

Ecological site R028AY006UT Loamy Bottom (Great Basin Wildrye)

Accessed: 05/06/2024

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.

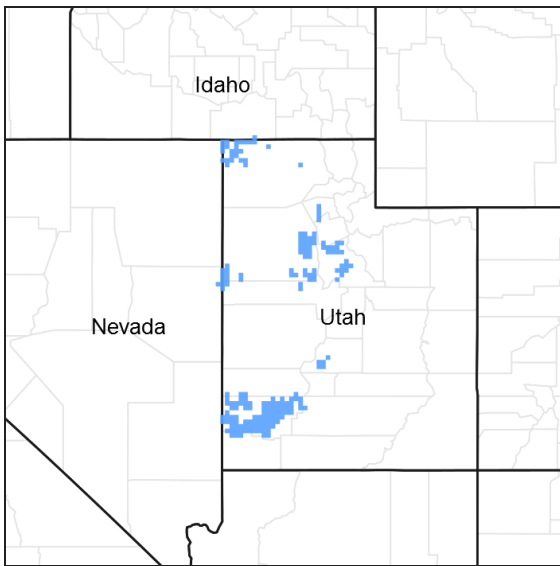


Figure 1. Mapped extent

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

Site concept: The loamy bottom (basin wildrye) ecological site is a run-in site found in the semidesert and upland precipitation zones of the northeastern Great Basin. It developed in a continental climate receiving 10-14 inches of mostly cool-season precipitation annually. The site occurs in the watershed in areas that receive extra water and fine sediment from surrounding uplands. Consequently, the soils are deep, loamy mollisols with high water-holding capacity and a seasonally-heightened water table from March to June. Buried surface horizons and very little rock characterize the soil profile. The soil moisture regime is xeric and the soil temperature regime is mesic. The historic climax plant community is dominated by basin wildrye (*Leymus cinereus*), basin big sagebrush (*Artemisia tridentata* spp. *tridentata*), western wheatgrass (*Pascopyrum smithii*) and rubber rabbitbrush (*Ericameria nauseosa*).

Classification relationships

Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions, Potential Natural Vegetation Group: Sagebrush-Warm (Basin Big Sagebrush) Without Trees. PNVG Code: BSAG1

Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions, Potential Natural Vegetation Group: Potential Natural Vegetation Group: Basin Big Sagebrush with Trees. PNVG Code: BSAG2

Western Intermountain Sagebrush Steppe (West 1983)

Associated sites

R028AY215UT	Semidesert Gravelly Loam (Wyoming Big Sagebrush) North
R028AY220UT	Semidesert Loam (Wyoming Big Sagebrush)
R028AY307UT	Upland Gravelly Loam (Wyoming Big Sagebrush)

Similar sites

R028AY090NV	LOAMY BOTTOM 10-14 P.Z.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata</i> ssp. <i>tridentata</i> (2) <i>Ericameria nauseosa</i>
Herbaceous	(1) <i>Leymus cinereus</i> (2) <i>Pascopyrum smithii</i>

Physiographic features

This site receives extra water from surrounding uplands and is often associated with stream terraces, drainage ways, flood plains and alluvial fans. It is found on gently-sloping, low-lying areas at elevations between 4,500 and 6,200 feet. The water table is usually several feet below the soil surface, though raised water tables and brief flooding may occur from March to June. This site extends throughout both the semidesert and upland precipitation zones.

Table 2. Representative physiographic features

Landforms	(1) Flood-plain step (2) Stream terrace (3) Alluvial flat
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	1,295–2,103 m
Slope	0–5%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by warm, dry summers and cold, wet winters and springs. May is the wettest month and July and August are typically the driest. Much of the moisture required for plant growth enters this site as groundwater or runoff from surrounding uplands. Summer thunderstorms tend not to be a reliable source of moisture to support the vegetation of this site.

Table 3. Representative climatic features

Frost-free period (average)	125 days
Freeze-free period (average)	156 days
Precipitation total (average)	356 mm

Influencing water features

This site is found in low-lying areas and is often adjacent to ephemeral streams.

Soil features

The soils of this site formed in alluvium derived from sandstone, limestone or quartzite. These are deep, loamy soils with very little rock on the surface or throughout the profile. A mollic epipedon is typically present (though not always) and is 20 to 40 inches thick. Sometimes there is a buried surface layer at depths up to 60 inches. Available water holding capacity is high, ranging from 5.5 to 7.3 inches of water in the upper 40 inches of soil. These soils are well-drained with moderately slow to moderate permeability. Calcium carbonate is usually less than 15 percent, but can be as high as 30 percent. Soil pH typically ranges from 7.4 to 9.0. The soil moisture regime is xeric and the soil temperature regime is mesic.

Soils Associated with Site R028AA006UT:

Soil Survey Area Soil Components (Map units in parentheses)

Camp Williams (UT605) Red Rock (8016);

Box Elder County, Western Part (UT601) Birdow (8); Koosharem (44);

Tooele Area (UT611) Birdow (6);

Utah County (UT621) Redola (RdA, ReC)

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone
Surface texture	(1) Silt loam (2) Loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	152 cm
Surface fragment cover <=3"	0–8%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	14.99–18.03 cm
Calcium carbonate equivalent (0-101.6cm)	0–30%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0

Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

Historic vegetation on this site was dominated by tall (7ft) cool season grasses, which are adapted to occasional high water tables. Other significant vegetation includes a variety of forbs and shrubs.

The dominant aspect of this site was grasses. The composition and production will vary naturally due to location (north to south of the MLRA), fluctuating precipitation, and fire return interval.

Due to the abundant forage, thermal cover, and often close proximity to water sources, this site has a high probability of receiving grazing pressures from domestic and wildlife grazers as well as having received historical grazing pressure.

Great basin wildrye is sensitive to spring grazing and clipping and frequent herbage removal during the growing season (Perry and Chapman 1976). Thus, under repetitive harvesting, Great basin wildrye can be “grazed out” of the system. As ecological condition deteriorates due to improper grazing, cool season grasses Great basin wildrye and Nevada bluegrass decrease in frequency and production. The ungrazed plants or grazing tolerant plants such as Basin big sagebrush, rabbitbrush and other will increase in frequency and production. This increase combined with the declining perennial grasses can lead to a site dominated by sagebrush and rabbitbrush with little to no understory. The area without an understory of perennial grasses and forbs has little value as a functioning ecosystem.

As a result of the grass dominated system, this site had lots of root mass and vegetation production which creates and maintains an organic layer and a mollic epipedon. If the perennial grasses are removed from the system, it is typical to see a decrease in organic matter and accelerated erosion.

Great Basin wildrye is also susceptible to Black grass bugs. Black grass bugs populations will invade a site, and can destroy most of the living grasses.

The fire regime for this site is similar to the surrounding sagebrush lands. The intensity of a fire determines the vegetation succession and structure. Low intensity or ground fires typically result in the removal of litter and decadent grasses while maintaining the nominal shrub cover, while higher intensity fires will remove the shrub species. After normal to high intensity fires, basin big sagebrush decreases while rubber rabbitbrush increases. If the fire regime is suppressed, this site may be invaded by Junipers.

Because of the position on the landscape, this site is typically one of the first to be invaded. Junipers will start to creep down into the sagebrush lands by using this site as a corridor. The fire transition stages are relatively short lived and tend to be mosaic in nature.

If halogeton, russian thistle, cheatgrass or other strongly invasive species invade the site concurrent to the area being stressed though disturbances or drought they are likely to invade and dominate this site.

When more information is available, this section will include a discussion of seral stages; fire influence and effects; effects of prolonged wet or dry periods; resistance to change; the influence of such things as grazing, rodent concentrations, insects, diseases, introduced species, and soil erosion or deposition; other stable vegetative states associated with this site as a result of extreme disturbance.

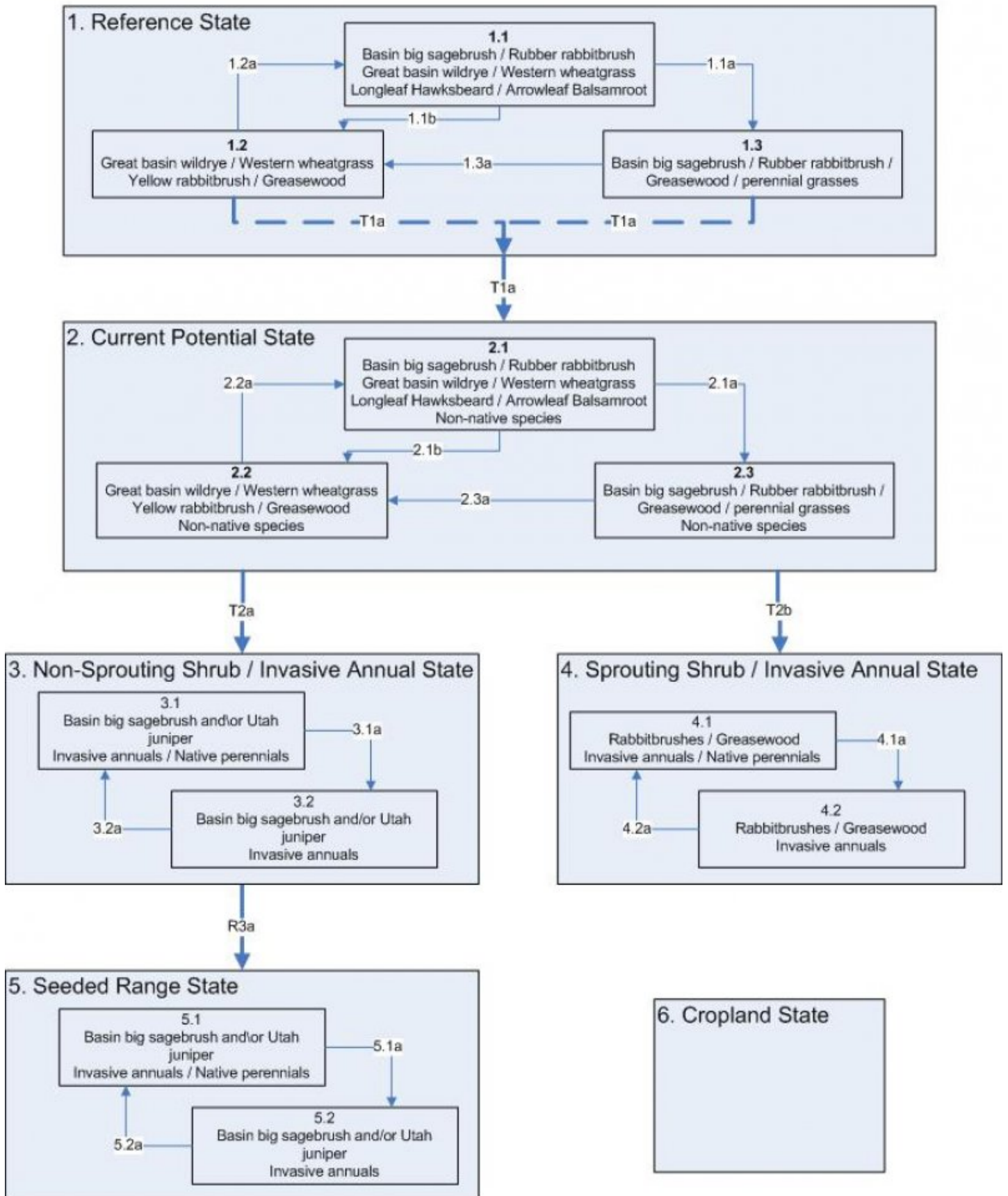
State and transition model

Loamy Bottom (Great Basin Wildrye)

See attached descriptions

9/27/2010

R028AY006UT



State 1
Reference State

Community 1.1
Plant Community A

This community is dominated by Great basin wildrye. Basin big sagebrush is the major shrub. Other significant herbaceous species in the plant community include Western wheatgrass, Nevada bluegrass, Longleaf hawksbeard and Arrowleaf balsamroot. Rubber rabbitbrush and Black greasewood are other important shrubs. Percent composition by air-dry weight is 70% grass, 10% forbs, and 20% shrubs. Natural fire frequency is estimated to be 40 to 50 years.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	706	1177	2040
Shrub/Vine	202	336	583
Forb	101	168	291
Total	1009	1681	2914

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	25-50%
Forb foliar cover	2-10%
Non-vascular plants	0%
Biological crusts	0-1%
Litter	3-9%
Surface fragments >0.25" and <=3"	0-1%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	5-14%

Figure 5. Plant community growth curve (percent production by month).
 UT0061, Reference State. High similarity index.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	25	50	10	0	0	5	5	0	0

Community 1.2
Plant Community B

Basin big sagebrush decreases in the community; Rubber rabbitbrush also decreases, but to a lesser degree. Yellow rabbitbrush, Black greasewood and, at times, horsebrush species resprout and increase in the community; much of the excess fine fuel accumulation is removed. Basin wildrye and other cool season bunchgrasses recover following fire and flourish, Western wheatgrass increases. Fire tolerant shrubs may persist as dominants in the shrub community for 30 years or longer.

Community 1.3

Plant Community C

Basin big sagebrush, Rubber rabbitbrush and Black greasewood increase in percent composition. Shrubs show signs of decadence due to age. Great basin wildrye and other cool season bunchgrasses begin losing vigor due to increased shrub competition and increase in old vegetation. Percent composition by air-dry weight is 40% grass, 10% forbs, and 50% shrubs.

Pathway 1.1b Community 1.1 to 1.2

Disturbance: Recent fire occurrence (1 – 30 years).

Pathway 1.2a Community 1.2 to 1.1

40-50 years or more without a fire occurrence (normal fire frequency).

State 2 Current Potential State

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.

Community 2.1 Plant Community A

This community is dominated by Great basin wildrye. Basin big sagebrush is the major shrub. Other significant herbaceous species in the plant community include Western wheatgrass, Nevada bluegrass, Longleaf hawksbeard and Arrowleaf balsamroot. Rubber rabbitbrush and Black greasewood are other important shrubs. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species. Percent composition by air-dry weight is 70% grass, 10% forbs, and 20% shrubs.

Community 2.2 Plant Community B

Basin big sagebrush decreases in the community; Rubber rabbitbrush also decreases, but to a lesser degree. Yellow rabbitbrush, Black greasewood and, at times, horsebrush species resprout and increase in the community; much of the excess fine fuel accumulation is removed. Basin wildrye and other cool season bunchgrasses recover following fire and flourish, Western wheatgrass increases. Fire tolerant shrubs may persist as dominants in the shrub community for 30 years or longer. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species.

Community 2.3 Plant Community C

Basin big sagebrush, Rubber rabbitbrush and Black greasewood increase in percent composition. Shrubs show signs of decadence due to age. Great basin wildrye and other cool season bunchgrasses begin losing vigor due to increased shrub competition and increase in old vegetation. Percent composition by air-dry weight is 40% grass, 10% forbs, and 50% shrubs. This community is dominated by native species, but may include acclimatized, naturalized and invasive non-native species.

Pathway 2.1b Community 2.1 to 2.2

Recent fire occurrence (1 – 30 years).

Pathway 2.2a

Community 2.2 to 2.1

40-50 years or more without a fire occurrence (normal fire frequency).

State 3

Utah Juniper, Brush with Annual Weeds State

Community 3.1

Plant Community A

Where Utah juniper has invaded, Basin big sagebrush, Rubber rabbitbrush and Black greasewood may decrease, otherwise they dominate the community; Yellow rabbitbrush often increases. 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.

Community 3.2

Plant Community B

Where Utah juniper has invaded, Basin big sagebrush, Rubber rabbitbrush, and Black greasewood decrease, otherwise they may dominate the community; Yellow rabbitbrush often increases. Remaining perennial herbaceous vegetation is rare and is found only in protected locations under shrubs. Invasive, non-native grasses and weeds, including cheat grass, annual mustards, redstem storksbill, etc., dominate the understory.

Pathway 3.1a

Community 3.1 to 3.2

Disturbance: Long-term improper grazing (including, season long, overstocking, wrong season, etc.) and/or drought reduce perennial grasses. Fine fuels are reduced 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 over an extended period of time. Native perennial vegetation slowly recovers; annual weeds dominate the understory. Fire frequency remains well beyond normal for the site. Fire frequency is > 100 years.

State 4

Sprouting Shrub with Annual Weeds State

Community 4.1

Plant Community A

Yellow rabbitbrush, Black greasewood and Smooth horsebrush resprout and dominate the shrub layer. Rubber rabbitbrush can be plentiful if conditions are right. Fire tolerant shrubs may persist as dominants with fire periods of 10 to 30 years. Broom snakeweed may be an episodic dominant species when conditions are favorable. Native bunchgrasses are significantly reduced; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory.

Community 4.2

Plant Community B

Yellow rabbitbrush, Black greasewood and Smooth horsebrush dominate the overstory community. Rubber rabbitbrush can be plentiful if conditions are right. Fire tolerant shrubs may persist as dominants in this community with fire periods of 10 to 30 years. Broom snakeweed may be an episodic dominant species when conditions are favorable. Only remnant native bunchgrasses remain; invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory.

Pathway 4.1a

Community 4.1 to 4.2

Disturbance: Long-term, improper grazing (including, season long, overstocking, wrong season, etc.) and/or drought reduce perennial grasses. Highly combustible fine fuels from invasive annuals dominate the community resulting in a shortened fire frequency. Fire frequency is typically 10 – 30 years.

Pathway 4.2a

Community 4.2 to 4.1

Site is properly grazed for an extended period of time. Perennial vegetation very slowly recovers. Fire frequency is typically 10 – 30 years.

State 5

Seeded Rangeland State

Community 5.1

Plant Community A

Rangeland seeding that may be composed of introduced, native or combination grass and/or forb species. Unwanted trees and/or shrubs are reduced but may occupy a portion of the site because of natural regeneration. Invasive annual grasses and weedy forb species, primarily cheatgrass and various annual mustards, may be present in the seeding. Seeding, when healthy, is resistant to fire.

Community 5.2

Plant Community B

This state is present after either a failed seeding or an improperly grazed one. Site may be herbaceous or may be returning to trees and/or shrubs. The state is primarily composed of invasive annual grasses and weedy forb species. Broom snakeweed may be an episodic dominant species in this community when conditions are favorable.

Pathway 5.1a

Community 5.1 to 5.2

Disturbance: Long-term improper grazing (including, season long, overstocking, wrong season, etc.) and/or drought reduce perennial grasses. Fine fuels are reduced lessening the potential for fire to occur. Fire frequency is > 100 years.

Transition T1a

State 1 to 2

Improper grazing (i.e. season long, overstocking, wrong season, etc.) and/or drought that remove fine fuels from the site lessening the potential for fire to occur. This allows both sprouting and non-sprouting shrubs such as Basin big sagebrush, Rubber rabbitbrush and Black greasewood to increase in the community. Shrubs may become decadent due to age. Great basin wildrye and other native bunchgrasses lose vigor and decrease in the community due to shrub competition and grazing pressure; Western wheatgrass 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 on the site. Prior to crossing the threshold, if this site is properly grazed over an extended period of time native perennial vegetation may recover. Fire frequency can return to within the normal range for the site. These events could set the site back into the normal range of variability.

Transition T2a

State 2 to 3

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

lengthened fire return interval resulting in a dense non-sprouting tree and/or shrub overstory, reduction of native perennial understory vegetation and increasing invading annuals. Utah junipers may increase to occupy a significant portion of the overstory, if a seed source is present. Basin big sagebrush dominates the shrub layer and may be decadent due to age. Rubber rabbitbrush and Greasewood may also be present. Great basin wildrye and other native bunchgrasses are significantly reduced due to increased shrub competition and heavy grazing pressure; Western wheatgrass may increase. The threshold is crossed when invasive annuals including cheatgrass, annual mustards, redstem storksbill, etc. dominate the understory. The occurrence of fire extends well beyond the normal period for the site.

Transition T2b

State 2 to 4

Disturbance: Sustained, 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, Black greasewood and Smooth horsebrush; significant reduction of perennial bunchgrass species. There is an invasion of annual grasses and weedy forb species primarily cheatgrass and various annual mustards.

Restoration pathway R3a

State 3 to 5

Disturbance: Mechanical chaining of Utah juniper where present, and/or mechanical or chemical treatment of unwanted brush species; with seeding of introduced, native or combination rangeland species.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Primary Shrubs			143–269	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	90–179	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	54–90	–
3	Secondary Shrubs			18–36	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–36	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	18–36	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	0–36	–
	Woods' rose	ROWO	<i>Rosa woodsii</i>	0–36	–
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–36	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	0–36	–
Grass/Grasslike					
0	Primary Grasses			950–1255	
	basin wildrye	LECI4	<i>Leymus cinereus</i>	807–986	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	90–179	–
1	Secondary Grasses			90–179	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	18–54	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	18–54	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	18–54	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	18–54	–
Forb					
2	Forbs			90–179	
	skeletonleaf bur ragweed	AMTO3	<i>Ambrosia tomentosa</i>	18–36	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	18–36	–
	arrowleaf balsamroot	BASA3	<i>Balsamorhiza sagittata</i>	18–36	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	18–36	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	18–36	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	18–36	–

Animal community

Livestock:

This site has good forage for cattle and horses, but may be less suited for sheep grazing. Basin wildrye is most palatable in the spring and may not be utilized at all during the winter months by livestock. (Dittberner)

Wildlife:

This site provides visual and thermal cover for wildlife species, particularly game birds, non-game birds, and small mammals. Mule deer, elk and pronghorn antelope may also bed beneath the Basin wildrye growth.

Reference State and Current Potential State: The abundant palatable forage and proximity to water make this state important for grazers and mixed feeders such as elk, deer, and antelope. The site also provides suitable thermal and escape cover for these animals. This plant community may provide brood rearing/foraging habitat for upland game birds. In good condition this site provides plentiful food, and cover for wildlife. Other wildlife using this site include cottontail rabbits; coyote; gold eagle; ravens and mule deer. This is a short list of the more common species found. Many other species are present as well as migratory birds are present at certain times of the year.

Seeded Range State: The seeded range site's ability to provide wildlife habitat is dependent on the seed mix and mechanical treatments chosen by the manager. If the site is planted to a monoculture of a grass species, then wildlife use will be diminished. The above mentioned grazers will use the grasses species, but the use will be more seasonal than if the area supported a diverse mix of species. And the lack of escape or thermal cover will also limit the amount of time the site is utilized for foraging or loafing. But if a diverse seed mix that is reflective of the reference state is established, wildlife use will be similar to the Reference State.

Annual Grass Invasion: This site has very limited wildlife habitat potential. Annual grasses such as cheatgrass green up for only a short time in the spring and then again in the late fall. This creates a long period of poor quality forage at the site. Also the thermal and escape cover is gone, thus creating a harsh environment that will receive very little use by the species expected in the reference state. In these disturbed states, wildlife that prefer less ground cover will dominant. Typically these are more generalist birds such as the lark sparrow, raven, and starlings. Other wildlife using this site includes cottontail rabbits; coyote; and mule deer. This is a short list of the more common species found. Many other species are present as well as migratory birds are present at certain times of the year.

Hydrological functions

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

Recreational uses

This site has values for natural beauty. It attracts many kinds of wildlife for viewing and can have a diversity of flowering plants. Other recreation opportunities include hiking, picnicing, horseback riding and hunting. Roads are often built on or near this site, allowing easy access which may result in overuse and degradation of the site.

Wood products

None

Type locality

Location 1: Box Elder County, UT	
General legal description	SW1/4 of NW1/4 Section 1

Other references

Herrick, J.E., W.G. Whitford, A.G. de Soyza, J.W. Van Zee, K.M. Havstad, C.A. Seybold, and M. Walton. 2001. Soil aggregate stability kit for field-based soil quality and rangeland health evaluations. *Catena* 44:27-35

Perry, L.J. and S.R. Chapman. 1975 Effect of clipping on dry matter yields and survival of Great basin wildrye. *J. Range Management*. 28:271-274

U.S. Department of Agriculture, Forest Service, Rock Mountain Research Station, Fire Sciences Laboratory (2002, December). Fire Effects Information System, [Online]. Available: <http://www.fs.fed.us/database/feis/> (05/31/05)

Dittberner, Phillip L.; Olson, Michael R. 1983. The plant information network (PIN) data base: Colorado, Montana, North Dakota, Utah, and Wyoming. FWS/OBS-83/86. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 786 p. [806]

Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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

Indicators

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

- 2. Presence of water flow patterns:** Few originating on this site. Flow patterns meander around rocks, litter, and perennial plant bases. They may be long (10-20'), but remain less than 1' wide, and are widely spaced (5-15' apart). They are stable with only minor evidence of deposition. This site is periodically inundated with runoff water due to its physiographic location.

- 3. Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (3-6") 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.

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10 – 20% 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:** Gullies may be present, but are rare. They would usually be expected in the lowest part of the site where water flows concentrate and/or in locations where there are concentrated flows into the site from an adjacent site or watershed. Gullies may show signs of active erosion along steep side walls but the bottoms would be mostly stabilized with perennial vegetation. Additional erosion is to be expected where concentrated flow patterns enter the site from adjacent steep slopes or drainages.

6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are very rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust.

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):** This site should have an soil stability rating of 5 or 6 under plant canopies and interspaces using the soil stability kit test.

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 (Birdow SiL, soil survey area: 601, West Box Elder). This site has 3 correlated soils, resulting in variation of each of these attributes. Unless working on a location with the modal soil, it is critical to supplement this description with the soil-specific information from the published soil survey.

Soil surface horizon is typically 20 to 41 inches deep. Structure is typically weak medium subangular blocky. Color is typically brown (10YR 5/3), very dark grayish brown (10YR 3/2) moist. Mollic epipedon is common.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants and any 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. With the physiographic location of the site being in stream terraces, alluvial flats, drainage ways, and flood plains this site is one of the terminal accumulation sites for runoff water. As such, infiltration is naturally facilitated. Natural erosion would be expected in severe thunder storms or heavy spring runoff. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

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 and should not be considered as compaction layers.

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: perennial bunchgrasses, tall cool season (basin wildrye)

Sub-dominant: perennial rhizomatous grasses (western wheatgrass) > non sprouting shrubs (basin big sagebrush)

Other: shrubs > forbs > other grasses

Additional: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. tall wheatgrass may substitute for tall 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).
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14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 25-30% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1500#/acre.
Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Halogeton, russian thistle, cheatgrass
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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
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