of soil. The soil pH is between 6.6 and 8.4. The soil temperature regime is frigid. The moisture regime is Aridic Xeric.

Soils associated with this site:

Box Elder Co UT601: Raftriver (65, 66, 97), Cottonthomas (20), Tomsherry (20), Duckree (65), Bluehill (9), Coalbank (9)

Table 4. Representative soil features

Parent material	(1) Alluvium–quartzite (2) Colluvium–limestone and sandstone (3) Residuum–mica schist
Surface texture	(1) Fine sandy loam (2) Loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	20–60 in
Surface fragment cover <=3"	5–11%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	2.3–3.1 in
Calcium carbonate equivalent (0-40in)	0–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–10
Soil reaction (1:1 water) (0-40in)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	11–12%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

The following are the narratives for each of the described plant communities. These plant communities may not represent every possibility, but they probably are the most prevalent and repeatable plant communities. As more data is collected, some of these plant communities way be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as the “desired plant community”. According to the USDA NRCS National Range and Pasture Handbook, the desired plant community will be determined be the decision makers and will meet minimum quality criteria established by the NRCS. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

State and transition model

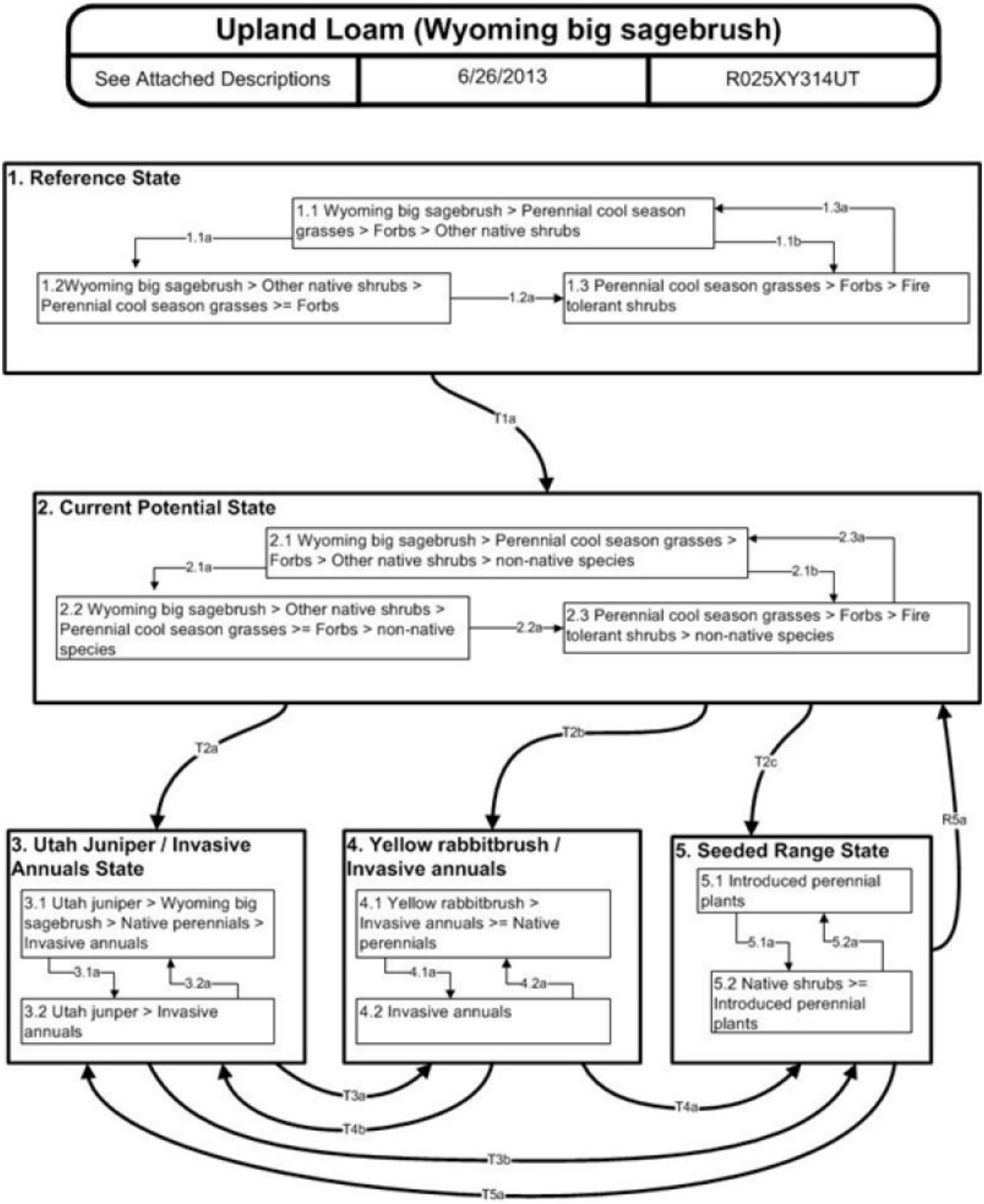

Figure 4. R025XY314UT State and Transistion Model

State 1
Reference State

This state includes the plant communities that were best adapted to the unique combination of factors associated with this ecological site prior to European settlement. It was in a natural dynamic equilibrium with the historic biotic, abiotic, climatic factors all being able to function freely. This dominant aspect of the plant community is Wyoming

big sagebrush and Bluebunch wheatgrass. The community is made up of 60 % Grass 10 % forbs and 30 % shrubs on a dry weight base. The Fire Regimes on this site would be 35 to 80 years. All of these scenarios are very interrelated and dependent on weather patterns and events as well as fire frequency and intensity. The fire frequency should be around 35 to 80 years. Any set of events that are strong enough to force the plant community out of this pattern can push it over a threshold and into another state.

Community 1.1
Wyoming big sagebrush > Perennial cool season grasses > Forbs > Other native shrubs

Wyoming big sagebrush, Perennial cool season grasses, Forbs and other shrubs: This is the Community that is described in the initial Plant List. This community is represented with 60% grasses, 10% Forbs and 30% Shrubs. The dominant shrub visually and in production is Wyoming big sagebrush. The dominant grass is Bluebunch wheatgrass and the dominant Forb visually is Western yarrow. This community is strong enough to only have around 12 – 18% bare ground..

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	537	650	725
Shrub/Vine	250	475	570
Forb	90	100	110
Total	**877**	**1225**	**1405**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	25-40%
Forb foliar cover	5-15%
Non-vascular plants	0.5-2.0%
Biological crusts	0.5-2.5%
Litter	10-20%
Surface fragments >0.25" and <=3"	0-8%
Surface fragments >3"	0-5%
Bedrock	0%
Water	0%
Bare ground	10-25%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	5-10%	5-10%
>1 <= 2	–	1-5%	15-30%	1-5%
>2 <= 4.5	–	10-20%	0-5%	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 6. Plant community growth curve (percent production by month). UT3141, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	1	5	30	44	10	5	5	0	0	0

Community 1.2
Wyoming big sagebrush > Other native shrubs > perennial cool season grasses > =forbs

Wyoming big sagebrush, other native shrubs, Perennial cool season grasses, and Forbs: This Community is shows up when there is a period of time when the Wyoming big sagebrush increases to where it is suppressing the understory and other shrubs (notably) Mountain snowberry, Low rabbitbrush and Utah serviceberry increase which also helps to suppress the herbaceous understory. This community is strong enough to only have around 12 – 20% bare ground.

Community 1.3
Perennial cool season grasses > Forbs > Fire tolerant Shrubs

Perennial cool season grasses, Forbs and Fire tolerant shrubs: This community usually occurs when there is a hot erratically moving fire that heats the ground to the point where it damages the antelope bitterbrush so that it cannot take the dominant community position. The plant community is represented with 65% grasses, 10% forbs and 25% shrubs. The initial Plant List of Grasses and Forbs will be quite accurate in this community also. This community will likely have around 15 – 20% bare ground.

Pathway 1.1a
Community 1.1 to 1.2

Time without catastrophic event. This was probably dependent on a specific chain of climatic events.

Pathway 1.1b
Community 1.1 to 1.3

Fire; insects; prolonged drought; pathogens that kills and/or reduces the Dominant shrub overstory. Fire is the most likely of these disturbances

Pathway 1.2a
Community 1.2 to 1.3

Fire; insects; prolonged drought; pathogens that kills and/or reduces the Dominant shrub overstory. Fire is the most likely of these disturbances

Pathway 1.3a
Community 1.3 to 1.1

Time without catastrophic event. This was probably dependent on a specific chain of climatic events.

State 2
Current Potential State

This state includes the biotic communities that would become established on the ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The CPS state will include acclimatized, naturalized or invasive nonnative species. There is no known way to effectively remove these plants from the site once they have become established. The level of occurrence of these plants in the CPS is such that careful management can prevent their domination of the site. This site is irreversibly changed. Plant communities within the CPS state may be managed and used for various purposes by man without significant alteration in plant community composition or production. It includes all of the plant communities that exist in the RPC state with the inclusion of species that are non-native to this ESD. These non-native plants are not to be considered when considering plants for the rangeland health site evaluation. The complete list of plants for this state are the ones listed in the Reference Plant Community list with these and other Non-Native and/or Native species. All of these scenarios are very interrelated and dependent on weather patterns and events as well as fire frequency and intensity. The fire frequency should be around 35 to 80 years. Any set of events that are strong enough to force the plant community out of this pattern can push it over a threshold and push it into another state.

Community 2.1
Wyoming big sagebrush > Perennial cool season grasses > Forbs > Other Native shrubs > Non-Native spe

Wyoming big sagebrush, Perennial cool season grasses, Forbs and other shrubs: This is the Community that is described in the initial Plant List. This community is represented with 60% grasses, 10% Forbs and 30% Shrubs. The dominant shrub visually and in production is Wyoming big sagebrush. The dominant grass is Bluebunch wheatgrass and the dominant Forb visually is Western yarrow. This community is strong enough to only have around 12 – 18% bare ground. This community will have notable amounts of non-native species shown above as well as others not mentioned.

Community 2.2
Wyoming big sagebrush > Other Native Shrubs > Perennial cool season grasses >= Forbs > Non-Native Sp

Wyoming big sagebrush, other native shrubs, Perennial cool season grasses, and Forbs: This Community is shows up when there is a period of time when the Wyoming big sagebrush increases to where it is suppressing the understory and other shrubs (notably) Mountain snowberry, Low rabbitbrush and Utah serviceberry increase which also helps to suppress the herbaceous understory. This community is strong enough to only have around 15 – 20% bare ground. This community will have notable amounts of non-native species shown above as well as others not mentioned.

Community 2.3
Perennial cool season grasses > forbs > Fire tolerant Shrubs > Non-Native Species

Perennial cool season grasses, Forbs and Fire tolerant shrubs: This community usually occurs when there is a hot erratically moving fire that heats the ground to the point where it damages the antelope bitterbrush so that it cannot take the dominant community position. The plant community is represented with 65% grasses, 10% forbs and 25% shrubs. This community will have notable amounts of non-native species shown above as well as others not mentioned. The initial Plant List of Grasses and Forbs will be quite accurate in this community also. This community will likely have around 10 – 25% bare ground. This community will have notable amounts of non-native species shown above as well as others not mentioned.

Pathway 2.1a
Community 2.1 to 2.2

Time without catastrophic event. This is dependent on a specific chain of climatic events

Pathway 2.1b
Community 2.1 to 2.3

Fire; insects; prolonged drought; pathogens that kills and/or reduces the dominant shrub overstory. Also overgrazing with or without drought over a prolonged period of time Fire and/or overgrazing are the most common of these disturbances

Pathway 2.2a
Community 2.2 to 2.3

Fire; insects; prolonged drought; pathogens that kills and/or reduces the dominant shrub overstory. Also overgrazing with or without drought over a prolonged period of time Fire and/or overgrazing are the most common of these disturbances

Pathway 2.3a
Community 2.3 to 2.1

Time without catastrophic event. This is dependent on a specific chain of climatic events

State 3
Utah Juiper / Invasive Annuals

This State has only two described Plant Communities but many variations of the represented ones are present. This is the State that this plant community will move to when there is a lack of fire with a source of Utah Juniper and maybe a source of pinyon seed. Movement from community fase to community fase can and often is accelerated by overgrazing. The dominate aspect of the plant community is Utah Juniper and Cheatgrass brome. This State can persist for a long time until extreme conditions needed for a wildfire occur or some other management treatment is implemented.

Community 3.1
Utah Juniper > wyoming big sagebrush > Native Perennials > Invasive Annuals

Figure 7. Photo State 3 Plant Comunity3.1

This community has a strong overstory of Utah Juniper and Singleleaf pinyon but still has an understory similar to community 2.1. This community will have around 20 – 35% bare ground. Fire is the surest means to bring this community back toward the Current potential State.

Community 3.2
Utah Juniper > Invasive annuals

This community is present when 99 – 100% of the native plants have been removed from the plant community and only Pinyon and Juniper with a sparse understory of Invasive annuals are left on the site. This community will have around 35 – 85% bare ground.

Pathway 3.1a
Community 3.1 to 3.2

Overgrazing with or without drought over a prolonged period of time

Pathway 3.2a
Community 3.2 to 3.1

Fire; insects; prolonged drought; pathogens that kills and/or reduces the Dominant shrub overstory. Fire is the most effective of these disturbances

State 4
Yellow rabbitbrush / Invasive Annuals

This is the state that this plant community will move to when it is in an over grazed condition and/or drought condition and then burned (wild or controlled) and not seeded or seeding is not successful. The dominant aspect of the plant community is Cheatgrass brome, Yellow rabbitbrush with a very small amount of Wyoming big sagebrush. The community will usually be made up of 70 % Cheatgrass brome and 10 % Forbs and 20 % Yellow rabbitbrush with minor components of other shrubs.

Community 4.1
Yellow rabbitbrush > Invasive Annuals >= Native Perennials

Yellow rabbitbrush, Invasive annuals, Native perennials: This plant community consists of approximately 35% Yellow rabbitbrush, 50% invasive annuals, and 10% Native perennials with a small component of other species. This community will have around 20 – 35% bare ground.

Figure 8. Plant community growth curve (percent production by month). UT3142, Cheatgrass brome - Yellow rabbitbrush.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	20	25	34	5	5	5	1	0	0

Community 4.2
Invasive Annuals

Figure 9. Photo State 4 Plant Community 4.2

Invasive annuals: This plant community consists of approximately 85% invasive annuals (Mostly Cheatgrass brome and Japanese (Field) brome), and 10% Native perennials with a small component of other species. This community will have around 20 – 45% bare ground.

Pathway 4.1a
Community 4.1 to 4.2

Increased fire frequency (from 20 - 45 years to 5 - 10 years) and intensity without follow-up management. Overgrazing can move this change along faster. In the State (4) the Yellow rabbitbrush / Invasive annuals State the fire frequency will remain at a 5 – 10 year interval. This condition is self sustaining and the site will keep deteriorating until the site potential is lost. This will continue unless a large amount of energy is injected into the system to cause a change to take place.

Pathway 4.2a
Community 4.2 to 4.1

Time and management of grazing alone or along with other disturbances where human and/or naturalized introduction of native and/or introduced perennial plant species takes place.

State 5
Seeded Range State

This state exists when the site is cultivated and/or burned and planted to Introduced and in some situations Native grasses, forbs and often half shrubs and shrubs.

Community 5.1
Introduced Perennial Plants

The plant community here consists of Introduced and in some situations Native grasses, forbs and half shrubs and shrubs. It is normally as productive as the site is in the Current Potential State.

Community 5.2
Native Shrubs >= Introduced Perennial Plants

This site comes into existence when weather conditions create the kind of episodic situation that allows Wyoming big sagebrush to move back onto the site.

Pathway 5.1a
Community 5.1 to 5.2

Time without catastrophic event. This is dependent on a specific chain of climatic events

Pathway 5.2a
Community 5.2 to 5.1

Time and management of grazing alone or along with other disturbances where human intervention takes place to move the community back.

Transition T1a
State 1 to 2

Introduction of non-native species into the ecosystem.

Transition T2a
State 2 to 3

Prolonged Drought, Overgrazing, Extreme lengthening of the fire interval frequency. This takes place when the sagebrush canopy gets so heavy that it destroys the perennial grass and forb under story and the fire frequency is increased from 20- to 45 years to 60 – 90 years and the introduction of Utah juniper.

Transition T2b
State 2 to 4

Continued overgrazing and increase of fire frequency over a very prolonged period of time. (5 – 12 year fire frequency interval)

Transition T2c
State 2 to 5

Human caused disturbance (mechanical treatment and seeding; chemical treatment and seeding. etc.)

Transition T3a
State 3 to 4

Continued overgrazing and increase of fire frequency over a very prolonged period of time. (5 – 10 year fire frequency interval)

Transition T3b
State 3 to 5

Human caused disturbance (mechanical treatment and seeding; chemical treatment and seeding. etc.)

Transition T4b
State 4 to 3

Prolonged Drought, Overgrazing, Extreme lengthening of the fire interval frequency. This takes place when the understory gets so depleted and the perennial grass and forb understory have been destroyed. At this time the fire frequency will increase from 20- to 45 years to 60 – 90 years because of the amount of bare ground common with this situation along with the introduction of Utah juniper.

Transition T4a
State 4 to 5

Human caused disturbance (mechanical treatment and seeding; chemical treatment and seeding. etc.)

Restoration pathway R5a
State 5 to 2

Time with proper management that favors the Native Plants as they move back into the site.

Conservation practices

Prescribed Grazing

Transition T5a
State 5 to 3

Prolonged Drought, Overgrazing, Extreme lengthening of the fire interval frequency. This takes place when the sagebrush canopy gets so heavy that it destroys the perennial grass and forb under story and the fire frequency is increased from 20- to 45 years to 60 – 90 years and the introduction of Utah juniper.

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**			124–190	
	Utah serviceberry	AMUT	*Amelanchier utahensis*	110–220	–
3	**Secondary Shrubs**			29–48	
	Shrub, other	2S	*Shrub, other*	5–95	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–29	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	10–29	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	10–29	–
	granite prickly phlox	LIPU11	*Linanthus pungens*	10–29	–
	Utah snowberry	SYORU	*Symphoricarpos oreophilus var. utahensis*	10–29	–
	spineless horsebrush	TECA2	*Tetradymia canescens*	10–29	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–19	–
	pricklypear	OPUNT	*Opuntia*	5–15	–
Grass/Grasslike					
0	**Primary Grasses**			380–570	
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	143–190	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	143–190	–
	Idaho fescue	FEID	*Festuca idahoensis*	48–95	–
1	**Secondary Grasses**			48–95	
	Grass, perennial	2GP	*Grass, perennial*	48–95	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	29–48	–
	Geyer's sedge	CAGE2	*Carex geyeri*	20–48	–
	squirreltail	ELEL5	*Elymus elymoides*	29–48	–
	thickspike wheatgrass	ELLA3	*Elymus lanceolatus*	29–48	–
	needle and thread	HECO26	*Hesperostipa comata*	29–48	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	29–48	–
	western wheatgrass	PASM	*Pascopyrum smithii*	29–48	–
	Grass, annual	2GA	*Grass, annual*	29–48	–
Forb					
0	**Primary Forbs**			55–110	
	western yarrow	ACMIO	*Achillea millefolium var. occidentalis*	29–48	–
	white sagebrush	ARLUC8	*Artemisia ludoviciana ssp. candicans*	29–48	–
	spiny phlox	PHHO	*Phlox hoodii*	29–48	–
2	**Secondary Forbs**			110–165	
	Forb, perennial	2FP	*Forb, perennial*	5–143	–
	Forb, annual	2FA	*Forb, annual*	11–110	–
	Torrey's milkvetch	ASCA9	*Astragalus calycosus*	10–29	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	10–29	–
	Indian paintbrush	CASTI2	*Castilleja*	10–29	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	10–29	–
	longstalk springparsley	CYLO	*Cymopterus longipes*	10–29	

	longstalk springparsley	CYLO	*Cymopterus longipes*	10–29	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	10–29	–
	sanddune wallflower	ERCAC	*Erysimum capitatum var. capitatum*	5–29	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	10–29	–
	common sunflower	HEAN3	*Helianthus annuus*	5–29	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	5–29	–
	smoothstem blazingstar	MELA2	*Mentzelia laevicaulis*	0–29	–
	yellow owl's-clover	ORLU2	*Orthocarpus luteus*	0–29	–
	low beardtongue	PEHU	*Penstemon humilis*	10–29	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	10–29	–
	foothill deathcamas	ZIPA2	*Zigadenus paniculatus*	10–29	–
	Utah buttercup	RAJO	*Ranunculus jovis*	10–19	–
	manyflower stickseed	HAFL2	*Hackelia floribunda*	10–19	–
	wavyleaf thistle	CIUNU	*Cirsium undulatum var. undulatum*	1–19	–
	Rocky Mountain beeplant	CLSE	*Cleome serrulata*	5–19	–
	sego lily	CANU3	*Calochortus nuttallii*	10–19	–
	Nevada onion	ALNE	*Allium nevadense*	10–19	–
	flatbud pricklypoppy	ARMUR	*Argemone munita ssp. rotundata*	0–15	–
	roundspike cryptantha	CRHU2	*Cryptantha humilis*	5–15	–
	pale evening primrose	OEPA	*Oenothera pallida*	5–15	–
	mountain tarweed	MAGL2	*Madia glomerata*	0–15	–

Animal community

This site provides grazing / Browsing for cattle and sheep in the spring, summer, and fall. Also Mule Deer and Elk in fall and winter.

Wildlife that use this site include blacktail jackrabbit, coyote, sage grouse, Elk and mule deer.

Hydrological functions

The soil series are in Hydologic group B. The runoff curve number is 61 when the vegetation and soil are in good condition.

Recreational uses

Recreation activities include aesthetic value; and fair opportunities for hiking and hunting.

Wood products

There are no wood products from this site unless there is Utah Juniper invasion onto the site. With this event you will be able to harvest Cedar posts and firewood.

Other products

Threatened and endangered species include plants and animals.

Inventory data references

The Range site description was documented with one (1) 417 and five (5) UT2s.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T14N R17W S24
General legal description	SE ¼ NW ¼ Section 24, Township 14N, Range 17W – Junction Valley

Contributors

GBB

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)	Shane A. Green (NRCS), Brock Benson (NRCS), Robert D. Stager (BLM), Mike Gates (BLM), Tyler Staggs (BLM), Alan Bass (BLM). Revised to include updated terminology and concepts by V. Keith Wadman (NRCS Retired).
Contact for lead author	shane.green@ut.usda.gov
Date	12/15/2011
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to very few rills present. Some very minor rill development may occur on steeper slopes or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Any rills present should be <1 inch deep, fairly short (<6 feet long) and somewhat widely spaced (4-8 feet). Minor rill development may be observed following major thunderstorm or spring runoff events but should heal during the next growing season.

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2. **Presence of water flow patterns:** Some very minor evidence of water flow patterns may be found around perennial plant bases. They show little evidence of current erosion. They are expected to be short (1-3 feet), stable, sinuous and not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat with slope.

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3. **Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (2 to 3% of individual plants). Plant roots are covered and litter remains in place around plant crowns. Terracettes should be absent or, if present, stable. A slight increase in both pedestal and terracette development may occur with increasing slope.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10-15% bare ground on slopes 5 to 25% and 15 to 30% bare ground on slopes greater than 25%. Bare ground spaces should not be greater than 1 to 2 feet in diameter.

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5. **Number of gullies and erosion associated with gullies:** None to very few gullies present on site. Rare gullies may be present in landscape settings where they transport runoff from areas of greater water flow such as exposed bedrock. These gullies will be limited to slopes exceeding 20% slope and adjacent to sites where this runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is present. Wind caused blowouts and deposition are not present.

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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 movement. Minor litter removal may occur in flow channels with deposition occurring within 1 to 2 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move. However, some litter movement is expected (up to 6 feet) with increases in slopes >15% and/or increased runoff resulting from heavy thunderstorms.

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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 4 or 5 under the plant canopies, and a rating of 3 to 5 in the interspaces. The average rating should be a 4. Soil surface textures are loams, fine sandy loams and silt loams.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface 0-3 inches. Texture is a loam; color is dark brown (10YR3/3); and structure is weak thin platy. Ochric epipedon ranges to 12 inches. Other soil series may have mollic epipedons. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, also protects soil from splash erosion and encourages a higher rate of infiltration. Plant spatial distribution should slow runoff, allowing additional time for infiltration. Bare spaces are expected to be small and irregular in shape and are usually not connected. Vegetative structure is usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing maximum time for infiltration, and reducing runoff and erosion in all but the most extreme storm events. When perennial grasses and shrubs decrease due to natural events including drought, insect damage, etc., which reduce ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

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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. Some soils have a calcic horizon that could be mistaken for a compaction layer.

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: Perennial bunchgrasses (bluebunch wheatgrass, Thurber needlegrass) > Non-sprouting shrubs (Wyoming big sagebrush).

    Sub-dominant: Rhizomatous grasses > Sprouting shrubs > Perennial forbs.

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

    Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 35 to 80 years. 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, intermediate wheatgrass, Siberian Wheatgrass etc.) Following a disturbance such as fire, drought, rodents or insects that remove woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a period of time. If a disturbance has not occurred for an extended period of time, woody species will continue to increase. These conditions would reflect a functional community phase within the reference state.

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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 under average to above average growing conditions with age class expression likely subdued during periods of extended drought. Slight decadence in the principle shrubs could occur near the end of the fire cycle or during periods of extended drought, or insect infestations. In general, a mix of age classes should be expected with some dead and decadent plants present not exceeding 5%.

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14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1/2 to 1 inch would be considered normal. Perennial vegetation should be well distributed on the site.

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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 900 - 1100 #/acre on an average year, but could range from 700 to 1400#/acre during periods of prolonged drought or above average precipitation.

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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, Russian thistle, Utah juniper, and non-native invasive annual forbs such as mustards or halogeton.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. Green rabbitbrush sprouts vigorously following fire. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is present during average and above average growing years.