

Ecological site R028AY226UT Semidesert Sandy Loam (Wyoming Big Sagebrush)

Accessed: 05/02/2024

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.

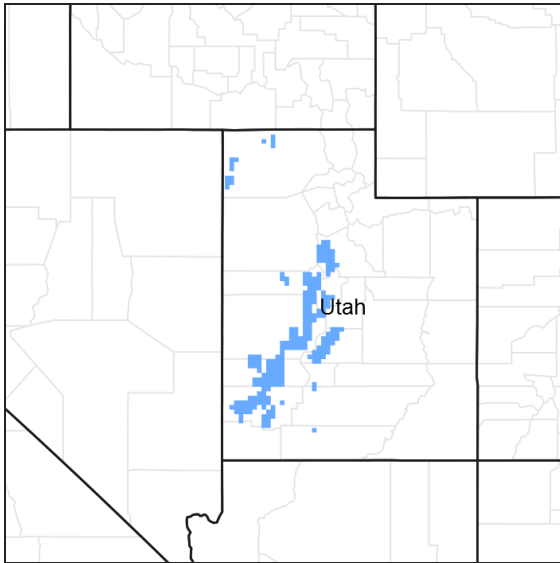


Figure 1. Mapped extent

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 encompasses approximately 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 feet (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 with scattered outcrops of Tertiary continental sediments and volcanic rocks. The average annual precipitation is 5 to 12 inches (13 to 30 cm) in the valleys and ranges up to 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 increasing elevation. The dominant

soil orders in this MLRA are Aridisols, Entisols, and Mollisols. Soils are dominantly in the mesic or frigid soil temperature regime, 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 > Ecological Site > Semidesert Sandy Loam (Wyoming Big Sagebrush)

EPA Ecoregion: 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

This site occurs on alluvial fans, lake plains and lake terraces. The soil is typically deep and the surface horizon is loamy sand with few rock fragments. This site is typically dominated by Wyoming sagebrush (*Artemisia tridentata* subsp. *wyomingensis*) and Indian ricegrass (*Achnatherum hymenoides*). As ecological condition deteriorates due to overgrazing, Indian ricegrass, needleandthread (*Hesperostipa comata*), fourwing saltbush (*Atriplex canescens*), and winterfat (*Krascheninnikovia lanata*) decrease, while Wyoming big sagebrush, rabbitbrush (*Chrysothamnus viscidiflorus*) and broom snakeweed (*Gutierrezia sarothrae*) increase. When the potential natural plant community is burned, Wyoming big sagebrush, Indian ricegrass, and needleandthread decrease while rabbitbrush increases.

Associated sites

R028AY227UT	Semidesert Gravelly Sandy Loam (Black Sagebrush) This site occurs adjacent to the Sandy Loam site, typically on soils with calcium carbonate accumulation/cementation about 20 inches below the soil surface.
-------------	---

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i> subsp. <i>wyomingensis</i>
Herbaceous	Not specified

Physiographic features

This site occurs on alluvial fans, lake plains, and lake terraces. It occurs between 4490 and 5740 feet at low slopes (between 0 and 5 percent). There is no flooding or ponding on this site.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Lake plain (3) Lake terrace
Flooding frequency	None

Ponding frequency	None
Elevation	1,369–1,750 m
Slope	0–5%
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: 49-53

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	144 days
Precipitation total (average)	330 mm

Influencing water features

Soil features

The characteristic soils in this site are over 60 inches deep and well drained.

They formed in alluvium and sandy beach materials derived mainly from sedimentary, basic intermediate igneous and granitic parent materials. The surface horizon is loamy sand textures and 4 inches thick. About 5 percent of the soil surface is covered by rock fragments. The volume of rock fragments in the soil profile is 0 to 19 percent.

The soil has moderately coarse and sandy textures throughout the profile. Generally these soils have root-restricting layer between 20 and 40 inches. The layer is in the form of weak cementation of a high percentage of rock fragments. The available water capacity is 3.7 to 7.3 inches. Permeability is moderate to moderately rapid. Runoff is slow and the hazard of water erosion is slight. The hazard of soil blowing is severe.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone (2) Lacustrine deposits–quartzite
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam (3) Sandy loam
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	152 cm
Surface fragment cover ≤3"	0–8%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	9.4–18.54 cm

Calcium carbonate equivalent (0-101.6cm)	0–40%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–19%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

As ecological condition deteriorates due to overgrazing, Indian ricegrass, needleandthread, fourwing saltbush, and winterfat decrease, while Wyoming big sagebrush, low rabbitbrush and broom snakeweed increase.

When the potential natural plant community is burned, Wyoming big sagebrush, Indian ricegrass, and needleandthread decrease while low rabbitbrush increases.

Cheatgrass and annual forbs are most likely to invade this site.

More data needs to be collected and analyzed to refine site dynamics.

State and transition model

Semidesert Sandy Loam (Wyoming Big Sagebrush)

See attached descriptions

9/27/2016

R028AA226UT

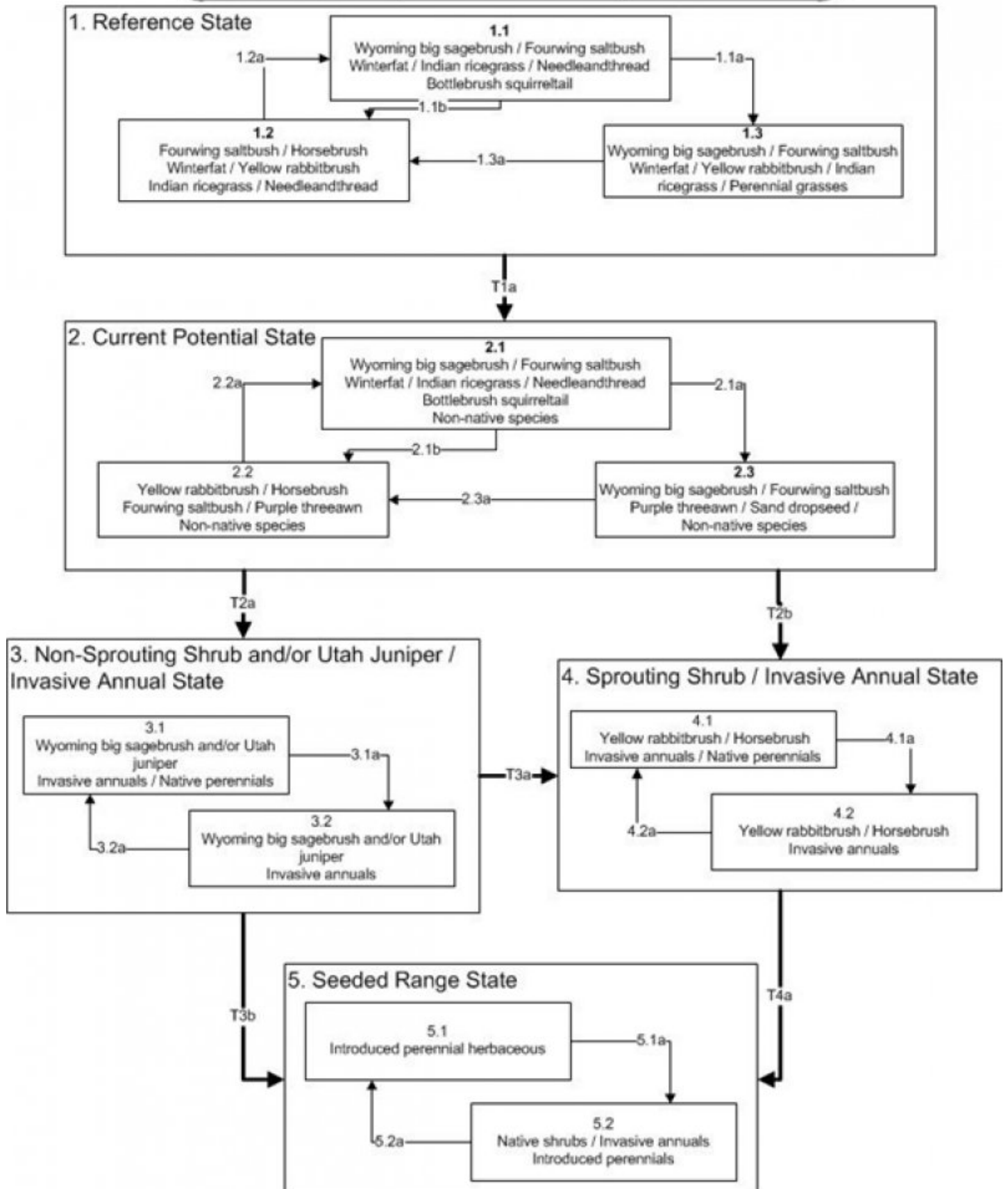


Figure 6. STM R028AA226UT

State 1

Reference State

The reference state has three community phases that are influenced by drought, fire or other disturbances. Fire typically favors resprouting shrubs like horsebrush and grasses. Drought typically decreases grasses in the understory and insect damage can reduce shrub cover.

Community 1.1

Wyoming big sagebrush/fourwing salt bush/winterfat/Indian ricegrass/needle and thread/squirreltail

The dominant aspect of this plant community is Wyoming big sagebrush. Fourwing saltbush and winterfat are also commonly present. Indian ricegrass and needleandthread are the principle perennial grasses. Western wheatgrass and bottlebrush squirreltail are often present. Abundant forbs include longleaf phlox and scarlet globemallow. The composition by air-dry weight is approximately 55 percent perennial grasses, 10 percent forbs, and 35 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	278	416	555
Shrub/Vine	177	263	353
Forb	50	76	101
Total	505	755	1009

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-25%
Grass/grasslike foliar cover	15-40%
Forb foliar cover	3-5%
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 (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	–
>0.3 <= 0.6	–	–	35-45%	0-10%
>0.6 <= 1.4	–	20-30%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 8. Plant community growth curve (percent production by month).
UT2261, 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

Fourwing salt bush/horsebrush/Indian ricegrass/needle and thread/squirreltail

Wyoming big sagebrush and shadscale decrease in the community. Fourwing saltbush and winterfat resprout and reestablish following fire. Yellow rabbitbrush and horsebrush species (Nuttall, Smooth and/or Spiny) may increase significantly in the community following fire. 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, needleandthread and other cool season bunchgrasses flourish; western wheatgrass increases in both cover and percent composition. Percent composition by air-dry weight is 60% grass, 10% forbs, and 30% shrubs.

Community 1.3

Wyoming big sagebrush/Fourwing salt bush/Indian ricegrass/perennial grasses

Wyoming big sagebrush and fourwing saltbush increase significantly 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 increased shrub competition and become dense with old vegetation. Western wheatgrass increases. Percent composition by air-dry weight is 40% grass, 10% forbs, and 50% shrubs

Pathway 1.1b

Community 1.1 to 1.2

Recent fire occurrence (1 – 30 years).

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

Plant communities in this site can include native and acclimatized, naturalized and invasive non-native species. This site is irreversibly changed from the reference state because these non-native species will now remain a permanent part of the community.

Community 2.1

Wyoming big sagebrush/Fourwing salt bush/Indian ricegrass/non-native species

This community is dominated by Wyoming big sagebrush. Fourwing saltbush and winterfat are also commonly present. Indian ricegrass and needleandthread are the principle perennial grasses. Western wheatgrass and bottlebrush squirreltail are often present. Abundant forbs include longleaf 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 55% grass, 10% forbs, and 35% shrubs. Natural fire frequency is estimated to be 40 to 50 years.

Community 2.2

Yellow rabbitbrush/Horsebrush/fourwing salt bush/purple threeawn/non-native species

Wyoming big sagebrush and shadscale decrease in the community. Fourwing saltbush and winterfat resprout and reestablish following fire. Yellow rabbitbrush and horsebrush species (Nuttall, Smooth and/or Spiny) may increase significantly in the community following fire. 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, needleandthread and other cool season bunchgrasses flourish; Western wheatgrass increases in both cover and percent composition. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Percent composition by air-dry weight is 60% grass, 10% forbs, and 30% shrubs.

Community 2.3

Wyoming big sagebrush/Fourwing salt bush/purple threeawn/sand dropseed/non-native species

Wyoming big sagebrush and fourwing saltbush increase significantly 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 increased shrub competition and become dense with old vegetation. Western wheatgrass increases. Percent composition by air-dry weight is 40% grass, 10% forbs, and 50% shrubs. Annual grasses and forbs area also present in this community phase.

Pathway 2.1b

Community 2.1 to 2.2

Recent fire occurrence (1 to 30 years).

Pathway 2.1a

Community 2.1 to 2.3

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 to 50 year average for the site. Utah juniper may invade the site if a seed source is available.

Pathway 2.2a

Community 2.2 to 2.1

Fire frequency returns to within the normal range for the site (40 to 50 years).

Pathway 2.3a Community 2.3 to 2.2

Recent fire occurrence (1 to 30 years).

State 3 Non-sprouting Shrub and/or Utah Juniper/Invasive Annual State

Non-native annual grasses dominate the understory with few native bunch grasses remaining in the community. Shrub layer is dominated by Wyoming sagebrush in a greater cover than is seen in state one or two. This state is caused by lack of disturbance in the shrub layer (fire or insects) and removal of bunchgrasses in the understory (typically season long grazing) that are replaced with invasive, non-native annual grasses.

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

Where Utah juniper has invaded the community, it dominates the overstory; Wyoming big sagebrush and other shrubs are reduced in the understory due to shading, moisture competition, and allelopathy; otherwise, Wyoming big sagebrush dominates the shrub layer. Fourwing saltbush and winterfat are dead or decadent. 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. Some soil movement is evident.

Community 3.2 Wyoming big sagebrush/and/or Utah juniper/invasive annuals



Figure 9. Community Phase 3.2



Figure 10. Community Phase 3.2, photo 2

Where Utah juniper has invaded the community it dominates the overstory; Wyoming big sagebrush and other shrubs are reduced significantly due to shading, moisture competition, and allelopathy, otherwise, Wyoming big sagebrush dominates the shrub layer. Fourwing saltbush and Winterfat are largely absent. Remaining perennial herbaceous vegetation is rare and is found only in protected locations under shrubs. Invasive, non-native grasses and weeds including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory. Soil is moving and is accumulating around shrubs. Photo 2 caption: State 3, Community Phase 3.2 – Mixed sagebrush, Utah juniper, rabbitbrush, and cheatgrass. Photo taken by Keith Wadman, 9/18/2006, location: T11S, R6W, S25, NW1/4.

Pathway 3.1a

Community 3.1 to 3.2

Long-term 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 is > 100 years.

Pathway 3.2a

Community 3.2 to 3.1

Site is properly grazed for an extended period of time. Native perennial vegetation is recovering, but annual weeds still dominate the understory. Fire frequency is well beyond normal for the community. Fire frequency is > 100 years.

State 4

Sprouting Shrub/Invasive Annual State

Sprouting shrubs can dominate the shrub layer in this state. The understory is almost entirely comprised of annual non-native species.

Community 4.1

Yellow rabbitbrush/horsebrush/invasive annuals/native perennials

Yellow rabbitbrush dominates the shrub layer. Fourwing saltbush and Winterfat are absent. Horsebrush species (Nuttall, Smooth & Spiny) can also be plentiful if conditions are right. Fire tolerant shrubs persist as dominants with fire periods occurring at intervals of 10 – 30 years or less. Broom snakeweed may be a dominant episodic species when conditions are favorable. Native bunchgrasses are significantly reduced with only a few Purple threeawn and sand dropseed remaining; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory. Bare ground increases and soil movement is evident with mounding around shrubs.

Community 4.2

Yellow rabbitbrush/horsebrush/invasive annuals



Figure 11. Community Phase 4.2, photo 1

Yellow rabbitbrush dominates the shrub layer. Fourwing saltbush and winterfat are absent. Horsebrush species (Nuttall, Smooth & Spiny) can also be plentiful if conditions are right. Fire tolerant shrubs persist as dominants with

fire periods occurring at intervals of 5 – 30 years. Broom snakeweed may be a dominant episodic species when conditions are favorable. Only remnant native bunchgrasses remain; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory. Percent bare ground increases and soil movement is evident with mounding around shrubs. Photo 1 caption: State 4, Community phase 4.2- After an old burn, rabbitbrush, Wyoming sagebrush dominant. Photo taken by Keith Wadman, 9/18/2006, T11A, R6W, S25, NW1/4.

Pathway 4.1a

Community 4.1 to 4.2

Sustained, long-term period of improper grazing (including season long, overstocking, wrong season, etc.) and/or drought reduce perennial fine fuels from the site. Recent fire removes non-sprouting shrubs from the community. Yellow rabbitbrush and horsebrush species may become dominant.

Pathway 4.2a

Community 4.2 to 4.1

Site is properly grazed for an extended period of time. Native perennial vegetation is recovering very slowly. Fire frequency is 10 – 30 years.

State 5

Seeded Range State

This state represents areas that have been seeded with either non-native bunch grasses, like crested wheatgrass (*Agropyron cristatum*) or other bunch grasses. Shrubs are typically low in cover after a seeding but may return after the seeding.

Community 5.1

Introduced perennial herbaceous



Figure 12. Community phase 5.1, photo 1

This community is seeded to rangeland species that may be composed of introduced, native or combinations of these species. Unwanted trees and/or shrubs are reduced, but they may still occupy a portion of the site due to natural regeneration. Invasive annual grasses and weedy forbs, primarily cheatgrass and various annual mustards, may be present in the seeding. Healthy range seedings are typically resistant to the occurrence of wild fire.

Community 5.2

Native shrubs/Invasive annuals/introduced perennials



Figure 13. Community Phase 5.2, photo 1



Figure 14. Community Phase 5.2, photo 2

This community is present after either a failed seeding or a heavily overgrazed one. Site may be herbaceous or may be returning to shrubs and/or Utah juniper. The state is primarily composed of invasive annual grasses and weedy forb species, mostly cheatgrass and various annual mustards. Broom snakeweed may be an episodic dominant species when conditions are favorable. Photo 2 caption: Broom snakeweed, crested wheatgrass, cheatgrass. Location T16S, R4W, S3, SE1/4. Photo taken by Keith Wadman, 9/8/2006.

**Pathway 5.1a
Community 5.1 to 5.2**



Introduced perennial herbaceous



Native shrubs/Invasive annuals/introduced perennials

Seeding is in poor condition; and is being improperly grazed (including season long, overstocking, wrong season, etc.); and/or drought has reduced any perennial grasses established. Highly combustible fine fuels from invasive annuals shorten the fire frequency.

**Pathway 5.2a
Community 5.2 to 5.1**



Native shrubs/Invasive annuals/introduced perennials



Introduced perennial herbaceous

Site receives excellent grazing management for a long period of time. Highly combustible fine fuels from invasive annuals may continue to dominate the community resulting in a shortened fire frequency. Seeded perennial vegetation slowly recovers.

Transition T1a State 1 to 2

Long-term improper grazing (including, season long overstocking, wrong season, etc.) and/or prolonged drought that removes fine fuels from the site lessening the potential for fire to occur. This allows both sprouting and non-sprouting shrubs such as Wyoming big sagebrush, Fourwing saltbush, Winterfat and Yellow rabbitbrush to increase. Shrubs may become decadent due to age. Indian ricegrass and other perennial bunchgrasses lose vigor and decrease in the community due to shrub competition and grazing pressure. Purple threeawn and Sand dropseed may increase. Utah juniper seedlings and saplings may begin to invade the community if a seed source is available. 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. Prior to crossing the threshold, if the site is properly grazed over an extended period of time, native perennial vegetation may recover. Fire frequency can return to within normal range for the site. These events could set the site back into the normal range of variability.

Transition T2a State 2 to 3

Sustained, long-term period of improper grazing (including season long, overstocking, wrong season, etc.); and/or prolonged drought; reduced fine fuels resulting in the continued lengthening of fire period and a dense shrub and/or tree overstory, significant reduction of native perennial vegetation and an increase in invading annuals. Utah junipers may increase to occupy a significant portion of the overstory, if a seed source is present. Wyoming big sagebrush dominates the shrub layer and may be decadent due to age. Indian ricegrass and other perennial bunchgrasses are significantly reduced due to increased shrub competition and/or heavy grazing pressure. Purple threeawn and sand dropseed may increase. The threshold is crossed when invasive annuals such as cheatgrass and annual mustards dominate the understory. The occurrence of fire extends well beyond the normal period for this site.

Transition T2b State 2 to 4

Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows site to be dominated by sprouting shrubs including Yellow rabbitbrush and horsebrush species. Indian ricegrass and other perennial bunchgrass species are significantly reduced due to increased shrub competition and/or heavy grazing pressure. Purple threeawn and sand dropseed may increase. Highly combustible fine fuels from invasive annuals dominate the community. Fire frequency is typically 10 – 30 years.

Transition T3a State 3 to 4

Long-term improper grazing (including season long, overstocking, wrong season, etc.) and/or prolonged drought; shortened fire frequency allows site to be dominated by sprouting shrubs including Yellow rabbitbrush and horsebrush species; significant reduction of perennial bunchgrass species. Highly combustible fine fuels from invasive annuals dominate the community resulting in a shortened fire frequency. Fire frequency is typically 10 – 30 years.

Transition T3b
State 3 to 5

Mechanical chaining of Utah juniper where present and/or mechanical or chemical treatment of unwanted shrub species. Range seeding of native, introduced or combination of rangeland species.

Transition T4a
State 4 to 5

Mechanical, fire and/or chemical treatment removes undesirable shrubs; with range seeding of introduced, native or combination rangeland species.

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	Primary Shrubs			141–275	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	39–78	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	39–78	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	39–78	–
	yellow rabbitbrush	CHV18	<i>Chrysothamnus viscidiflorus</i>	24–39	–
3	Secondary Shrubs			39–78	
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	8–24	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	8–24	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	8–24	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	8–24	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	8–24	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	8–24	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	8–24	–
Grass/Grasslike					
0	Primary Grasses			306–471	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	157–235	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	78–118	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	24–39	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	24–39	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	24–39	–
1	Secondary Grasses			24–39	
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	8–24	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	8–24	–
Forb					
2	Forbs			39–78	
	Holboell's rockcress	ARHO2	<i>Arabis holboellii</i>	8–24	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	8–24	–
	twolobe larkspur	DENU2	<i>Delphinium nuttallianum</i>	8–24	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	8–24	–
	thorn skeletonweed	PLSP7	<i>Pleiocanthus spinosus</i>	8–24	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	8–24	–
	Pacific aster	SYCHC	<i>Symphotrichum chilense var. chilense</i>	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 horseback riding.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T6N R18W S17
General legal description	Box Elder County, Utah, Pilot Mountains, East Foot Slopes SW ¼ SW ¼ Section 17, Township 6N, Range 18W

Contributors

David J. Somorville
DJS
Sarah Quistberg
Burk Rydalch

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)	Jack Alexander, Range Specialist, Synergy Resource Solutions, Inc. Julia Kluck, Soil Scientist, Synergy Resource Solutions, Inc. Shane Green, State Range Specialist, Utah NRCS
Contact for lead author	Shane Green, Shane.Green@ut.usda.gov
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 do not form.

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.
-

3. **Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1-3") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-3") 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.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 30-50% 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.
-

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

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.
-

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.
-

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).
-

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 (Okrist LS Thick Surface, soil survey area: 601, West Box Elder). This site has 7 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 8 inches deep. Structure is typically weak medium platy. Color is typically yellowish brown (10YR 5/4), dark brown (10YR 4/3) moist.

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.
-

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. Durinodic features (weakly cemented to indurated nodules with a diameter of 1 cm or more) may be present at 19 to 30".
-

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: Indian ricegrass > needle and thread

Sub-dominant: Wyoming big sagebrush, fourwing saltbush, winterfat

Other: The perennial grass/non-sprouting shrub functioning group is expected on this site.

Additional: In the northern portion of the MLRA cool-season perennial grasses (Indian ricegrass, needle and thread) dominate. In the southernmost portion of the MLRA warm-season perennial grasses (galleta, sand dropseed) dominate. The two groups share dominance in the middle portion of the MLRA.

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.

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 mortality of bunchgrass and other shrubs may occur during very severe (long-term) droughts. There may be partial mortality of individual bunchgrasses and shrubs during less severe drought. Long-lived species dominate site. Open spaces from disturbance are quickly filled by new plants through seedlings and reproductive reproduction (tillering).
-

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%.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 675#/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.
-

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 and annual forbs
-

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.
-