USDA Natural Resources
Conservation Service

Ecological site R025XY412UT
Mountain Gravelly Loam (Mountain Big Sagebrush)

Accessed: 05/13/2025

General information

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

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 025X–Owyhee High Plateau

The Utah portion of this Major Land Resource Area (MLRA) occurs in the Great Basin Section of the Basin and Range Province. It encompasses the Raft River Mountains in northwestern Utah which run east and west, and their surrounding desert plains and valleys. The Raft River Mountains are characterized by steep slopes with narrow crests and deep valleys. Active faulting and erosion are the dominant forces controlling the geomorphology of the area. Clear Creek, a deep narrow canyon is the major drainage basin for the area.

Associated sites

R025XY310UT	**Upland Loam (Basin Big Sagebrush)**
R025XY318UT	**Upland Stony Loam (Black Sagebrush)**
R025XY418UT	**Mountain Windswept Ridge (Low Sagebrush)** Site R025XY510UT is also and associated site and a similar site with differentiae.

Similar sites

R025XY310UT	**Upland Loam (Basin Big Sagebrush)**

R025XY315UT	**Upland Shallow Gravelly Loam (Thurber Needlegrass)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata var. vaseyana* (2) *Symphoricarpos oreophilus*
Herbaceous	(1) *Festuca idahoensis* (2) *Leymus cinereus*

Physiographic features

This site is typically found on mountain slopes and hillslopes. Slopes range from moderate to very steep, usually between 20 and 60%. It occurs at elevations between 6,000 to 8,600 feet, with sites on the Bickmore soil component occurring up to 9,500 feet. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,829–2,621 m
Slope	20–60%
Aspect	Aspect is not a significant factor

Climatic features

The climate is cold and snowy in the winter and warm and dry in the summer. Approximately 40 percent of the moisture comes as rain between May 1st and September 1st. On the average May and June are the wettest months and September and October are the driest months. In average years, grasses begin growth around June 1 and end around September 30. The following table information is from stations located at Park Valley and Grouse Creek. This site likely has higher precipitation and colder temperatures because of its higher elevation.

Mean Annual Air Temperature: 45.6
Mean Annual Soil Temperature: 42-47

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	153 days
Precipitation total (average)	330 mm

Influencing water features

There are no influencing water features on this site.

Soil features

The soils on this site were formed in colluvium, alluvium, or redisuum derived from mixed metamorphic and sedimentary rock. The soil is well drained with moderate permeability in the upper 10 inches of soil. The soil is also deep with bedrock greater than 60 inches beneath the soil surface for most of the site, although the Bickmore soil component has lithic bedrock between 20 and 40 inches. The soil texture at the surface is gravelly loam and surface gravels are 5 to 28% by cover and subsurface gravels are between 7 and 41% by volume. Surface and subsurface

rocks over 3 inches in diameter are less than 15% by cover or volume. Available water capacity is between 3.2 and 4.3 in the upper 40 inches of soil. The soil pH is between 6.1 and 6.5. The soil temperature regime is frigid.

Soils associated with this site:
Box Elder Co. UT601 – Bickmore (6, 24, 54, 70), Hades (34), Parkay (58, 59), Skylick (81)

Table 4. Representative soil features

Parent material	(1) Colluvium–metasedimentary rock
Surface texture	(1) Gravelly loam (2) Loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	102–152 cm
Surface fragment cover <=3"	5–28%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	8.13–10.92 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	6.1–6.5
Subsurface fragment volume <=3" (Depth not specified)	7–41%
Subsurface fragment volume >3" (Depth not specified)	0–4%

Ecological dynamics

This site developed under the Owyhee High Plateau's ecological conditions including the natural influences of fire, herbivory and climate. This sites plant species composition is typically dominated by shrub species, principally mountain big sagebrush. Mountain snowberry and antelope bitterbrush are also commonly found. Idaho fescue, bluebunch wheatgrass and basin wildrye are the most common herbaceous species. A wide variety of other grasses and forbs are expected to occur on this site.

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 occurs on this site with a burn period estimated at 80 to 100 years. Disturbances such as improper grazing, poorly designed brush or seeding treatments 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 and bur buttercup 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 abscence of disturbance, but rarely increase to a point where they dominate the community.

As this sites ecological condition deteriorates, palatable perennial grasses and antelope bitterbrush typically

decrease while mountain big sagebrush, 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.

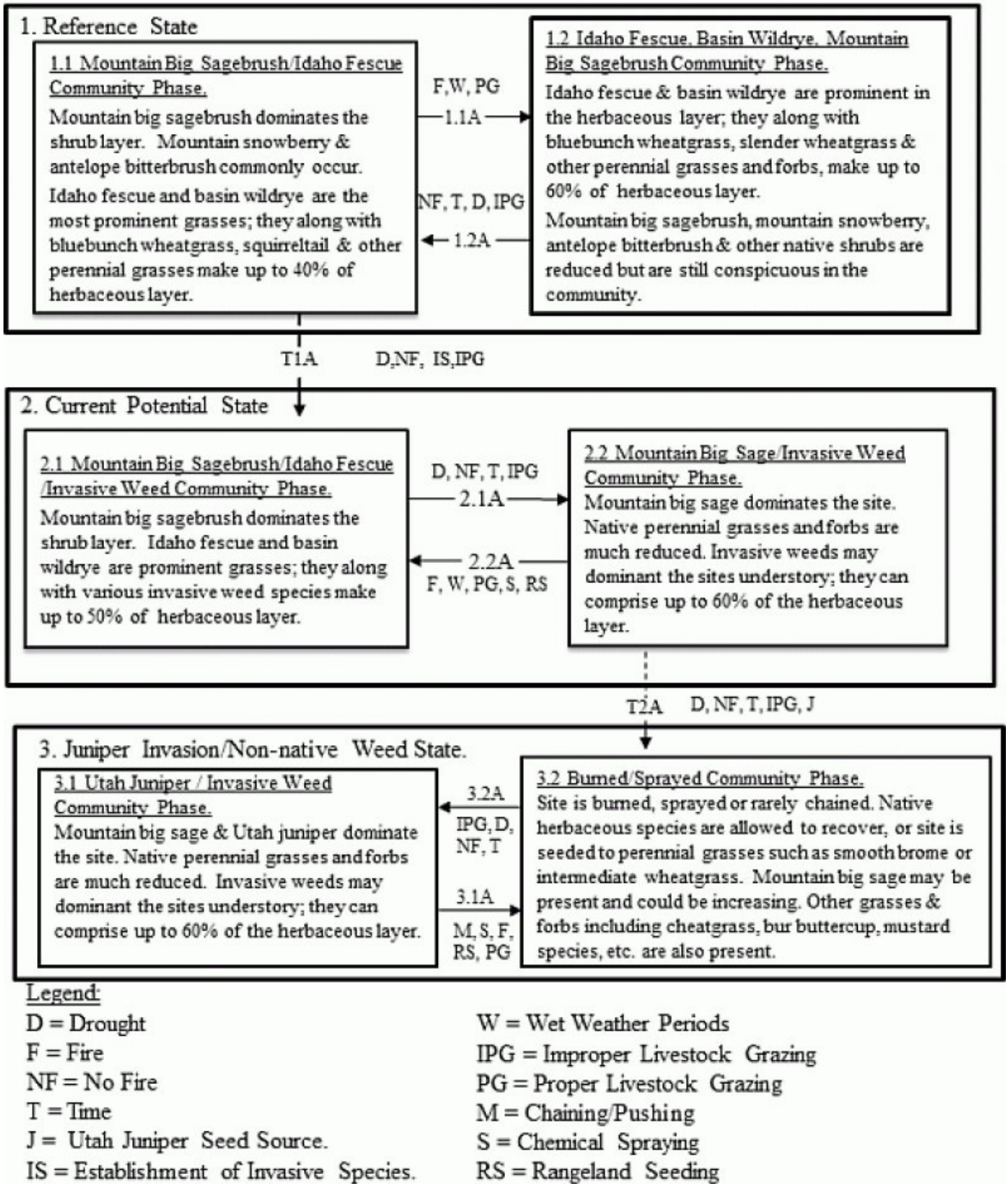
Suitability for rangeland seeding is good on this site. This practice can be used to improve forage quality and to control erosion. Treated pastures, including burning, sagebrush spraying and Utah juniper chaining areas are found throughout this sites range. These treated areas are typically managed to improve native herbaceous grasses or seeded to adapted forage plants including smooth brome 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 D25 in northwestern Utah. Both ocular and measured data was collected and utilized.

State and transition model

State and Transition Model
State: Utah
Site Type: Rangeland
MLRA: D-25- Owyhee High Plateau
R025XY412UT – Mountain Gravelly Loam (Mountain Big Sage/ Idaho Fescue.)



Legend:

D = Drought
F = Fire
NF = No Fire
T = Time
J = Utah Juniper Seed Source.
IS = Establishment of Invasive Species.
W = Wet Weather Periods
IPG = Improper Livestock Grazing
PG = Proper Livestock Grazing
M = Chaining/Pushing
S = Chemical Spraying
RS = Rangeland Seeding

Figure 4. R025XY412UT

State 1
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 mountain big sagebrush dominating. Antelope bitterbrush and mountain snowberry are other common shrub species. Idaho fescue, bluebunch wheatgrass and basin wildrye are the dominant herbaceous species with prairie junegrass and slender wheatgrass 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 20 to 60% slopes on all aspects. It is usually found on more gentle mountain and hill slopes. Its soils are typically deep, well drained and gravelly 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 mountain big sagebrush and mountain snowberry. 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
Mountain Big Sage/Idaho Fescue Community Phase.

Figure 5. Community Phase 1.1

This reference community is dominated by mountain big sagebrush and Idaho fescue. Other significant shrubs include antelope bitterbrush and mountain snowberry. Other commonly occurring grasses include bluebunch wheatgrass and basin wildrye. 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	504	1289	1569
Shrub/Vine	336	482	560
Forb	196	303	392
Total	**1036**	**2074**	**2521**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	5-10%
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	–	–	–	5-15%
>0.3 <= 0.6	–	–	35-45%	–
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). UT4121, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	50	5	10	5	5	0	0

Community 1.2
Idaho Fescue, Basin Wildrye, Mountain Big Sage Community Phase.

Figure 8. Community Phase 1.2

This reference community is dominated by Idaho fescue and basin wildrye. Significant shrubs are present and typically include mountain big sagebrush, antelope bitterbrush and mountain snowberry. Other commonly occurring grasses include bluebunch wheatgrass and prairie junegrass. 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, 15 percent forbs, and 25 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	504	1289	1569
Shrub/Vine	336	482	560
Forb	196	303	392
Total	**1036**	**2074**	**2521**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	5-10%
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%

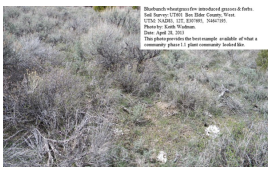
Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	5-15%
>0.3 <= 0.6	–	–	35-45%	–
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

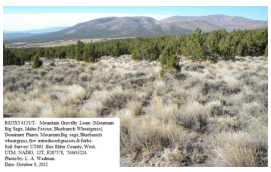
Figure 10. Plant community growth curve (percent production by month). UT4121, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	50	5	10	5	5	0	0

Pathway 1.1A
Community 1.1 to 1.2



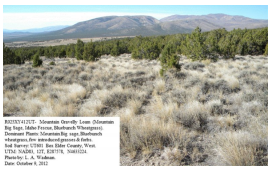
Mountain Big Sage/Idaho Fescue Community Phase.



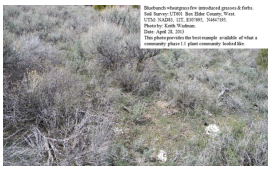
Idaho Fescue, Basin Wildrye, Mountain Big Sage Community Phase.

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



Idaho Fescue, Basin Wildrye, Mountain Big Sage Community Phase.



Mountain Big Sage/Idaho Fescue 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 Sate 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 mountain big sagebrush dominating. Antelope bitterbrush and mountain snowberry are other common shrub species. Idaho fescue, bluebunch wheatgrass and basin wildrye are the dominant herbaceous species with bluebunch wheatgrass 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 mountain big sagebrush and mountain snowberry. 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
Mountain Big Sage/Idaho Fescue/Invasive Weed Community Phase.

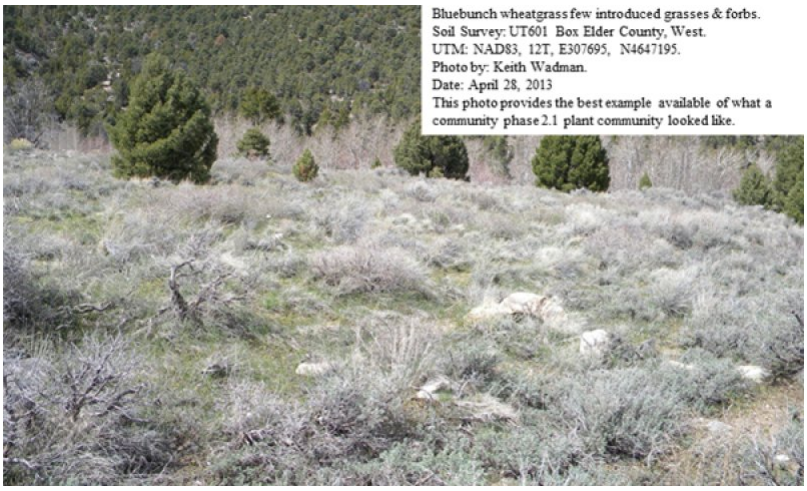


Figure 11. Community Phase 2.1

This community phase is dominated by mountain big sagebrush and Idaho fescue. Other significant shrubs include antelope bitterbrush and mountain snowberry. Other commonly occurring grasses include basin wildrye, prairie junegrass and bluebunch wheatgrass. 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 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 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	504	1289	1569
Shrub/Vine	336	482	560
Forb	196	303	392
Total	**1036**	**2074**	**2521**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	5-10%
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	–	–	–	5-15%
>0.3 <= 0.6	–	–	35-45%	–
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 13. Plant community growth curve (percent production by month). UT4121, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	50	5	10	5	5	0	0

Community 2.2
Mountain Big Sage/Invasive Weed Community Phase.

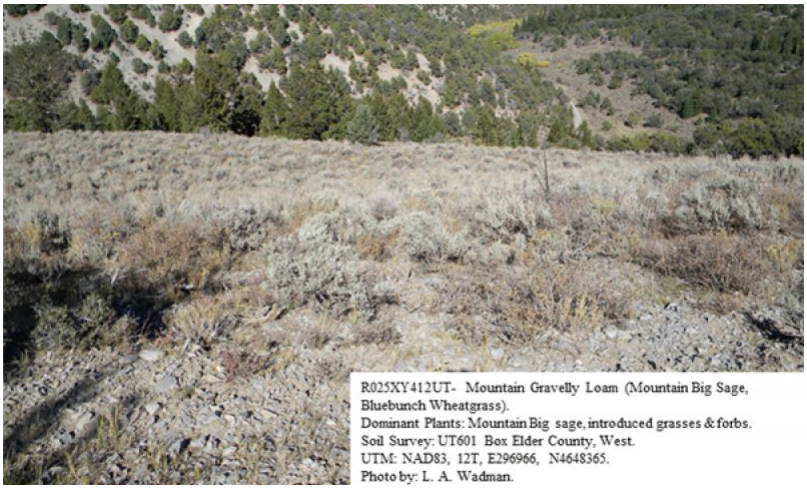


Figure 14. Community Phase 2.2

This community phase is dominated by mountain big sagebrush and mountain snowberry. Other shrubs, including antelope bitterbrush and slender buckwheat may or may not be present. Native perennial grasses are much reduced or missing from the herbaceous layer. Slender wheatgrass 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, and 65 percent shrubs. 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	504	1289	1569
Shrub/Vine	336	482	560
Forb	196	303	392
Total	**1036**	**2074**	**2521**

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	5-10%
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%

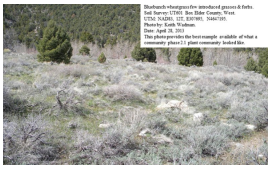
Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	5-15%
>0.3 <= 0.6	–	–	35-45%	–
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

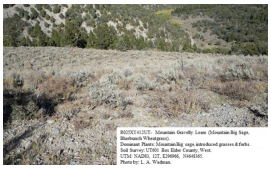
Figure 16. Plant community growth curve (percent production by month). UT4121, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	50	5	10	5	5	0	0

Pathway 2.1A
Community 2.1 to 2.2



Mountain Big Sage/Idaho Fescue/Invasive Weed Community Phase.



Mountain Big Sage/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

Mountain Big Sage/Invasive Weed Community Phase.

Mountain Big Sage/Idaho Fescue/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 basin big 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
Juniper Invasion/Non-native Weed State.

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 mountain big sagebrush often dominating. Mountain snowberry and antelope bitterbrush are typically present in various amounts. Idaho fescue, basin wildrye and other native perennial grass species are often reduced or missing from the herbaceous layer. Slender wheatgrass is usually still present and along with invasive weedy species, including cheatgrass, alyssum, 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 mountain big 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 mountain big 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.

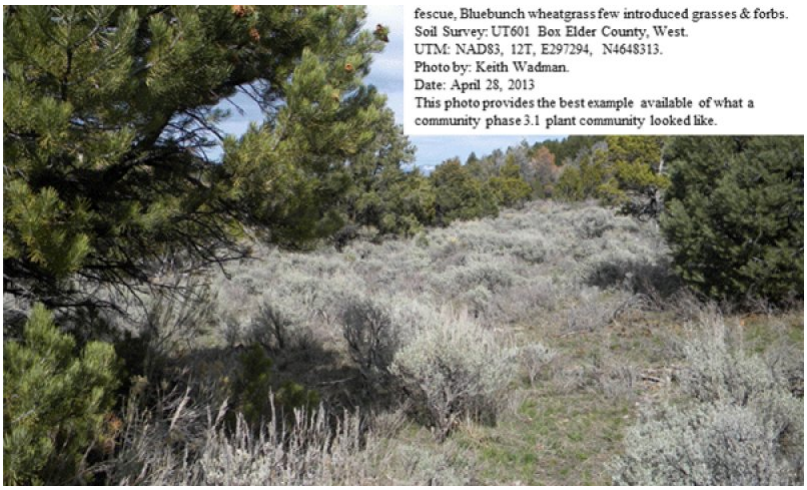


Figure 17. Community Phase 3.1

This community phase is dominated by an overstory of Utah juniper. Mountain big sagebrush and mountain snowberry are present in varying amounts. Antelope bitterbrush and slender buckwheat may or may not be present. Native perennial grasses are much reduced or missing from the herbaceous layer. Slender wheatgrass 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, 40 percent shrubs and 25% 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	504	1289	1569
Shrub/Vine	336	482	560
Forb	196	303	392
Total	**1036**	**2074**	**2521**

Table 18. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	5-10%
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	–	–	–	5-15%
>0.3 <= 0.6	–	–	35-45%	–
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 19. Plant community growth curve (percent production by month). UT4121, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	50	5	10	5	5	0	0

Community 3.2
Burned/Sprayed Community Phase.

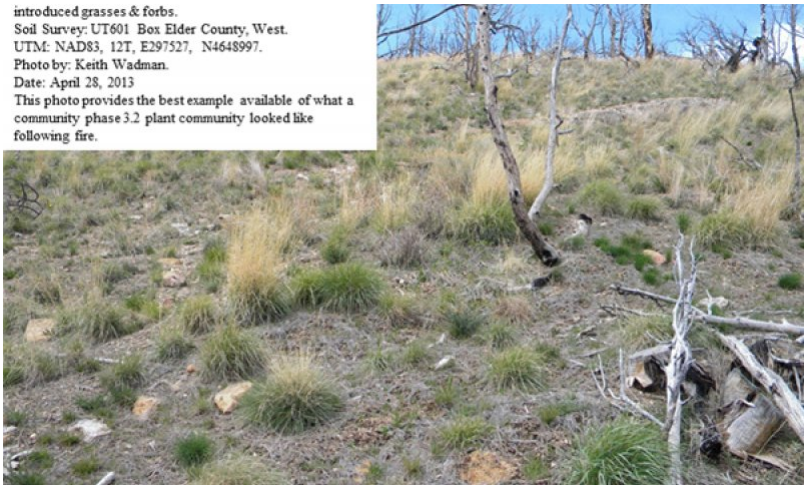


Figure 20. Community Phase 3.2

Figure 21. Community Phase 3.2

Site has been burned, sprayed or rarely chained to remove mountain big sagebrush and any Utah juniper and/or pinyon present. Antelope bitterbrush, slender buckwheat and mountain snowberry may also be present, amounts will vary depending on treatment method. Native perennial grasses may dominate the site or could be reduced or missing from the herbaceous layer. Where native perennials are missing, the site is typically seeded to introduced grasses such as smooth brome or intermediate wheatgrass. Various amounts of other introduced and native grasses and forbs may also be present. Utah pinyon and juniper seedlings may also be present and may need follow-up treatment. The sites vegetative composition by air-dry weight is approximately 65 percent grasses and introduced weedy species, 10 percent forbs, 20 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	504	1289	1569
Shrub/Vine	336	482	560
Forb	196	303	392
Total	**1036**	**2074**	**2521**

Table 21. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	20-40%
Forb foliar cover	5-10%
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	–	–	–	5-15%
>0.3 <= 0.6	–	–	35-45%	–
>0.6 <= 1.4	–	10-20%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 23. Plant community growth curve (percent production by month). UT4121, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	50	5	10	5	5	0	0

Pathway 3.1A
Community 3.1 to 3.2

Utah Juniper/Invasive Weed Community Phase.

Burned/Sprayed Community Phase.

This community phase occurs when the site is mechanically chained or pushed to remove Utah juniper. It is then typically seeded to adapted forage species such as intermediate wheatgrass or smooth brome. Proper grazing management is needed to allow for good site recovery.

Pathway 3.2A
Community 3.2 to 3.1

Burned/Sprayed Community Phase.

Utah Juniper/Invasive Weed Community Phase.

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 basin big 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, alyssum, Russian thistle, etc. are present, a threshold has been crossed.

Transition T2A
State 2 to 3

This transitional pathway occurs when extended drought and a lack of fire allow Utah juniper and other non-native, invasive species to 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. Once non-native species such as Utah juniper, cheatgrass, alyssum, Russian thistle, etc. are present, a threshold has been crossed.

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**			673–1121	
	Idaho fescue	FEID	*Festuca idahoensis*	202–314	–
	basin wildrye	LECI4	*Leymus cinereus*	202–314	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	101–202	–
	California brome	BRCA5	*Bromus carinatus*	101–202	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	101–202	–
4	**Secondary Grasses**			101–202	
	Grass, perennial	2GP	*Grass, perennial*	67–101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	67–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	67–101	–
	spike fescue	LEKI2	*Leucopoa kingii*	67–101	–
	oniongrass	MEBU	*Melica bulbosa*	67–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–101	–
	muttongrass	POFE	*Poa fendleriana*	67–101	–
Forb					
2	**Forbs**			202–314	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–

	common yarrow	ACMI2	*Achillea millefolium*	22–45	–
	pale agoseris	AGGL	*Agoseris glauca*	22–45	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	22–45	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	22–45	–
	Beckwith's milkvetch	ASBE3	*Astragalus beckwithii*	22–45	–
	Utah milkvetch	ASUT	*Astragalus utahensis*	22–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	22–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	22–45	–
	sego lily	CANU3	*Calochortus nuttallii*	22–45	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	22–45	–
	narrowleaf goosefoot	CHLE4	*Chenopodium leptophyllum*	22–45	–
	tiny trumpet	COLI2	*Collomia linearis*	22–45	–
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	22–45	–
	bastard toadflax	COUM	*Comandra umbellata*	22–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	22–45	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	22–45	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	22–45	–
	elkweed	FRSP	*Frasera speciosa*	22–45	–
	twinleaf bedstraw	GABI	*Galium bifolium*	22–45	–
	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	–
	pinyon groundsmoke	GARA2	*Gayophytum ramosissimum*	22–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	22–45	–
	spotted stickseed	HAPA	*Hackelia patens*	22–45	–
	common nipplewort	LACO3	*Lapsana communis*	22–45	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	22–45	–
	silvery lupine	LUAR3	*Lupinus argenteus*	22–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	22–45	–
	spiny phlox	PHHO	*Phlox hoodii*	22–45	–
	longleaf phlox	PHLO2	*Phlox longifolia*	22–45	–
	yellow salsify	TRDU	*Tragopogon dubius*	22–45	–
	twolobe speedwell	VEBI2	*Veronica biloba*	22–45	–
	hookedspur violet	VIAD	*Viola adunca*	22–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	22–45	–
Shrub/Vine					
3	**Primary Shrubs**			448–673	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	252–364	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	135–202	–
5	**Secondary Shrubs**			135–202	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	101–146	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–101	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	56–101	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–

	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–101	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	56–101	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	56–101	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–101	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	56–101	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	56–101	–
	chokecherry	PRVI	*Prunus virginiana*	56–101	–

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**			1121–1457	
	Idaho fescue	FEID	*Festuca idahoensis*	314–426	–
	basin wildrye	LECI4	*Leymus cinereus*	314–426	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	101–202	–
	California brome	BRCA5	*Bromus carinatus*	101–202	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	101–202	–
4	**Secondary Grasses**			101–202	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	67–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	67–101	–
	spike fescue	LEKI2	*Leucopoa kingii*	67–101	–
	oniongrass	MEBU	*Melica bulbosa*	67–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–101	–
	muttongrass	POFE	*Poa fendleriana*	67–101	–
Forb					
2	**Forbs**			202–314	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–
	common yarrow	ACMI2	*Achillea millefolium*	22–45	–
	pale agoseris	AGGL	*Agoseris glauca*	22–45	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	22–45	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	22–45	–
	Beckwith's milkvetch	ASBE3	*Astragalus beckwithii*	22–45	–
	Utah milkvetch	ASUT	*Astragalus utahensis*	22–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	22–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	22–45	–
	sego lily	CANU3	*Calochortus nuttallii*	22–45	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	22–45	–
	narrowleaf goosefoot	CHLE4	*Chenopodium leptophyllum*	22–45	–
	tiny trumpet	COLI2	*Collomia linearis*	22–45	–
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	22–45	–

	~~maiden blue eyed mary~~	~~COPA3~~	~~*Collinsia parviflora*~~	~~22–45~~	
	bastard toadflax	COUM	*Comandra umbellata*	22–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	22–45	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	22–45	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	22–45	–
	elkweed	FRSP	*Frasera speciosa*	22–45	–
	twinleaf bedstraw	GABI	*Galium bifolium*	22–45	–
	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	–
	pinyon groundsmoke	GARA2	*Gayophytum ramosissimum*	22–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	22–45	–
	spotted stickseed	HAPA	*Hackelia patens*	22–45	–
	common nipplewort	LACO3	*Lapsana communis*	22–45	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	22–45	–
	silvery lupine	LUAR3	*Lupinus argenteus*	22–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	22–45	–
	spiny phlox	PHHO	*Phlox hoodii*	22–45	–
	longleaf phlox	PHLO2	*Phlox longifolia*	22–45	–
	yellow salsify	TRDU	*Tragopogon dubius*	22–45	–
	twolobe speedwell	VEBI2	*Veronica biloba*	22–45	–
	hookedspur violet	VIAD	*Viola adunca*	22–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	22–45	–
Shrub/Vine					
3	**Primary Shrubs**			314–504	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	168–252	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	67–135	–
5	**Secondary Shrubs**			135–202	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	101–146	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	56–101	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–101	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	56–101	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	56–101	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–101	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	56–101	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	56–101	–
	chokecherry	PRVI	*Prunus virginiana*	56–101	–

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**			673–1121	
	Idaho fescue	FEID	*Festuca idahoensis*	202–314	–

	basin wildrye	LECI4	*Leymus cinereus*	202–314	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	101–202	–
	California brome	BRCA5	*Bromus carinatus*	101–202	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	101–202	–
4	**Secondary Grasses**			101–202	
	Grass, perennial	2GP	*Grass, perennial*	67–101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	67–101	–
	red brome	BRRU2	*Bromus rubens*	67–101	–
	cheatgrass	BRTE	*Bromus tectorum*	67–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	67–101	–
	spike fescue	LEKI2	*Leucopoa kingii*	67–101	–
	oniongrass	MEBU	*Melica bulbosa*	67–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–101	–
	bulbous bluegrass	POBU	*Poa bulbosa*	67–101	–
	muttongrass	POFE	*Poa fendleriana*	67–101	–
Forb					
2	**Forbs**			202–314	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–
	common yarrow	ACMI2	*Achillea millefolium*	22–45	–
	pale agoseris	AGGL	*Agoseris glauca*	22–45	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	22–45	–
	pale madwort	ALAL3	*Alyssum alyssoides*	22–45	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	22–45	–
	Beckwith's milkvetch	ASBE3	*Astragalus beckwithii*	22–45	–
	Utah milkvetch	ASUT	*Astragalus utahensis*	22–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	22–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	22–45	–
	sego lily	CANU3	*Calochortus nuttallii*	22–45	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	22–45	–
	narrowleaf goosefoot	CHLE4	*Chenopodium leptophyllum*	22–45	–
	crossflower	CHTE2	*Chorispora tenella*	22–45	–
	tiny trumpet	COLI2	*Collomia linearis*	22–45	–
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	22–45	–
	bastard toadflax	COUM	*Comandra umbellata*	22–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	22–45	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	22–45	–
	western tansymustard	DEPI	*Descurainia pinnata*	22–45	–
	herb sophia	DESO2	*Descurainia sophia*	22–45	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	22–45	–
	elkweed	FRSP	*Frasera speciosa*	22–45	–
	twinleaf bedstraw	GABI	*Galium bifolium*	22–45	–
	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	

	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	–
	pinyon groundsmoke	GARA2	*Gayophytum ramosissimum*	22–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	22–45	–
	spotted stickseed	HAPA	*Hackelia patens*	22–45	–
	common sunflower	HEAN3	*Helianthus annuus*	22–45	–
	common nipplewort	LACO3	*Lapsana communis*	22–45	–
	prickly lettuce	LASE	*Lactuca serriola*	22–45	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	22–45	–
	silvery lupine	LUAR3	*Lupinus argenteus*	22–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	22–45	–
	spiny phlox	PHHO	*Phlox hoodii*	22–45	–
	longleaf phlox	PHLO2	*Phlox longifolia*	22–45	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	22–45	–
	yellow salsify	TRDU	*Tragopogon dubius*	22–45	–
	twolobe speedwell	VEBI2	*Veronica biloba*	22–45	–
	hookedspur violet	VIAD	*Viola adunca*	22–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	22–45	–
Shrub/Vine					
3	**Primary Shrubs**			448–673	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	252–364	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	135–202	–
5	**Secondary Shrubs**			135–202	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	101–146	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–101	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	56–101	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–101	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	56–101	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	56–101	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–101	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	56–101	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	56–101	–
	chokecherry	PRVI	*Prunus virginiana*	56–101	–

Table 26. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Primary Grasses**			673–1121	
	Idaho fescue	FEID	*Festuca idahoensis*	202–314	–
	basin wildrye	LECI4	*Leymus cinereus*	202–314	–
	bulbous bluegrass	POBU	*Poa bulbosa*	112–224	–
	red brome	BRRU2	*Bromus rubens*	112–224	–
	cheatgrass	BRTE	*Bromus tectorum*	112–224	–

	cheatgrass	BRTE	*Bromus tectorum*	112–224	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	101–202	–
	California brome	BRCA5	*Bromus carinatus*	101–202	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	101–202	–
4	**Secondary Grasses**			101–202	
	Grass, perennial	2GP	*Grass, perennial*	67–101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	67–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	67–101	–
	spike fescue	LEKI2	*Leucopoa kingii*	67–101	–
	oniongrass	MEBU	*Melica bulbosa*	67–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–101	–
	muttongrass	POFE	*Poa fendleriana*	67–101	–
Forb					
2	**Forbs**			202–314	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–
	common yarrow	ACMI2	*Achillea millefolium*	22–45	–
	pale agoseris	AGGL	*Agoseris glauca*	22–45	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	22–45	–
	pale madwort	ALAL3	*Alyssum alyssoides*	22–45	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	22–45	–
	Beckwith's milkvetch	ASBE3	*Astragalus beckwithii*	22–45	–
	Utah milkvetch	ASUT	*Astragalus utahensis*	22–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	22–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	22–45	–
	sego lily	CANU3	*Calochortus nuttallii*	22–45	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	22–45	–
	narrowleaf goosefoot	CHLE4	*Chenopodium leptophyllum*	22–45	–
	crossflower	CHTE2	*Chorispora tenella*	22–45	–
	tiny trumpet	COLI2	*Collomia linearis*	22–45	–
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	22–45	–
	bastard toadflax	COUM	*Comandra umbellata*	22–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	22–45	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	22–45	–
	western tansymustard	DEPI	*Descurainia pinnata*	22–45	–
	herb sophia	DESO2	*Descurainia sophia*	22–45	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	22–45	–
	elkweed	FRSP	*Frasera speciosa*	22–45	–
	twinleaf bedstraw	GABI	*Galium bifolium*	22–45	–
	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	–
	pinyon groundsmoke	GARA2	*Gayophytum ramosissimum*	22–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	22–45	–
	spotted stickseed	HAPA	*Hackelia patens*	22–45	–

	common sunflower	HEAN3	*Helianthus annuus*	22–45	–
	common nipplewort	LACO3	*Lapsana communis*	22–45	–
	prickly lettuce	LASE	*Lactuca serriola*	22–45	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	22–45	–
	silvery lupine	LUAR3	*Lupinus argenteus*	22–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	22–45	–
	spiny phlox	PHHO	*Phlox hoodii*	22–45	–
	longleaf phlox	PHLO2	*Phlox longifolia*	22–45	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	22–45	–
	yellow salsify	TRDU	*Tragopogon dubius*	22–45	–
	twolobe speedwell	VEBI2	*Veronica biloba*	22–45	–
	hookedspur violet	VIAD	*Viola adunca*	22–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	22–45	–
Shrub/Vine					
3	**Primary Shrubs**			448–673	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	252–364	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	135–202	–
5	**Secondary Shrubs**			135–202	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	101–146	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–101	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	56–101	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–101	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	56–101	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	56–101	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–101	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	56–101	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	56–101	–
	chokecherry	PRVI	*Prunus virginiana*	56–101	–

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**			673–1121	
	Idaho fescue	FEID	*Festuca idahoensis*	202–314	–
	basin wildrye	LECI4	*Leymus cinereus*	202–314	–
	bulbous bluegrass	POBU	*Poa bulbosa*	112–224	–
	red brome	BRRU2	*Bromus rubens*	112–224	–
	cheatgrass	BRTE	*Bromus tectorum*	112–224	–
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	101–202	–
	California brome	BRCA5	*Bromus carinatus*	101–202	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	101–202	–

4	**Secondary Grasses**			101–202	
	Grass, perennial	2GP	*Grass, perennial*	67–101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	67–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	67–101	–
	spike fescue	LEKI2	*Leucopoa kingii*	67–101	–
	oniongrass	MEBU	*Melica bulbosa*	67–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–101	–
	muttongrass	POFE	*Poa fendleriana*	67–101	–
Forb					
2	**Forbs**			202–314	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–
	common yarrow	ACMI2	*Achillea millefolium*	22–45	–
	pale agoseris	AGGL	*Agoseris glauca*	22–45	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	22–45	–
	pale madwort	ALAL3	*Alyssum alyssoides*	22–45	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	22–45	–
	Beckwith's milkvetch	ASBE3	*Astragalus beckwithii*	22–45	–
	Utah milkvetch	ASUT	*Astragalus utahensis*	22–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	22–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	22–45	–
	sego lily	CANU3	*Calochortus nuttallii*	22–45	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	22–45	–
	narrowleaf goosefoot	CHLE4	*Chenopodium leptophyllum*	22–45	–
	crossflower	CHTE2	*Chorispora tenella*	22–45	–
	tiny trumpet	COLI2	*Collomia linearis*	22–45	–
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	22–45	–
	bastard toadflax	COUM	*Comandra umbellata*	22–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	22–45	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	22–45	–
	western tansymustard	DEPI	*Descurainia pinnata*	22–45	–
	herb sophia	DESO2	*Descurainia sophia*	22–45	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	22–45	–
	elkweed	FRSP	*Frasera speciosa*	22–45	–
	twinleaf bedstraw	GABI	*Galium bifolium*	22–45	–
	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	–
	pinyon groundsmoke	GARA2	*Gayophytum ramosissimum*	22–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	22–45	–
	spotted stickseed	HAPA	*Hackelia patens*	22–45	–
	common sunflower	HEAN3	*Helianthus annuus*	22–45	–
	common nipplewort	LACO3	*Lapsana communis*	22–45	–
	prickly lettuce	LASE	*Lactuca serriola*	22–45	–

	western stoneseed	LIRU4	*Lithospermum ruderale*	22–45	–
	silvery lupine	LUAR3	*Lupinus argenteus*	22–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	22–45	–
	spiny phlox	PHHO	*Phlox hoodii*	22–45	–
	longleaf phlox	PHLO2	*Phlox longifolia*	22–45	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	22–45	–
	yellow salsify	TRDU	*Tragopogon dubius*	22–45	–
	twolobe speedwell	VEBI2	*Veronica biloba*	22–45	–
	hookedspur violet	VIAD	*Viola adunca*	22–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	22–45	–
Shrub/Vine					
3	**Primary Shrubs**			448–673	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	252–364	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	135–202	–
5	**Secondary Shrubs**			135–202	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	101–146	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–101	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	56–101	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–101	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	56–101	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	56–101	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–101	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	56–101	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	56–101	–
	chokecherry	PRVI	*Prunus virginiana*	56–101	–
Tree					
6	**Trees**			168–336	
	Utah juniper	JUOS	*Juniperus osteosperma*	168–280	–
	twoneedle pinyon	PIED	*Pinus edulis*	56–112	–

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**			673–1121	
	smooth brome	BRIN2	*Bromus inermis*	336–560	–
	intermediate wheatgrass	THIN6	*Thinopyrum intermedium*	336–560	–
	Idaho fescue	FEID	*Festuca idahoensis*	202–314	–
	basin wildrye	LECI4	*Leymus cinereus*	202–314	–
	bulbous bluegrass	POBU	*Poa bulbosa*	112–224	–
	red brome	BRRU2	*Bromus rubens*	112–224	–
	cheatgrass	BRTE	*Bromus tectorum*	112–224	–

	slender wheatgrass	ELTR7	*Elymus trachycaulus*	101–202	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	101–202	–
	California brome	BRCA5	*Bromus carinatus*	101–202	–
4	**Secondary Grasses**			101–202	
	Grass, perennial	2GP	*Grass, perennial*	67–101	–
	Columbia needlegrass	ACNE9	*Achnatherum nelsonii*	67–101	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	67–101	–
	spike fescue	LEKI2	*Leucopoa kingii*	67–101	–
	oniongrass	MEBU	*Melica bulbosa*	67–101	–
	western wheatgrass	PASM	*Pascopyrum smithii*	67–101	–
	muttongrass	POFE	*Poa fendleriana*	67–101	–
Forb					
2	**Forbs**			202–314	
	Forb, annual	2FA	*Forb, annual*	22–45	–
	Forb, perennial	2FP	*Forb, perennial*	22–45	–
	common yarrow	ACMI2	*Achillea millefolium*	22–45	–
	pale agoseris	AGGL	*Agoseris glauca*	22–45	–
	nettleleaf giant hyssop	AGUR	*Agastache urticifolia*	22–45	–
	pale madwort	ALAL3	*Alyssum alyssoides*	22–45	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	22–45	–
	Beckwith's milkvetch	ASBE3	*Astragalus beckwithii*	22–45	–
	Utah milkvetch	ASUT	*Astragalus utahensis*	22–45	–
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	22–45	–
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	22–45	–
	sego lily	CANU3	*Calochortus nuttallii*	22–45	–
	Douglas' dustymaiden	CHDO	*Chaenactis douglasii*	22–45	–
	narrowleaf goosefoot	CHLE4	*Chenopodium leptophyllum*	22–45	–
	crossflower	CHTE2	*Chorispora tenella*	22–45	–
	tiny trumpet	COLI2	*Collomia linearis*	22–45	–
	maiden blue eyed Mary	COPA3	*Collinsia parviflora*	22–45	–
	bastard toadflax	COUM	*Comandra umbellata*	22–45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	22–45	–
	twolobe larkspur	DENU2	*Delphinium nuttallianum*	22–45	–
	western tansymustard	DEPI	*Descurainia pinnata*	22–45	–
	herb sophia	DESO2	*Descurainia sophia*	22–45	–
	sulphur-flower buckwheat	ERUM	*Eriogonum umbellatum*	22–45	–
	elkweed	FRSP	*Frasera speciosa*	22–45	–
	twinleaf bedstraw	GABI	*Galium bifolium*	22–45	–
	gallant soldier	GAPA2	*Galinsoga parviflora*	22–45	–
	pinyon groundsmoke	GARA2	*Gayophytum ramosissimum*	22–45	–
	sticky purple geranium	GEVI2	*Geranium viscosissimum*	22–45	–
	spotted stickseed	HAPA	*Hackelia patens*	22–45	–

	common sunflower	HEAN3	*Helianthus annuus*	22–45	–
	common nipplewort	LACO3	*Lapsana communis*	22–45	–
	prickly lettuce	LASE	*Lactuca serriola*	22–45	–
	western stoneseed	LIRU4	*Lithospermum ruderale*	22–45	–
	silvery lupine	LUAR3	*Lupinus argenteus*	22–45	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	22–45	–
	spiny phlox	PHHO	*Phlox hoodii*	22–45	–
	longleaf phlox	PHLO2	*Phlox longifolia*	22–45	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	22–45	–
	yellow salsify	TRDU	*Tragopogon dubius*	22–45	–
	twolobe speedwell	VEBI2	*Veronica biloba*	22–45	–
	hookedspur violet	VIAD	*Viola adunca*	22–45	–
	mule-ears	WYAM	*Wyethia amplexicaulis*	22–45	–
Shrub/Vine					
3	**Primary Shrubs**			448–673	
	mountain big sagebrush	ARTRV	*Artemisia tridentata ssp. vaseyana*	252–364	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	135–202	–
5	**Secondary Shrubs**			135–202	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	101–146	–
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	56–101	–
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	56–101	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	56–101	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–101	–
	yellow rabbitbrush	CHVIL4	*Chrysothamnus viscidiflorus ssp. lanceolatus*	56–101	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	56–101	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–101	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	56–101	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	56–101	–
	chokecherry	PRVI	*Prunus virginiana*	56–101	–
Tree					
6	**Trees**			84–168	
	Utah juniper	JUOS	*Juniperus osteosperma*	56–112	–
	twoneedle pinyon	PIED	*Pinus edulis*	28–56	–

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 with 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, basin big sagebrush and rabbitbrush species increase.

When this site is stressed, cheatgrass, alyssum, various mustard species, Russian thistle and Utah juniper are likely to invade.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group B with hydrology curve numbers ranging from 61 to 79. On these sites runoff potential is moderately low and infiltration rates are moderate, depending on slope and ground cover/health (NRCS National Engineering Handbook). 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. In areas similar to the reference state where ground cover is adequate infiltration is increased and runoff potential is decreased. In areas where ground cover is less than 50%, infiltration is reduced and runoff potential is increased. Heavy use by domestic livestock affects hydrology in two ways. Trampling increases bulk density and breaks down soil aggregates. This results in decreased infiltration rates and increased runoff. Heavy grazing can also alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but it 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.

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 in reference or current potential states. Where Utah juniper has invaded this site, firewood and fence posts may become available products.

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 (indolizdine 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, alyssum 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. Sagebrush will reestablish either 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	T15N R18W S36
General legal description	NW ¼ NE ¼ Section 36, Township 15N, Range 18W – Granite Pass

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Contributors

GBB
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), Robert D. Stager (BLM), Brock Benson (NRCS), 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	01/10/2013
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to very rare. Any rills present should be somewhat short in length (less than 6 feet long), less than 1 inch deep, and occur mostly on areas with increased runoff on the lower parts of steeper slopes, and areas below exposed bedrock. They should be somewhat widely spaced (10-12 feet). Old rills present should be weathered and muted in appearance. An increase in rill formation may be seen after disturbance events such as recent fire or episodic thunderstorms (for example, 100 year storms).

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2. **Presence of water flow patterns:** None to few. A very few flow patterns wind around perennial plant bases and may show slight evidence of erosion. They are expected to be short (3-6 feet), stable, sinuous and not connected. There is usually very minor evidence of deposition. Evidence of flow will increase slightly with slope.

3. **Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (1 to 2% of individual plants). Plant roots are covered and litter remains in place around plant crowns. Terracettes should be very few and 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):** 5 – 15%. The soil surface may have large rocks throughout with 30 to 60 percent rock fragments. Bare ground openings should not be greater than 1 foot in diameter.

5. **Number of gullies and erosion associated with gullies:** No gullies present on site. A very 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% 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 evident. 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 5 or 6 under the plant canopies, and a rating of 4 to 5 in the interspaces. The average should be a 5. Surface texture is gravelly silt loam to cobbly loam. Vegetation cover, litter and/or surface rock reduce erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Parkay) Soil surface horizon is 0 to 12 inches deep. Texture is a gravelly loam. Structure is moderate medium granular. Color is black (7.5YR 2/1). Mollic epipedon ranges to 30 inches deep. 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 raindrops and reduce raindrop splash erosion. Litter on soil surface and condition of soil surface also protect soil from splash erosion and encourage a high rate of infiltration. Plant spatial distribution should slow runoff allowing additional time for infiltration. Bare spaces are expected to be small (< 1 foot) and irregular in shape and are usually not connected. The vegetative structure is usually adequate to capture snow and ensure snowmelt occurs in a subdued

manner allowing maximum time for infiltration and reduce runoff and erosion in all but the most extreme storm events (for example, 100 year storm). When perennial grasses and shrubs decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Some soils may have an argillic horizon that could be mistaken for a compaction pan.

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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: Perennial bunchgrasses (Idaho fescue, basin wildrye), = > Non-sprouting shrub (mountain big sagebrush, antelope bitterbrush), >> Sprouting shrubs (mountain snowberry, green rabbitbrush, rubber rabbitbrush).

    Sub-dominant: Rhizomatous grasses (slender wheatgrass) > Perennial forbs (arrowleaf balsamroot).

    Other: Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Disturbance regime includes fire, drought, and insects. Assumed fire cycle of 60-90 years.
    Dominance is based on average annual production, air dry weight: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state. Following a recent disturbance such as drought, fire or insects that remove the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase, reducing the perennial herbaceous understory species. These conditions would normally reflect functional community phases within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued in below average growing conditions, or on sites with high (usually greater than 65%) similarity index (late seral to historic climax). 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 may 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 to 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 1750 - 1850 #/acre on an average year but could range from 925 - 2250 #/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, alyssum, Russian thistle, Utah juniper, other non-native grasses and forbs.

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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 and mountain snowberry sprout 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.
