

Ecological site R028AY325UT **Upland Shallow Loam (Black Sagebrush)**

Accessed: 05/16/2024

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.

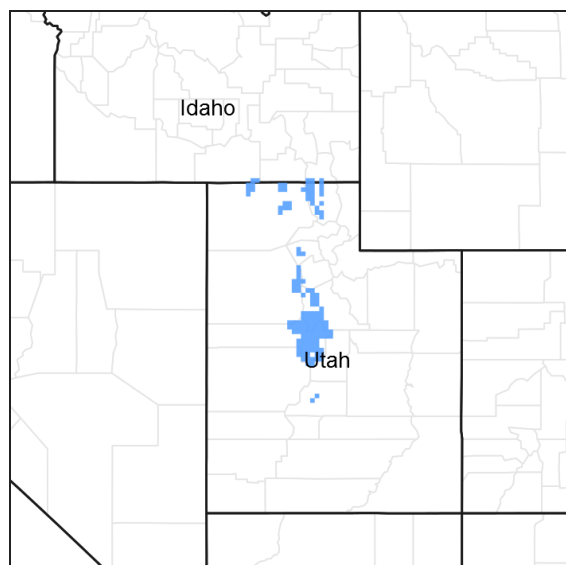


Figure 1. Mapped extent

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-D28A, Great Salt Lake Area, occurs in the eastern portion of the Basin and Range Ecological Province. This area is composed of nearly level basins located between widely separated mountain ranges that run mostly north and south. Basin edges are often bordered by gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes.

Associated sites

R028AY324UT	Upland Shallow Loam (Utah Juniper - Singleleaf Pinyon)
R028AY334UT	Upland Stony Loam (Wyoming Big Sagebrush)
R028AY338UT	Upland Stony Loam (Pinyon-Utah Juniper)

Similar sites

R028AY320UT	Upland Shallow Hardpan (Pinyon-Utah Juniper)
R028AY324UT	Upland Shallow Loam (Utah Juniper - Singleleaf Pinyon)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia nova</i> (2) <i>Atriplex confertifolia</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i> (2) <i>Poa nevadensis</i>

Physiographic features

This site occurs primarily on hills, mountain slopes, alluvial fans, lake terraces and escarpments at elevations between 4,600 to 7,900 feet. The site is found on slopes ranging from 3 to 70%, occurs on all aspects and typically produces medium to very high amounts of runoff.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,402–2,408 m
Slope	3–70%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by cold, snowy winters and warm dry summers. The average annual precipitation is mostly 12 to 18 inches, but in a few instances is as high as 20 inches on south and west exposures. July and August are commonly the driest months for precipitation. Annual distribution varies from 20 to 45 percent during the plant growth period, May to October. However, this is often not very effective in influencing plant growth since it comes as small intermittent showers which do not wet the soil very deep or as intense cloud bursts where considerable runoff occurs. The effective moisture for plant growth is the 55 to 80 percent that falls during the winter plant dormant period.

Mean Annual Air Temperature: 41-52

Mean Annual Soil Temperature: 44-46

Table 3. Representative climatic features

Frost-free period (average)	162 days
Freeze-free period (average)	194 days
Precipitation total (average)	457 mm

Influencing water features

There are no influencing water features on this ecological site.

Soil features

The characteristic soils in this site are 10 to 20 inches deep over bedrock and well drained. They formed in colluvium, alluvium and residuum. Parent materials are of mixed origin with sandstone, limestone, quartzite and igneous rock found most often. The surface texture is normally a loam or fine sandy loam. Sixty to 80 percent of the soil surface is covered by rock fragments. The volume of rock fragments in the soil profile is 35 to 60 percent. The soils are calcareous throughout the profile. The available water capacity is 1 to 2 inches. The permeability is

moderate and runoff is rapid. The hazard of water erosion is moderate.

The water supplying capacity is 2 to 4 inches. Natural geologic erosion in potential is approximately 2 tons/acre/year.

Soil Survey Areas:

UT601- Box Elder County - Western Part: Reebok.

UT603 - Cache Valley Area: Blackrock.

UT608 - Fairfield, Nephi Area: Lodar, Pibler, Reebok, Reywat, Saxby, Shabliss.

UT611 - Tooele Area: Reywat.

UT628 - Sevier County Area: Reebok, Saxby.

UT649 - Fishlake National Forest: Lodar, Reywat, Saxby.

UT651 - Fishlake National Forest: Lodar, Reywat, Saxby.

Table 4. Representative soil features

Parent material	(1) Colluvium–limestone and sandstone (2) Alluvium–quartzite
Surface texture	(1) Loam (2) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate
Soil depth	25–51 cm
Surface fragment cover ≤3"	0–27%
Surface fragment cover >3"	8–36%
Available water capacity (0–101.6cm)	2.79–5.84 cm
Calcium carbonate equivalent (0–101.6cm)	0–20%
Electrical conductivity (0–101.6cm)	0–4 mmhos/cm
Soil reaction (1:1 water) (0–101.6cm)	6.6–9
Subsurface fragment volume ≤3" (Depth not specified)	2–35%
Subsurface fragment volume >3" (Depth not specified)	8–35%

Ecological dynamics

This site is found in the Great Salt Lake Area of the Basin and Range Ecological Province. It developed under the natural ecological conditions found there, including the normal influences of native wildlife herbivory, fire and climate. This site's plant species composition is typically dominated by shrubs including black sagebrush, smooth and spiny horsebrush and shadscale. Important perennial grasses include bluebunch wheatgrass and Nevada bluegrass.

This ecological site has been grazed by domestic livestock since they were first introduced into the area in the late 1800's. This introduction of livestock, mainly cattle and sheep, including the use of fencing to control those stock, and the development of reliable water sources, has in places altered the historic disturbance regimes associated with this ecological site. Improper livestock grazing that includes season long grazing and/or heavy stocking rates over long periods of time, will likely cause this site to depart from the reference plant community.

Periodic fire naturally occurred on this site with a burn period estimated at 60 to 80 years. Disturbances such as improper grazing, poorly designed brush treatments and OHV misuse can put this site at risk of entering a shorter burn cycle by allowing invasive annuals to enter the system. These annuals can produce flashy fuel loads which easily burn. Cheatgrass, red brome, various mustard species, alyssum and Russian thistle are most likely to invade this site. These and other invasive weed species are capable of establishing themselves on this site, however, even in the absence of disturbance, but rarely increase to a point where they dominate the community.

As this site's ecological condition deteriorates, palatable perennial grasses and antelope bitterbrush typically decrease while black sagebrush, stemless mock goldenweed, green rabbitbrush and less palatable grasses and forbs increase.

Management practices that maintain or improve rangeland vegetation include prescribed grazing and the proper location of water and fencing developments. Severe drought may adversely affect the production of the herbaceous perennial vegetation.

Suitability for rangeland seeding is fair to good on this site due to its shallow soils. This practice can be used to improve forage quality and to control erosion. Mechanically treated pastures, including sagebrush removal and Utah juniper chaining areas are commonly found throughout this site's range. These treated areas are typically seeded to adapted forage plants including crested wheatgrass and intermediate wheatgrass.

Where vegetative communities have been impacted by changes in management or natural influences that moved them from one ecological state to another, a return to previous states is often not possible. The amount of energy needed to affect desired vegetative shifts on this site depends on both its present biotic and abiotic features and the desired results.

The following State and Transition diagram shows some of the most commonly occurring plant communities found on this ecological site. These plant communities may not represent every possibility, but they are the most prevalent and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. This model was developed using range data collected over the last 40 years in MLRA D28A in Utah. Both ocular and measured data was collected and utilized. These descriptions capture the current knowledge and experience at the time of this revision.

State and transition model

State and Transition Model

State: Utah

Site Type: Rangeland

MLRA: D-28A- Great Salt Lake Area

R028AY325UT – Upland Shallow Loam (Black Sagebrush/ Bluebunch Wheatgrass)

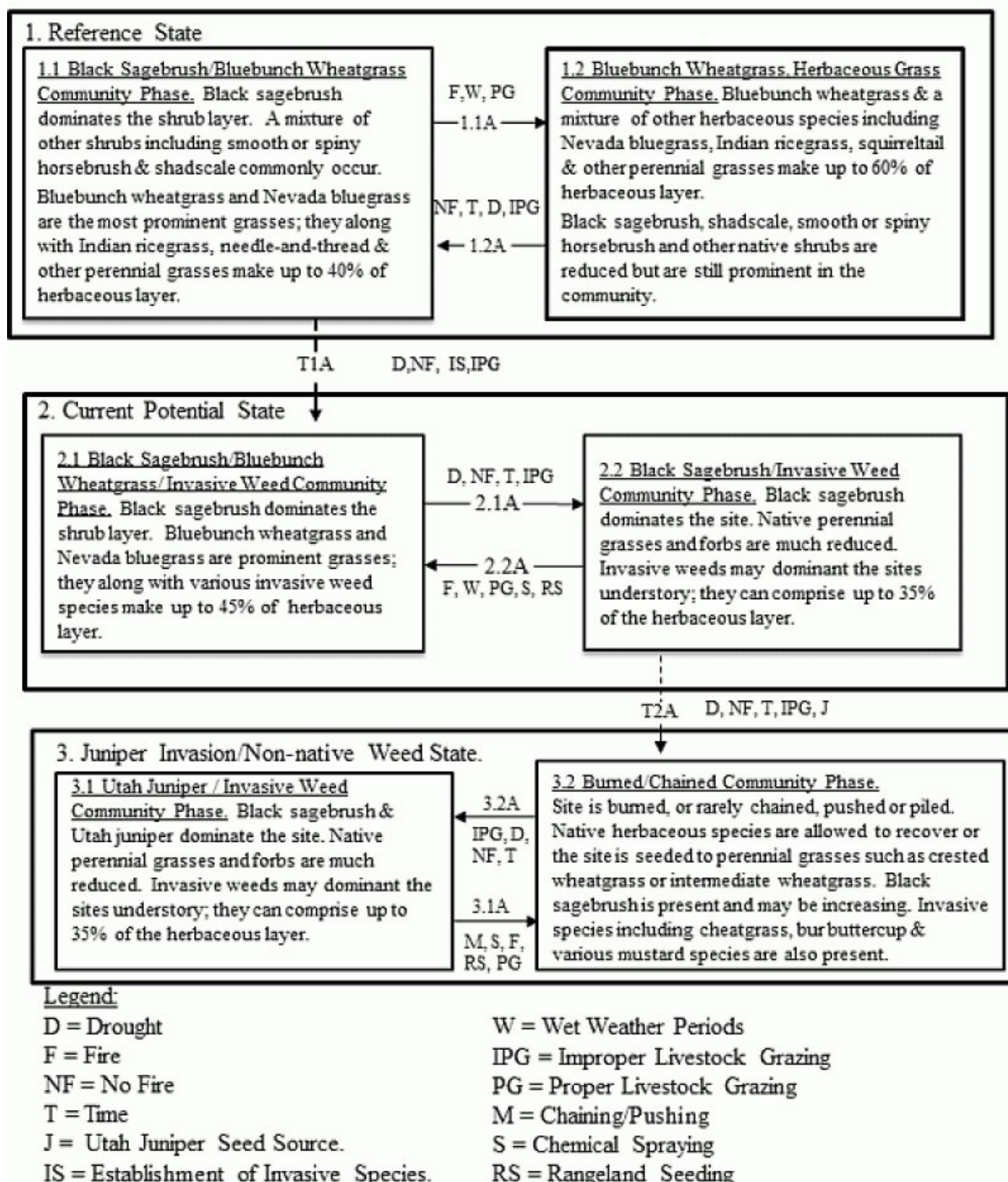


Figure 4. R028AY325UT

Reference State

This state describes the various biotic communities that are expected to be found on this ecological site under natural conditions. This reference state has a well developed shrub layer with black sagebrush dominating. Smooth and/or spiny horsebrush and shadscale are other common shrub species. Bluebunch wheatgrass is the dominant herbaceous species with Nevada bluegrass and Indian ricegrass commonly occurring. Other native grasses, forbs, and shrubs will often produce a significant portion of vegetative composition in the plant community. This site occurs on 3 to 70% slopes on all aspects. It is usually found on hills, mountain slopes, alluvial fans, lake terraces and escarpments. Its soils are shallow, well drained and very cobbly or gravelly loams in texture. The reference state is self-sustaining and resistant to change due to a good natural resilience to its natural disturbances. The primary natural disturbance mechanisms are wildlife population densities which can affect the shrub layer composition, weather fluctuations, and fire period. Definitions: Reference State: Natural plant communities as influenced by shrub canopy density, long term weather fluctuations, and periodic fire. Indicators: These communities are dominated by black sagebrush and bluebunch wheatgrass. The density of the shrub canopy determines the amount and composition of the other native species present in the community. Feedbacks: Natural fluctuations in weather patterns that allow for a self-sustaining shrub and native grass community. Prolonged drought, an increase in fire frequency, or other disturbances may allow for the establishment of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and conditions are created that may allow invasive plants to establish. Trigger: The establishment of invasive plant species.

Community 1.1
Black Sagebrush/Bluebunch Wheatgrass Community Phase.

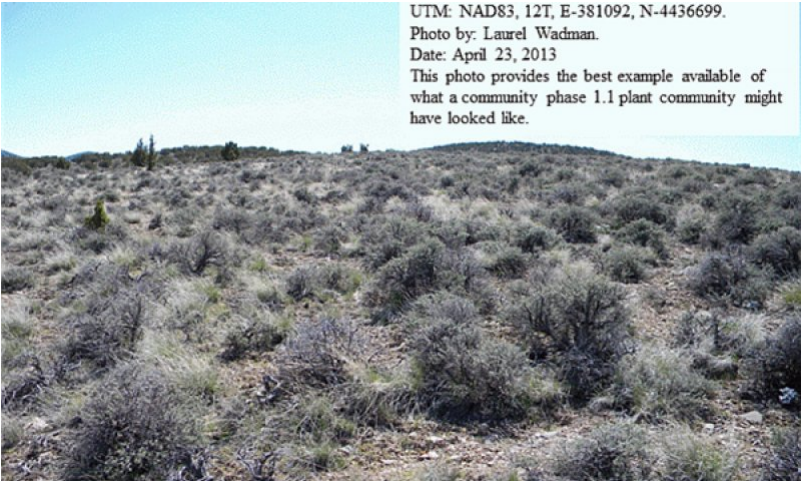


Figure 5. Community Phase 1.1

This reference community phase is dominated by black sagebrush. Other significant shrubs include spiny or smooth horsebrush and shadscale. Bluebunch wheatgrass is the dominant grass. Other commonly occurring grasses include Nevada bluegrass and Indian ricegrass. This site is mature and may be nearing the end of its natural fire cycle. The sites vegetative composition by air-dry weight is approximately 40 percent perennial grasses, 15 percent forbs, and 45 percent shrubs. The following tables provide an example of the typical vegetative floristics of a community phase 1.1 plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	308	392
Shrub/Vine	168	280	392
Forb	56	84	112
Total	336	672	896

Table 6. Ground cover

Tree foliar cover	0%
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Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	15-30%
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	—	30-40%	25-35%	0-10%
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 1.2

Bluebunch Wheatgrass, Herbaceous Grass Community Phase.



Figure 7. Community Phase 1.2

The visual aspect of this community phase is dominated by bluebunch wheatgrass. Nevada bluegrass, Indian ricegrass and several other perennial grasses are typically present. Significant shrubs are present including black sagebrush, smooth or spiny horsebrush, winterfat and shadscale. This site is early in its natural fire cycle and a slow transition from herbaceous species to woody species is occurring. The sites vegetative composition by air-dry weight is approximately 60 percent perennial grasses, 10 percent forbs, and 30 percent shrubs. The following tables provide an example of the typical vegetative floristics of a community phase 1.2 plant community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	308	392
Shrub/Vine	168	280	392
Forb	56	84	112
Total	336	672	896

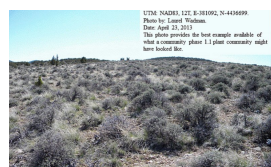
Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	15-30%
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 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	—
>0.15 <= 0.3	—	—	—	—
>0.3 <= 0.6	—	30-40%	25-35%	0-10%
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 1.1A Community 1.1 to 1.2



Black Sagebrush/Bluebunch Wheatgrass Community Phase.



Bluebunch Wheatgrass, Herbaceous Grass Community Phase.

This community pathway occurs when conditions favor an increase in native herbaceous species. A series of above average moisture years combined with excellent grazing management where the site is grazed can facilitate this

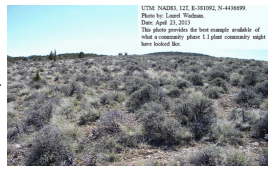
shift to grasses and forbs. This pathway normally occurs in the early part of fire cycle (20 - 30 years).

Pathway 1.2A

Community 1.2 to 1.1



Bluebunch Wheatgrass, Herbaceous Grass Community Phase.



Black Sagebrush/Bluebunch Wheatgrass Community Phase.

This community pathway occurs when fire is absent from the community for long periods of time. It usually is found near the end of the sites natural fire cycle (60 - 80 years). Drought periods and improper livestock grazing can facilitate this change in composition.

State 2

Current Potential State

The Current Potential State is similar to the Reference State except that non-native species are now present. This state describes the plant communities that may or have become established on this ecological site under various successional sequences and disturbance conditions. This state typically has a well developed shrub layer with black sagebrush often dominating. Shadscale and various horsebrush species are other common shrub species. Bluebunch wheatgrass is the dominant herbaceous species with Nevada bluegrass and other perennial grasses and forbs commonly found in abundance also. These other native grasses, forbs, and shrubs may produce significant composition in the plant community. Cheatgrass, alyssum, various mustard species and other non-native species are present on the site and under certain circumstances, may visually dominate the sites aspect. The primary disturbance mechanisms are the shrub layer density; the amount of invasive species present; weather fluctuations; and fire. The current potential state is still self-sustaining but may be losing its resistance to change due to the impact of disturbances with less resilience following those disturbances. Definitions: Current Potential State: Plant communities influenced by shrub canopy density, long term weather fluctuations, and periodic fire. Invasive species are present in various amounts. Indicators: A community dominated by black sagebrush and bluebunch wheatgrass. The density of the shrub canopy determines the amount and composition of the other native and introduced grasses and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow for a self sustaining shrub and native grass community. Prolonged drought, more frequent fires, and/or other disturbances that may allow for the increase of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for invasive plants to increase. Trigger: A reduction of perennial grass and forb species combined with an increase of invasive plant species.

Community 2.1

Black Sagebrush/Bluebunch Wheatgrass/Invasive Weed Community Phase.



Figure 9. Community Phase 2.1

This community phase is dominated by black sagebrush and bluebunch wheatgrass. Other significant shrubs include spiny or smooth horsebrush and shadscale. Other commonly occurring grasses include Nevada bluegrass and Indian ricegrass. Non-native species are now present in the all plant communities and are expected to remain a permanent part of these communities. The sites vegetative composition by air-dry weight is approximately 30 percent perennial grasses, 15 percent forbs, and 45 percent shrubs. The following tables provide an example of the typical vegetative floristics of a community phase 2.1 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	308	392
Shrub/Vine	168	280	392
Forb	56	84	112
Total	336	672	896

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	15-30%
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 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	—
>0.15 <= 0.3	—	—	—	—
>0.3 <= 0.6	—	30-40%	25-35%	0-10%
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 2.2

Black Sagebrush/Invasive Weed Community Phase.



Figure 11. Community Phase 2.2

This community phase is dominated by black sagebrush. Other shrubs, including spiny or smooth horsebrush and shadscale may or may not be present. Utah juniper may be invading if a seed source is available. Native perennial grasses are much reduced or missing from the herbaceous layer. Nevada and Sandberg bluegrasses may still be present but at reduced levels. Non-native species are now present in the all plant communities and may dominate the community. The lack of fire extends well beyond the normal period for the site. Utah juniper seedlings and saplings may begin invading the community if a seed source is available. The sites vegetative composition by air-dry weight is approximately 25 percent grasses and introduced weedy species, 10 percent forbs, 60 percent shrubs and 5% trees. The following tables provide an example of the typical vegetative floristics of a community phase 2.2 plant community.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	308	392
Shrub/Vine	168	280	392
Forb	56	84	112
Total	336	672	896

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	15-30%
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 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	—
>0.15 <= 0.3	—	—	—	—
>0.3 <= 0.6	—	30-40%	25-35%	0-10%
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 2.1A Community 2.1 to 2.2



Black Sagebrush/Bluebunch Wheatgrass/Invasive Weed Community Phase.



Black Sagebrush/Invasive Weed Community Phase.

This community pathway occurs when fire is absent from the community for long periods of time. It usually is found near the end of the sites natural fire cycle (60 - 80 years). Drought periods and improper livestock grazing can facilitate this change in composition.

Pathway 2.2A Community 2.2 to 2.1



Black Sagebrush/Invasive Weed Community Phase.



Black Sagebrush/Bluebunch Wheatgrass/Invasive Weed Community Phase.

This community pathway occurs when conditions favor an increase in native herbaceous species. A series of above average moisture years combined with excellent grazing management where the site is grazed can facilitate this shift to grasses and forbs. This pathway normally occurs in the early part of fire cycle (20 - 30 years). Where there is not sufficient desirable perennial vegetation present or black sagebrush is too dense to allow for a natural recovery to take place, spraying the sagebrush followed by range seeding can facilitate this change.

State 3 Utah Juniper/Invasive Weed Community Phase.

The Juniper Invasion/Invasive Weed State is similar to the Current Potential State except that Utah juniper along with various non-native species is now present. This state describes the plant communities that may or have become established on this ecological site under various successional sequences and disturbance conditions. This state is dominated by Utah juniper and typically has a well developed shrub layer as well, with black sagebrush often dominating. Shadscale and horsebrush species are much reduced or may not be present. Bluebunch wheatgrass and other native perennial grass species are also reduced or missing from the herbaceous layer. Nevada bluegrass is usually still present and along with invasive weedy species, including cheatgrass, alysium, various mustard species and other non-native species, may visually dominate the sites herbaceous layer. The

primary disturbance mechanisms include an overstory of Utah juniper; a shrub layer comprised of various amounts of black sagebrush; significant amounts of invasive herbaceous species present; weather fluctuations, and fire patterns. This state is losing its resistance to change due to the impact of these disturbances and has less resilience following those disturbances. Definitions: Juniper Invasion State: Plant communities dominated by an overstory of Utah juniper; a shrub canopy typically composed of black sagebrush of various densities; long term weather fluctuations; and periodic fire. Indicators: The density of the tree and shrub canopies determines the amount and composition of the other native and introduced grasses and forbs that may be present. Feedbacks: Natural fluctuations in weather patterns that allow Utah juniper to invade and impact the native shrub and grass communities. Prolonged drought, less frequent fire, and/or other disturbances that allow for the increase of all invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for invasive plants to increase. Trigger: A reduction of perennial grass and forb species combined with an increase of invasive plant species.

Community 3.1

Utah Juniper/Invasive Weed Community Phase.



Figure 13. Community Phase 3.1

This community phase is dominated by an overstory of Utah juniper. Black sagebrush is present in varying amounts. Other native shrubs are much reduced or may not be present. Native perennial grasses are much reduced or missing from the herbaceous layer. Sandberg and some Nevada bluegrass may still be present but at reduced levels. Non-native species are now present in the all plant communities and may dominate the community. The occurrence of fire extends well beyond the normal period for the site. Mature Utah juniper, along with seedlings and saplings are present in the community. The sites vegetative composition by air-dry weight is approximately 25 percent grasses and introduced weedy species, 10 percent forbs, 50 percent shrubs and 15% trees. The following tables provide an example of the typical vegetative floristics of a community phase 3.1 plant community.

Table 17. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	308	392
Shrub/Vine	168	280	392
Forb	56	84	112
Total	336	672	896

Table 18. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	15-30%
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 19. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	—
>0.15 <= 0.3	—	—	—	—
>0.3 <= 0.6	—	30-40%	25-35%	0-10%
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 3.2

Burnes/Chained Community Phase.

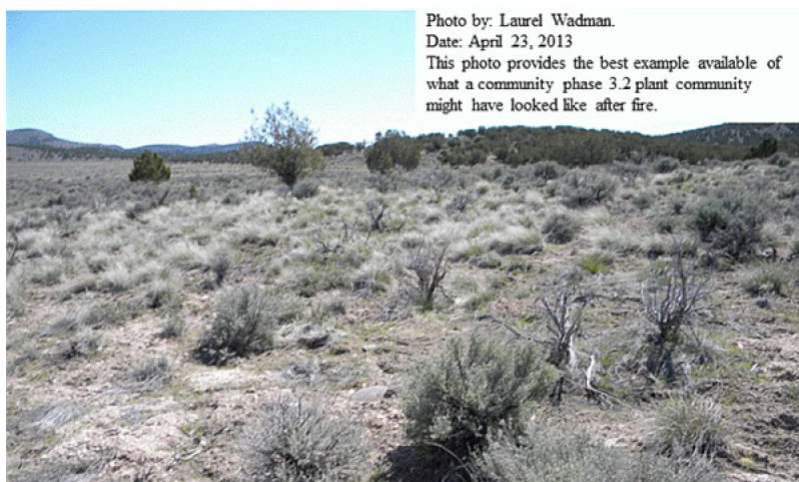


Figure 15. Community Phase 3.2

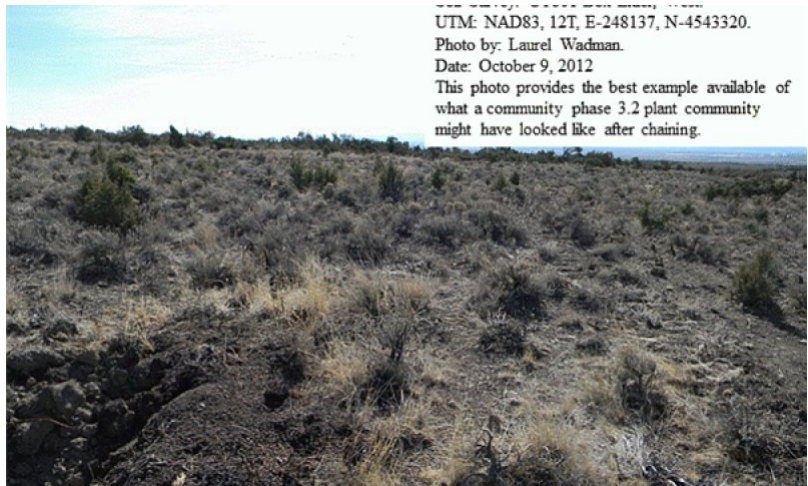


Figure 16. Community Phase 3.2

Site has recently burned (< 10 Yr.) or rarely chained or pushed to remove the overstory Utah juniper. Black sagebrush is present in varying amounts. Smooth and/or spiny horsebrush and shadscale may or may not be present. Native perennial grasses are allowed to recover and may dominate the site. Where native herbaceous are reduced or missing from the herbaceous layer, the site is often seeded to crested or intermediate wheatgrass. Various amounts of native grasses and forbs may still be present but at reduced levels. Non-native species are present on the site and will be present in the seeded community. Utah juniper seedlings are also typically present in the chained community and may need follow-up treatment. The sites vegetative composition by air-dry weight is approximately 55 percent grasses and introduced weedy species, 10 percent forbs, 30 percent shrubs and 5% trees. The following tables provide an example of the typical vegetative floristics of a community phase 3.2 plant community.

Table 20. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	308	392
Shrub/Vine	168	280	392
Forb	56	84	112
Total	336	672	896

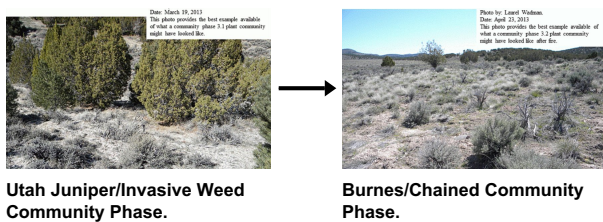
Table 21. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-35%
Grass/grasslike foliar cover	15-30%
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 22. Canopy structure (% cover)

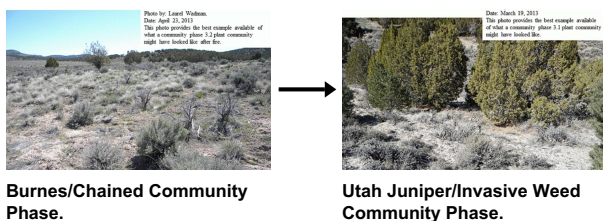
Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	—	—
>0.15 <= 0.3	—	—	—	—
>0.3 <= 0.6	—	30-40%	25-35%	0-10%
>0.6 <= 1.4	—	—	—	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 3.1A Community 3.1 to 3.2



This community phase occurs when the site is burned, or rarely, chained or pushed to remove Utah juniper. It is then typically managed for the recovery of native perennials or seeded to adapted forage species such as crested or intermediate wheatgrass. Proper grazing management is needed to allow for good site recovery.

Pathway 3.2A Community 3.2 to 3.1



This community pathway can occur when the site is improperly grazed following treatment. Drought periods can facilitate this change in vegetative composition. The lack of fire can allow Utah juniper and black sagebrush to increase during these periods until they can again dominate the community.

Transition T1A State 1 to 2

This transitional pathway occurs when any combination of drought and a lack of fire allow non-native, invasive species to occupy the site. Improper livestock grazing can stress the community by decreasing palatable perennial grasses and forbs, creating areas for these species to become well established. Once non-native species such as cheatgrass, alysium, Russian thistle, etc. are present, a threshold has been crossed.

Transition T2A State 2 to 3

This transitional pathway occurs when extended drought and/or a lack of fire to allow Utah juniper, along with non-native, invasive species to fully occupy the site. Improper livestock grazing can add additional stress the community by decreasing palatable perennial grasses and forbs, creating areas for these species to become well established.

Additional community tables

Table 23. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			280–336	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	224–280	–
4	Secondary Grasses			67–90	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–67	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–34	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	22–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–34	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	22–34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	22–34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	22–34	–
	muttongrass	POFE	<i>Poa fendleriana</i>	22–34	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–34	–
Forb					
2	Forbs			67–101	
	Forb, annual	2FA	<i>Forb, annual</i>	22–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	Nevada onion	ALNE	<i>Allium nevadense</i>	22–34	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	22–34	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–34	–
	Torrey's milkvetch	ASCA9	<i>Astragalus calycosus</i>	22–34	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	22–34	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	22–34	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	22–34	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	22–34	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	22–34	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	22–34	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	22–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	22–34	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	22–34	–
	two-lobed larkspur	DENU2	<i>Delphinium nuttallianum</i>	22–34	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	22–34	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulis</i>	22–34	–
	western stoneweed	LIRU4	<i>Lithospermum rudersale</i>	22–34	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	22–34	–

	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	22–34	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	22–34	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	22–34	–
	rock goldenrod	PEPU7	<i>Petradoria pumila</i>	22–34	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	22–34	–
	threadleaf phacelia	PHLI	<i>Phacelia linearis</i>	22–34	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	22–34	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	22–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	22–34	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	22–34	–
	American vetch	VIAM	<i>Vicia americana</i>	22–34	–
Shrub/Vine					
3	Primary Shrubs			280–364	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	224–280	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–45	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	22–45	–
5	Secondary Shrubs			67–101	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	34–67	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	34–67	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	22–34	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	22–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	22–34	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	22–34	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	22–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	22–34	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	22–34	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	22–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	22–34	–

Table 24. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			392–504	

	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	336–448	–
4	Secondary Grasses			67–90	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–67	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–34	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	22–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–34	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	22–34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	22–34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	22–34	–
	muttongrass	POFE	<i>Poa fendleriana</i>	22–34	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–34	–
Forb					
2	Forbs			67–101	
	Forb, annual	2FA	<i>Forb, annual</i>	22–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	Nevada onion	ALNE	<i>Allium nevadense</i>	22–34	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	22–34	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–34	–
	Torrey's milkvetch	ASCA9	<i>Astragalus calycosus</i>	22–34	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	22–34	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	22–34	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	22–34	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	22–34	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	22–34	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	22–34	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	22–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	22–34	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	22–34	–
	two-lobed larkspur	DENU2	<i>Delphinium nuttallianum</i>	22–34	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	22–34	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulis</i>	22–34	–
	western stoneweed	LIRU4	<i>Lithospermum ruderales</i>	22–34	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	22–34	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	22–34	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	22–34	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	22–34	–
	rock goldenrod	PEPU7	<i>Petrorhiza pumila</i>	22–34	–

	spiny phlox	PHHO	<i>Phlox hoodii</i>	22–34	–
	threadleaf phacelia	PHLI	<i>Phacelia linearis</i>	22–34	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	22–34	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	22–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	22–34	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	22–34	–
	American vetch	VIAM	<i>Vicia americana</i>	22–34	–
Shrub/Vine					
3	Primary Shrubs			168–252	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	112–168	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–45	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	22–45	–
5	Secondary Shribs			67–101	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	34–67	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	34–67	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	22–34	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	22–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	22–34	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	22–34	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	22–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	22–34	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	22–34	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	22–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	22–34	–

Table 25. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			280–336	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	224–280	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	34–67	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	34–67	–
4	Secondary Grasses			67–90	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–67	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–34	–
	red brome	BRRU2	<i>Bromus rubens</i>	22–34	–

	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–34	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	22–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–34	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	22–34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	22–34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	22–34	–
	muttongrass	POFE	<i>Poa fendleriana</i>	22–34	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–34	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	22–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–34	–

Forb

2	Forbs			67–101	
	Forb, annual	2FA	<i>Forb, annual</i>	22–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	desert madwort	ALDE	<i>Alyssum desertorum</i>	22–34	–
	Nevada onion	ALNE	<i>Allium nevadense</i>	22–34	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	22–34	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–34	–
	Torrey's milkvetch	ASCA9	<i>Astragalus calycosus</i>	22–34	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	22–34	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	22–34	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	22–34	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	22–34	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	22–34	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	22–34	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	22–34	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	22–34	–
	crossflower	CHTE2	<i>Chorispora tenella</i>	22–34	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	22–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	22–34	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	22–34	–
	twolobe larkspur	DENU2	<i>Delphinium nuttallianum</i>	22–34	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	22–34	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	22–34	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	22–34	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulis</i>	22–34	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	22–34	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	22–34	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	22–34	–
	western stoneseed	LIRU4	<i>Lithospermum ruderale</i>	22–34	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	22–34	–

	African mustard	MAAF	<i>Malcolmia africana</i>	22–34	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	22–34	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	22–34	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	22–34	–
	rock goldenrod	PEPU7	<i>Petradoria pumila</i>	22–34	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	22–34	–
	threadleaf phacelia	PHLI	<i>Phacelia linearis</i>	22–34	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	22–34	–
	Russian thistle	SAKA	<i>Salsola kali</i>	22–34	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	22–34	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	22–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	22–34	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	22–34	–
	American vetch	VIAM	<i>Vicia americana</i>	22–34	–
Shrub/Vine					
3	Primary Shrubs			280–364	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	224–280	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–45	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	22–45	–
5	Secondary Shrubs			67–101	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	34–67	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	34–67	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	22–34	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	22–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	22–34	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	22–34	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	22–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	22–34	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	22–34	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	22–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	22–34	–

Table 26. Community 2.2 plant community composition

				Annual Production	Foliar Cover
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Group	Common Name	Symbol	Scientific Name	(Kg/Hectare)	(%)
Grass/Grasslike					
1	Primary Grasses			280–336	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	101–135	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	101–135	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	101–135	–
4	Secondary Grasses			67–90	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–67	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–34	–
	red brome	BRRU2	<i>Bromus rubens</i>	22–34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–34	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	22–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–34	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	22–34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	22–34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	22–34	–
	muttongrass	POFE	<i>Poa fendleriana</i>	22–34	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–34	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	22–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–34	–
Forb					
2	Forbs			67–101	
	Forb, annual	2FA	<i>Forb, annual</i>	22–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	desert madwort	ALDE	<i>Alyssum desertorum</i>	22–34	–
	Nevada onion	ALNE	<i>Allium nevadense</i>	22–34	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	22–34	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–34	–
	Torrey's milkvetch	ASCA9	<i>Astragalus calycosus</i>	22–34	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	22–34	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	22–34	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	22–34	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	22–34	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	22–34	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	22–34	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	22–34	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	22–34	–
	crossflower	CHTE2	<i>Chorispora tenella</i>	22–34	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	22–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	22–34	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	22–34	–

	twolobe larkspur	DENU2	<i>Delphinium nuttallianum</i>	22–34	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	22–34	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	22–34	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	22–34	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulis</i>	22–34	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	22–34	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	22–34	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	22–34	–
	western stoneseed	LIRU4	<i>Lithospermum rudersale</i>	22–34	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	22–34	–
	African mustard	MAAF	<i>Malcolmia africana</i>	22–34	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	22–34	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	22–34	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	22–34	–
	rock goldenrod	PEPU7	<i>Petrorhiza pumila</i>	22–34	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	22–34	–
	threadleaf phacelia	PHLI	<i>Phacelia linearis</i>	22–34	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	22–34	–
	Russian thistle	SAKA	<i>Salsola kali</i>	22–34	–
	tall tumbledustard	SIAL2	<i>Sisymbrium altissimum</i>	22–34	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	22–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	22–34	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	22–34	–
	American vetch	VIAM	<i>Vicia americana</i>	22–34	–

Shrub/Vine

3	Primary Shrubs			364–420	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	308–336	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–45	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	22–45	–
5	Secondary Shrubs			67–101	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	34–67	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	34–67	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	22–34	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	22–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	22–34	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	22–34	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–34	–
	spiny hopsage	GRSP	<i>Gravia spinosa</i>	22–34	–

	spring nepeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	22–34	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	22–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	22–34	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	22–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	22–34	–
Tree					
6	Trees			56–84	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	56–84	–

Table 27. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			280–336	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	101–135	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	101–135	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	34–67	–
4	Secondary Grasses			67–90	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–67	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–34	–
	red brome	BRRU2	<i>Bromus rubens</i>	22–34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–34	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	22–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–34	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	22–34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	22–34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	22–34	–
	muttongrass	POFE	<i>Poa fendleriana</i>	22–34	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–34	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	22–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–34	–
Forb					
2	Forbs			67–101	
	Forb, annual	2FA	<i>Forb, annual</i>	22–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	desert madwort	ALDE	<i>Alyssum desertorum</i>	22–34	–
	Nevada onion	ALNE	<i>Allium nevadense</i>	22–34	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	22–34	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–34	–
	Torrey's milkvetch	ASCA9	<i>Astragalus calycosus</i>	22–34	–

	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	22–34	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	22–34	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	22–34	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	22–34	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	22–34	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	22–34	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	22–34	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	22–34	–
	crossflower	CHTE2	<i>Chorispora tenella</i>	22–34	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	22–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	22–34	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	22–34	–
	twolobe larkspur	DENU2	<i>Delphinium nuttallianum</i>	22–34	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	22–34	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	22–34	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	22–34	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulis</i>	22–34	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	22–34	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	22–34	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	22–34	–
	western stoneseed	LIRU4	<i>Lithospermum rudersale</i>	22–34	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	22–34	–
	African mustard	MAAF	<i>Malcolmia africana</i>	22–34	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	22–34	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	22–34	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	22–34	–
	rock goldenrod	PEPU7	<i>Petrorhiza pumila</i>	22–34	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	22–34	–
	threadleaf phacelia	PHLI	<i>Phacelia linearis</i>	22–34	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	22–34	–
	Russian thistle	SAKA	<i>Salsola kali</i>	22–34	–
	tall tumbledustard	SIAL2	<i>Sisymbrium altissimum</i>	22–34	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	22–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	22–34	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	22–34	–
	American vetch	VIAM	<i>Vicia americana</i>	22–34	–

Shrub/Vine

3	Primary Shrubs			252–308	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	168–196	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–45	–

	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	22–45	–
5	Secondary Shrubs			67–101	
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	34–67	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	34–67	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	22–34	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	22–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	22–34	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	22–34	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	22–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	22–34	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	22–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	22–34	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	22–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	22–34	–
Tree					
6	Trees			168–224	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	168–224	–

Table 28. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			504–560	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	202–252	–
	intermediate wheatgrass	THIN6	<i>Thinopyrum intermedium</i>	202–252	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	101–135	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	101–135	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	67–101	–
4	Secondary Grasses			67–90	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	34–67	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	22–34	–
	red brome	BRRU2	<i>Bromus rubens</i>	22–34	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	22–34	–
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	22–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	22–34	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	22–34	–
	saline wildrye	LESA4	<i>Leymus salinus</i>	22–34	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	22–34	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	22–34	–

	muttongrass	POFE	<i>Poa fendleriana</i>	22–34	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	22–34	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	22–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	22–34	–
Forb					
2	Forbs			67–101	
	Forb, annual	2FA	<i>Forb, annual</i>	22–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	22–34	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	22–34	–
	desert madwort	ALDE	<i>Alyssum desertorum</i>	22–34	–
	Nevada onion	ALNE	<i>Allium nevadense</i>	22–34	–
	littleleaf pussytoes	ANMI3	<i>Antennaria microphylla</i>	22–34	–
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	22–34	–
	Torrey's milkvetch	ASCA9	<i>Astragalus calycosus</i>	22–34	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	22–34	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	22–34	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	22–34	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	22–34	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	22–34	–
	sego lily	CANU3	<i>Calochortus nuttallii</i>	22–34	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	22–34	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	22–34	–
	crossflower	CHTE2	<i>Chorispura tenella</i>	22–34	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	22–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	22–34	–
	tapertip hawksbeard	CRAC2	<i>Crepis acuminata</i>	22–34	–
	twolobe larkspur	DENU2	<i>Delphinium nuttallianum</i>	22–34	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	22–34	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	22–34	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	22–34	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulle</i>	22–34	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	22–34	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	22–34	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	22–34	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	22–34	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	22–34	–
	African mustard	MAAF	<i>Malcolmia africana</i>	22–34	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	22–34	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	22–34	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	22–34	–
	rock goldenrod	PEPU7	<i>Petradoria pumila</i>	22–34	–

	spiny phlox	PHHO	<i>Phlox hoodii</i>	22–34	–
	threadleaf phacelia	PHLI	<i>Phacelia linearis</i>	22–34	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	22–34	–
	Russian thistle	SAKA	<i>Salsola kali</i>	22–34	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	22–34	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	22–34	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	22–34	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	22–34	–
	American vetch	VIAM	<i>Vicia americana</i>	22–34	–
Shrub/Vine					
3	Primary Shrubs			252–308	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	224–252	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	22–45	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	22–45	–
5	Secondary Shrubs			67–101	
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	34–67	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	34–67	–
	antelope bitterbrush	PUTR2	<i>Purshia tridentata</i>	34–67	–
	skunkbush sumac	RHTR	<i>Rhus trilobata</i>	22–34	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	22–34	–
	curl-leaf mountain mahogany	CELE3	<i>Cercocarpus ledifolius</i>	22–34	–
	alderleaf mountain mahogany	CEMO2	<i>Cercocarpus montanus</i>	22–34	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	22–34	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	22–34	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	22–34	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	22–34	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	22–34	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	22–34	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	22–34	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	22–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata</i> ssp. <i>vaseyana</i>	22–34	–
Tree					
6	Trees			56–84	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	56–84	–

Animal community

--Wildlife Interpretation--

This ecological site, in its reference state, produces significant amounts of nutritious forage that was utilized by native herbivores including Rocky Mountain elk, mule deer and pronghorn antelope who lived here along their associated predators. Although much of this site is presently different from the reference state, it is still very important as wildlife habitat. Other wildlife commonly observed using this site include mountain lions, rabbits,

coyotes, badgers, and red fox's.

This site also provides habitat to raptors and other bird species including golden eagles, red-tailed hawks, ferruginous hawks, and several species of owls. Ringneck pheasant, sage grouse, chukars, and California quail are also commonly found.

--Grazing Interpretations--

This site provides good spring, fall, and winter grazing conditions for domestic livestock due to its accessibility and its supply of nutritious forage. The herbaceous plant community is primarily grasses, with the majority of canopy cover being attributed to bluebunch wheatgrass and western wheatgrass. Improper livestock grazing can cause these species to decrease while annual forbs, black sagebrush and rabbitbrush species increase.

When this site is stressed, cheatgrass, alyssum, Russian thistle and halogeton are likely to invade.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group D due to the shallow depth (NRCS National Engineering Handbook). Runoff curves range from 80 to 89. These soils are saturated quickly due to high infiltration rates and shallow depth; once soils are saturated, run off potential is high. Hydrological groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. Heavy grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but its affect is variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff (National Range and Pasture Handbook, 2003).

Recreational uses

Recreation activities include aesthetic value and good opportunities for hiking, horseback riding, hunting, and off-road vehicle use. Due to the high erosion potential after a surface disturbance, care should be taken when planning recreational activities. Camp sites are usually limited due to lack of sheltering trees or rock outcrop.

Wood products

None

Other products

Cedar posts and firewood are possible where Utah juniper has invaded this site.

Other information

--Poisonous and Toxic Plant Communities--

Toxic plants possibly associated with this site include woolly locoweed, broom snakeweed, and Russian thistle.

Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed is palatable and has similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is available. Locoweed contains swainsonine (indolizidine alkaloid) and is poisonous at all stages of growth. Poisoning will become evident after 2-3 weeks of continuous grazing and is associated with 4 major symptoms: 1) neurological damage, 2) emaciation, 3) reproductive failure and abortion, and 4) congestive heart failure linked with "high mountain disease".

Broom snakeweed contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however, cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep generally will only graze broom snakeweed when other forage is unavailable, typically in winter when toxicity levels are at their lowest (Knight and Walter, 2001).

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors such as

after a rain storm, during a drought, during periods with cool/cloudy days, and when growing on soils high in nitrogen and low in sulfur and phosphorus. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora, and thus, are able to degrade the toxin before clinical poisoning can occur.

--Invasive Plant Communities--

Generally, as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses may invade the site. Of particular concern in semi-arid environments are annual invaders including cheatgrass, Russian thistle, alysium and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult, but suppression may be possible. Very few invaded site have been observed to date and so documentation is very limited.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on its' present fuel load and plant moisture content. Sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Most research agrees that historic fire return intervals are at a minimum 100 years, indicating that fire may have not played an important role in short term community dynamics. Fires are more common when plants are stressed or dead due to drought. Fire tolerant shrubs will recover quickly following fire. Black sagebrush will reestablish by seeds dispersed from adjacent unburned patches or by unburned seeds found at the burn site. Continuous (every 20-40 years) burning of these ecological sites can result in herbaceous dominated communities, due to the relatively fast recovery of grasses and forbs when compared to shrubs. If invasive annual grasses are allowed to establish, fires may become more frequent, inhibiting the site's ability to recover.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T9N R16W S19
General legal description	Bovine Mountain Southwest Slope; 2100 ft. East, 2500 ft. South of NW Corner of Section 19, Township 9N, Range 16W

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Contributors

David J. Somorville

DJS

V. Keith Wadman

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	04/09/2013
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Few rills present. Some 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 (<4 feet long) and somewhat widely spaced (6-8 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 somewhat short (3-6 feet), stable,

sinuous and not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat with slope.

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.
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 surface is typically covered by approximately 60 to 80% coarse fragments. Bare ground spaces should not be greater than 1 foot in diameter.
5. **Number of gullies and erosion associated with gullies:** None to very few gullies present on site. A few 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.
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.
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.
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 4 in the interspaces. The average rating should be a 4. Soil surface texture is typically a very gravelly loam.
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Saxby) Soil surface 0-4 inches. Texture is a very stony silt loam; color is dark brownish gray (10YR6/2); and structure is weak fine granular. Ochric epipedon ranges to 10 inches. Some soils correlated to this site may have mollic epipedons. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.
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.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Fractured basalt with weakly cemented lime accumulations occurs at approximately 18 inches.
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Non-Sprouting shrubs (black sagebrush) > Perennial bunchgrasses (bluebunch wheatgrass, Nevada bluegrass) > Sprouting shrubs (antelope bitterbrush).

Sub-dominant: Other perennial bunchgrasses (Indian ricegrass, needle-and-thread) >> Rhizomatous grasses (western wheatgrass) > Sprouting shrubs (green rabbitbrush) >> Perennial forbs (carpet phlox).

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 30 to 40+ 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, Smooth brome, 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 may continue to increase. These conditions would reflect a functional community phase within the reference state.

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.
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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 1/4 to 1/2 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 600#/acre on an average year, but could range from 300 to 800#/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 alyssum.
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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.
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