

Ecological site R028AY252UT Semidesert Stony Loam (Black Sagebrush)

Accessed: 04/19/2024

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.

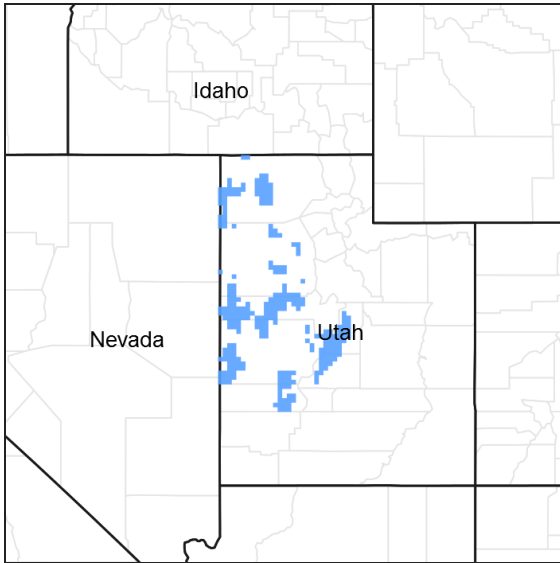


Figure 1. Mapped extent

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

R028AY215UT	Semidesert Gravelly Loam (Wyoming Big Sagebrush) North
R028AY230UT	Semidesert Shallow Hardpan (Black Sagebrush)
R028AY243UT	Semidesert Shallow Loam (Wyoming Big Sagebrush) North

Similar sites

R028AY325UT	Upland Shallow Loam (Black Sagebrush)
-------------	---------------------------------------

Table 1. Dominant plant species

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

Physiographic features

This site is located on a broad range of physiographical features, the most common ones include fan terraces and remnants, alluvial flats, hills, ridges and mountain slopes. They are also occasionally found on lake terraces and flood plains. Slopes range from 1 to 30 percent but may occasionally be steeper. Runoff potential typically ranges from low to medium but may rarely be high. Sites are located between 4,400 to 7,400 feet in elevation.

Table 2. Representative physiographic features

Landforms	(1) Alluvial flat (2) Fan remnant (3) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	4,400–7,400 ft
Slope	1–30%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is dry subhumid and semiarid. It is characterized by cold, snowy winters and warm, dry summers. The average annual precipitation ranges from 9 to 13 inches. March, April and May are typically the wettest months with June, July and September being the driest. The most reliable sources of moisture for plant growth are the snow that accumulates over the winter, and spring rains. Summer thunderstorms are intermittent and sporadic in nature, and thus are not reliable sources of moisture to support vegetative growth on this site. The mean annual air temperature is 45 to 52 degrees. Mean Annual Soil Temperature: 49-54 degrees.

Table 3. Representative climatic features

Frost-free period (average)	111 days
Freeze-free period (average)	142 days
Precipitation total (average)	11 in

Influencing water features

There are no influencing water features on this ecological site.

Soil features

The soil is deep and well to somewhat excessively drained. It formed in alluvium derived mainly from igneous rock, limestone, quartzite, and rhyolite parent materials. The soil surface is 45 to 65 percent covered by pebbles, cobbles, or stones. Rock fragment content in the particle-size control section of the soil profile is 25 to 60 percent. The soil is mainly coarse textured and may show weak discontinuous cementation by silica or carbonates in some subhorizons. It is calcareous to the surface. Reaction is mildly alkaline to very strongly alkaline. Permeability is moderate to moderately rapid. Available water capacity is 1 to 5.2 inches and the water supplying capacity is 2 to 6 inches.

Soil Survey Area: Soil Components:

Box Elder County - Western Part (UT601) Stucky; Tosser.

Tooele Area (UT611): Hiko Peak.

West Millard-Juab Area (UT617): Heist; Kessler.

Millard County (UT618): Hiko Peak; Pober; Sanpete.

Sanpete Valley Area (UT627): Sanpete; Sigurd.

Beaver-Cove Fort (UT640): Decca; Hiko Peak; Sigurd.

Table 4. Representative soil features

Parent material	(1) Alluvium–quartzite
Surface texture	(1) Very gravelly sandy loam (2) Cobbly fine sandy loam (3) Very cobbly loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	60 in
Surface fragment cover <=3"	2–39%
Surface fragment cover >3"	2–47%
Available water capacity (0-40in)	1–5.2 in
Calcium carbonate equivalent (0-40in)	0–40%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–13
Soil reaction (1:1 water) (0-40in)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	31–47%
Subsurface fragment volume >3" (Depth not specified)	3–35%

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 black sagebrush. A wide mixture of other shrubs including Nevada ephedra and shadscale are also commonly found. Bluebunch wheatgrass and Indian ricegrass are the most prominent herbaceous species. Needle-and thread, western wheatgrass and James galleta are other common perennial grasses.

This ecological site has been grazed by domestic livestock since they were first introduced into the area in the mid to 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 80 to 90 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, halogeton, 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 winterfat typically decrease while Wyoming 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 only fair on this site because of its stony soils. This practice is being used, however, over large areas to improve forage quality and to control erosion. Treated pastures, including sagebrush spraying, brush beating and juniper chaining 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 western 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-28A- Great Salt Lake Area

R028AY252UT – Semidesert Stony Loam (Black Sage/ Indian Ricegrass/Bluebunch Wheatgrass).

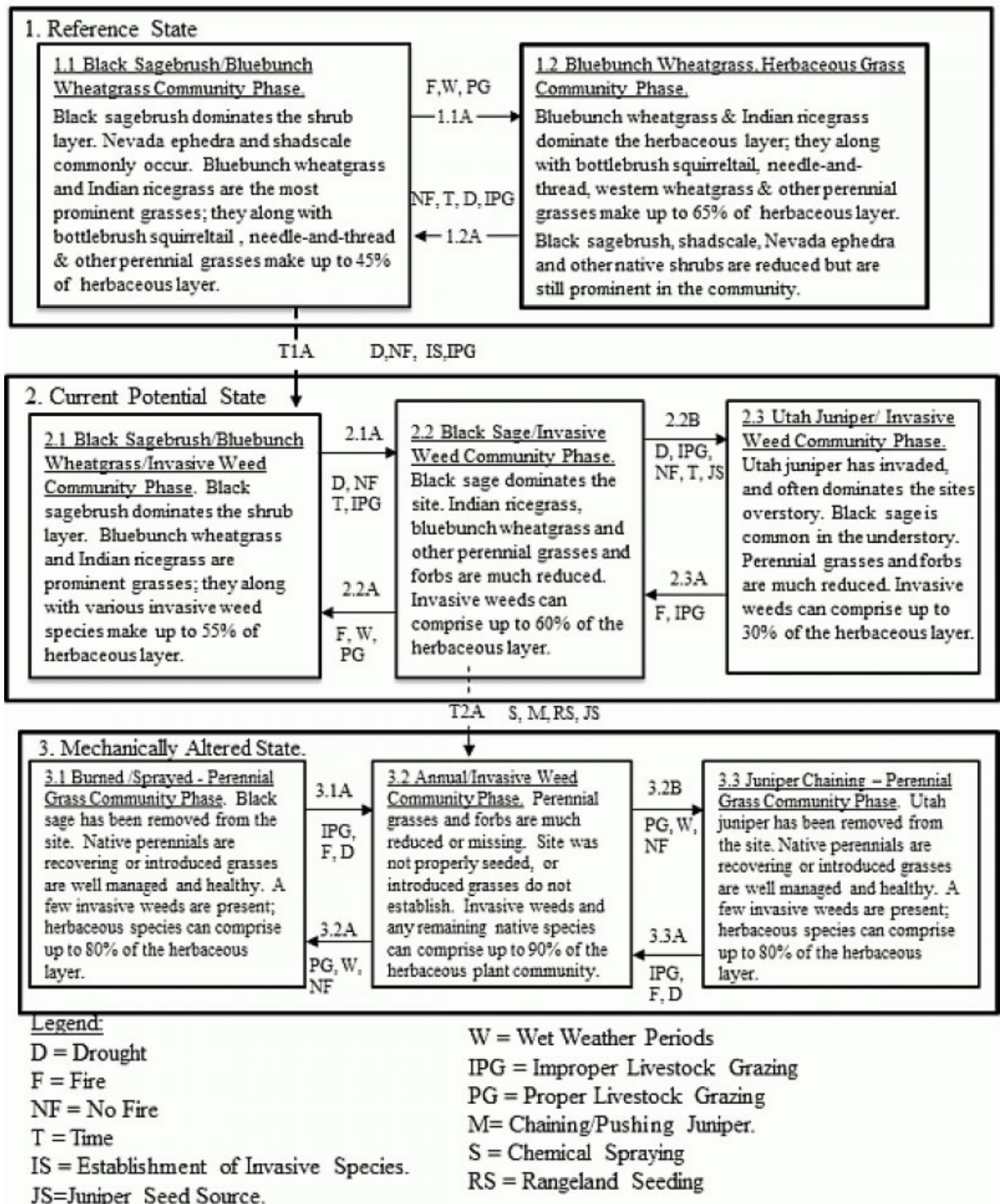


Figure 6. R028AY252UT

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 black sagebrush dominating. Nevada ephedra and shadscale are other common shrub species. Bluebunch wheatgrass and Idaho fescue are co-dominant herbaceous species with needle-and-thread and bottlebrush squirreltail 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 1 to 30% slopes on all aspects. It is usually found on fan terraces and remnants, alluvial flats, hills, ridges and mountain slopes. Its' soils are deep, well to excessive well drained and very gravelly or very cobbly sandy loams or 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, Idaho fescue 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.

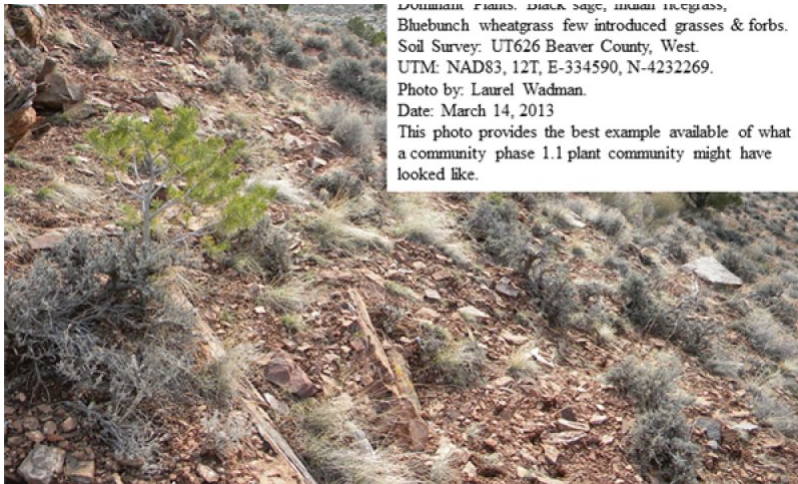


Figure 7. Community Phase 1.1

This reference community is dominated by black sagebrush. Other significant shrubs include shadscale and Nevada ephedra. Bluebunch wheatgrass and Indian ricegrass co-dominate the herbaceous layer. Other commonly occurring grasses include Nevada bluegrass, needle-and-thread and bottlebrush squirreltail. 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, 10 percent forbs, and 50 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 9. Plant community growth curve (percent production by month).
UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 10. Plant community growth curve (percent production by month).
UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Community 1.2 Bluebunch Wheatgrass, Herbaceous Grass Community Phase.

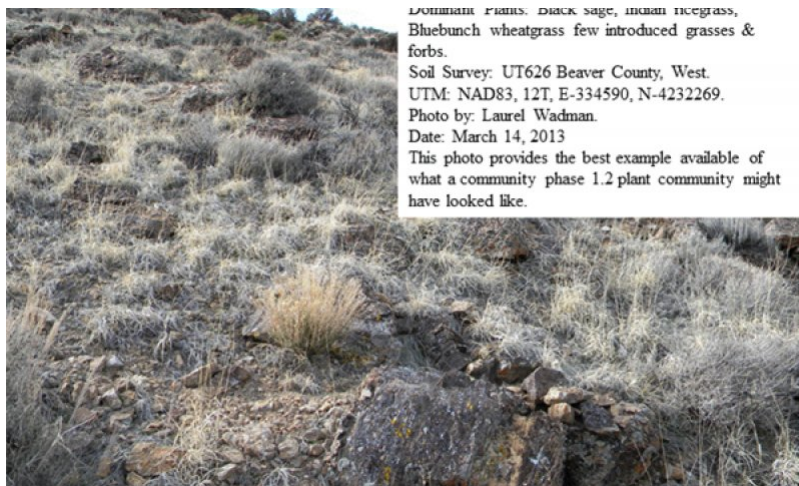


Figure 11. Community Phase 1.2

The visual aspect of this reference community is dominated by bluebunch wheatgrass, Indian ricegrass and other native perennial grasses. Significant shrubs are still present and typically include black sagebrush, Nevada ephedra and shadscale and various horsebrush species. Other commonly occurring grasses include needle-and-thread and bottlebrush squirreltail. 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 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 13. Plant community growth curve (percent production by month).
UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

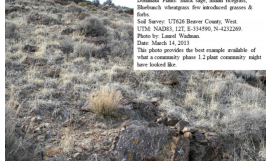
Figure 14. Plant community growth curve (percent production by month).
UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Pathway 1.1A Community 1.1 to 1.2



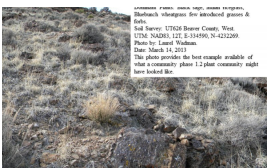
Black Sagebrush/Bluebunch Wheatgrass Community Phase.



Bluebunch Wheatgrass, Herbaceous Grass Community Phase.

This community pathway occurs when winter weather patterns are within normal ranges and some level of fire reduces the black sagebrush canopy, significantly opening the site. This more open canopy allows understory vegetation to increase in production, and under some circumstances, flourish on the site. Proper livestock grazing during these periods can facilitate this process.

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 long-term drought and/or extended periods without fire allows canopies, mainly black sagebrush to significantly increase. This closing canopy event causes understory vegetation to be reduced and eventually nearly eliminated from the site. Drought alone can also reduce native perennial grass production and eventually eliminate some species from the system. Improper livestock grazing during these periods can facilitate this process.

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 Nevada ephedra are other common shrub species. Bluebunch wheatgrass and Indian ricegrass are co-dominant herbaceous species with needle-and-thread, 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, bur buttercup, 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 livestock grazing, 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, grazing and periodic fire. Invasive species are present in various amounts. Indicators: A community dominated by black sagebrush and perennial grasses. 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.

DOMINANT GRASSES: BLACK SAGE, INDIAN RICEGRASS,
introduced grasses & forbs.

Soil Survey: UT626 Beaver County, West.
UTM: NAD83, 12T, E-341206, N-4278723.

Photo by: Laurel Wadman.

Date: March 14, 2013

This photo provides the best example available of what a community phase 2.1 plant community might have looked like.



Figure 15. Community Phase 2.1

This community phase is dominated by black sagebrush. Other significant shrubs include shadscale and Nevada ephedra. Bluebunch wheatgrass and Indian ricegrass are the most prominent grasses. Other commonly occurring grasses include needle-and-thread, Nevada bluegrass and bottlebrush squirreltail. 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 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 17. Plant community growth curve (percent production by month).
UT2521, PNC. Excellent Condition.

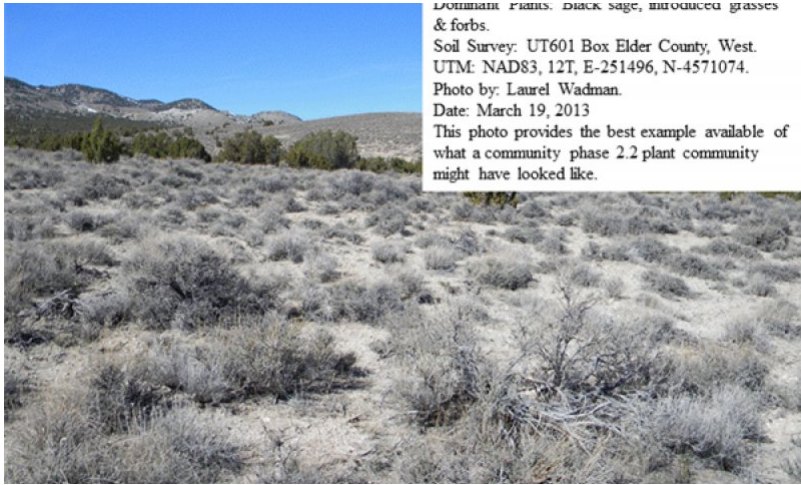
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 18. Plant community growth curve (percent production by month).
UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Community 2.2

Black Sagebrush/Invasive Weed Community Phase.



LOHMAN PLANTS. Black sage, introduced grasses & forbs.
 Soil Survey: UT601 Box Elder County, West.
 UTM: NAD83, 12T, E-251496, N-4571074.
 Photo by: Laurel Wadman.
 Date: March 19, 2013
 This photo provides the best example available of what a community phase 2.2 plant community might have looked like.

Figure 19. Cpmunity Phase 2.2

This community phase is dominated by black sagebrush. Other significant shrubs include shadscale and Nevada ephedra. Bluebunch wheatgrass and Indian ricegrass and other native perennial herbaceous vegetation are much reduced or missing from the site. Non-native species are now present in the all plant communities and often dominate the understory. The sites vegetative composition by air-dry weight is approximately 20 percent perennial and annual grasses, 15 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 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 21. Plant community growth curve (percent production by month). UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 22. Plant community growth curve (percent production by month). UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Community 2.3 Utah Juniper/Invasive Weed Community Phase.

Common plants: Utah juniper, black sage, Indian ricegrass, introduced grasses & forbs.
 Soil Survey: UT626 Beaver County, West.
 UTM: NAD83, 12T, E-341206, N-4278723.
 Photo by: Laurel Wadman.
 Date: March 14, 2013
 This photo provides the best example available of what a community phase 2.3 plant community might have looked like.



Figure 23. Community Phase 2.3

This community phase is dominated by an overstory of invading Utah juniper. Black sagebrush and other shrubs are present and may dominate the shrub layer. Bluebunch wheatgrass and Indian ricegrass and other native perennial herbaceous vegetation are much reduced or missing from the site. Non-native species are now present in the all plant communities and often dominate the herbaceous layer. The sites vegetative composition by air-dry weight is approximately 20 percent perennial and annual grasses, 15 percent forbs, 40 percent shrubs and 25 percent trees. The following tables provide an example of the typical vegetative floristics of a community phase 2.3 plant community.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

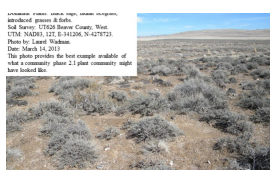
Figure 25. Plant community growth curve (percent production by month).
 UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 26. Plant community growth curve (percent production by month).
 UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Pathway 2.1A Community 2.1 to 2.2



Black Sagebrush/Bluebunch Wheatgrass/Invasive Weed Community Phase.

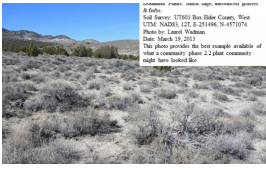


Black Sagebrush/Invasive Weed Community Phase.

This community pathway occurs when long-term drought and/or extended periods without fire allows canopies, mainly black sagebrush to significantly increase. This closing canopy event causes understory vegetation to be

reduced and eventually, nearly eliminated from the site. Drought alone can also reduce native perennial grass production and eventually eliminate some species from the system. Improper livestock grazing during these periods can facilitate this process.

Pathway 2.2A Community 2.2 to 2.1



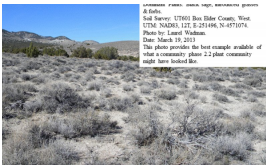
Black Sagebrush/Invasive Weed Community Phase.



Black Sagebrush/Bluebunch Wheatgrass/Invasive Weed Community Phase.

This community pathway occurs when weather patterns are within normal ranges and some level of fire reduces the black sagebrush canopy, significantly opening the site. This more open canopy allows understory vegetation to increase in production. Proper livestock grazing during these periods can facilitate this process.

Pathway 2.2B Community 2.2 to 2.3



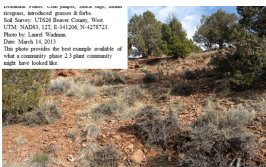
Black Sagebrush/Invasive Weed Community Phase.



Utah Juniper/Invasive Weed Community Phase.

This community pathway occurs when long-term drought and/or extended periods without fire allows Utah juniper to invade and eventually dominate the site. Black sagebrush is still significant in the shrub layer. This closing canopy causes understory vegetation to be reduced and eventually, nearly eliminated from the site. Drought alone can also reduce native perennial grass production and eventually eliminate some species from the system. Improper livestock grazing during these periods can facilitate this process.

Pathway 2.3A Community 2.3 to 2.2



Utah Juniper/Invasive Weed Community Phase.



Black Sagebrush/Invasive Weed Community Phase.

This community pathway occurs when fire reduces or removes the Utah juniper canopy and lessens the amount of black sagebrush canopy on the site. This more open canopy allows understory vegetation to increase in production. Improper livestock grazing during these periods can favor invasive annuals over perennial species.

State 3 Mechanically Altered State.

This state describes plant community phases that have been mechanically treated to remove black sagebrush and/or Utah juniper. Common treatment methods include sagebrush spraying, brush-beating, and where juniper invasion has occurred, chaining. These treated pastures are then typically seeded to introduced forage species such as intermediate or crested wheatgrass, or managed to allow native perennial grasses to recover. Invasive weedy species, including cheatgrass, halogeton, alyssum, bur buttercup, various mustard species and other non-native species, are present and, in some cases, may visually dominate the sites herbaceous layer. On pastures where seedings fail or native species do not respond to management, the site is often covered with annuals which can

prevent site recovery and may periodically burn and re-burn. The primary disturbance mechanisms include; the amount of of invasive herbaceous species present; weather fluctuations, and fire patterns. This state may have lost its resistance to change due to the impact of these disturbances and has less resilience following those disturbances. Definitions: Mechanically Altered State: Plant communities that have been manipulated to remove black sagebrush and/or Utah juniper; long term weather fluctuations; and periodic fire. Indicators: The composition of the herbaceous community determines any additional treatment needs including range seeding and/or proper grazing management to allow native and introduced grasses and forbs to recover. Feedbacks: Natural fluctuations in weather patterns that impact herbaceous 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 Burned/Sprayed - Perennial Grass Community Phase.

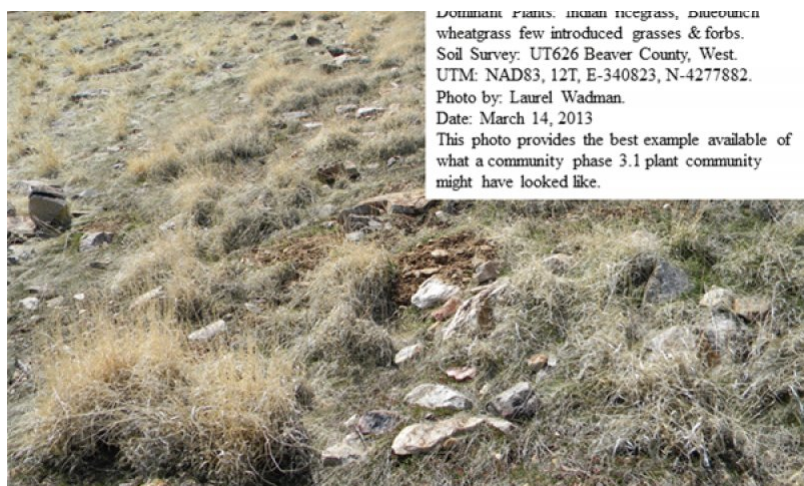


Figure 27. Community Phase 3.1

Site has been burned or sprayed to remove black sagebrush. Nevada ephedra, shadscale and other shrubs may also be removed. Various amounts of native grasses and forbs may still be present but at reduced levels. Site may be managed to allow these species to recover. Where sufficient natives are not present, the site is typically seeded to crested or intermediate wheatgrass. Non-native species are present on the site and will be present in the seeded community. The sites vegetative composition by air-dry weight is approximately 75 percent grasses and introduced weedy species, 10 percent forbs, 15 percent shrubs. The following tables provide an example of the typical vegetative floristics of a community phase 3.1 plant community.

Table 10. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 29. Plant community growth curve (percent production by month).
UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 30. Plant community growth curve (percent production by month).
UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Community 3.2 Annual/Invasive Weed Community Phase.



Figure 31. Community Phase 3.2

This community phase is found following successful burning or spraying to remove black sagebrush or chaining to remove Utah juniper. Other shrubs, including Nevada ephedra, winterfat and shadscale may also be removed from the site. Native herbaceous species such as bluebunch wheatgrass, Indian ricegrass, needle-and-thread and James galleta are either much reduced or missing. Site is either not seeded, or the seeding is a failure. Non-native species are present and produce most of the sites herbage. Annuals such as cheatgrass, Russian thistle and various mustards readily burn and re-burn every few years. This short burn cycle may lock the site into a potentially permanent annual weed community phase. This site has little value for forage production. The sites vegetative composition by air-dry weight is approximately 60% annual grasses, 10 percent perennial grasses, 20 percent annual forbs, and 10 percent shrubs. The following tables provide an example of the typical vegetative floristics of a community phase 3.2 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 33. Plant community growth curve (percent production by month).
UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 34. Plant community growth curve (percent production by month).
UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Community 3.3 Juniper Chaining - Perennial Grass Community Phase.

Site has been burned or chained to remove Utah juniper and possibly black sagebrush. Nevada ephedra, shadscale and other shrubs may also be removed. Various amounts of native grasses and forbs may still be present but at reduced levels. Site may be managed to allow these species to recover. Where sufficient natives are not present, the site is typically seeded to crested or intermediate wheatgrass. Non-native species are present on the site and will be present in the seeded community. The sites vegetative composition by air-dry weight is approximately 75 percent grasses and introduced weedy species, 10 percent forbs, 15 percent shrubs and trees. The following tables provide an example of the typical vegetative floristics of a community phase 3.1 plant community.

Table 12. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	180	300	350
Grass/Grasslike	180	240	270
Forb	40	60	80
Total	400	600	700

Figure 36. Plant community growth curve (percent production by month). UT2521, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	30	5	5	0	0	0	0

Figure 37. Plant community growth curve (percent production by month). UT2522, Good Condition NO. 1. Bluegrass, Black Sagebrush.

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

Pathway 3.1A Community 3.1 to 3.2



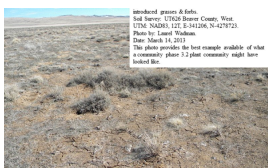
Burned/Sprayed - Perennial Grass Community Phase.



Annual/Invasive Weed Community Phase.

This community pathway occurs when fire removes the remaining black sagebrush canopy from the site. Improper livestock grazing, especially when combined with droughty conditions, can favor invasive annuals over perennial species during these periods.

Pathway 3.2A Community 3.2 to 3.1



Annual/Invasive Weed Community Phase.



Burned/Sprayed - Perennial Grass Community Phase.

This community pathway occurs when weather patterns are within normal ranges and fire does not occur on the site. This combination of events allows black sagebrush canopy to increase on the site. Proper livestock grazing during these periods can facilitate this process.

Pathway 3.2B Community 3.2 to 3.3

This community pathway occurs when weather patterns are within normal ranges and some level of fire reduces the black sagebrush canopy, significantly opening the site. This more open canopy allows understory vegetation to increase in production. Proper livestock grazing during these periods can facilitate this process.

Pathway 3.3A Community 3.3 to 3.2

This community pathway occurs when fire removes the remaining black sagebrush and Utah juniper canopies from the site. Improper livestock grazing, especially when combined with droughty conditions, can favor invasive annuals over perennial species during these periods.

Transition T1A State 1 to 2

This transitional pathway occurs when any combination of improper livestock grazing, prolonged drought or other disturbance causes the perennial herbaceous community to become significantly reduced allowing non-native species such as cheatgrass, halogeton, allysum, Russian thistle and other invasive weeds to become established. Broom snakeweed may also increase during this time. Once invasive species occupy the site, a threshold has been crossed. Cheatgrass, however, has been known to become established in healthy communities on this site.

Transition T2A State 2 to 3

This transitional pathway occurs when the site is sprayed, brush beat, or disked to remove black sagebrush and other unwanted shrubs. Where Utah juniper has invaded, chaining has been completed. The perennial herbaceous community may respond positively to this treatment if proper management is applied. Where insufficient desirable forage species are not available, introduced species are seeded onto the site. Non-native species such as cheatgrass, halogeton, allysum, Russian thistle and other invasive weeds are also present. Broom snakeweed may also increase during this time.

Additional community tables

Table 13. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			200–250	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	60–100	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	60–100	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–

	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderale</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
Shrub/Vine					
3	Primary Shrubs			250–300	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	180–210	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	60–90	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	60–90	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60–90	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–

	yellow rabbitbrush	CHV18	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20–40	–

Table 14. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			300–350	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	100–140	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	100–140	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–

	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossularifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
Shrub/Vine					
3	Primary Shrubs			150–200	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	80–120	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60–90	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	30–60	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	30–60	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20–40	–

Table 15. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					

Grass/Grasslike

1	Primary Grasses			200–250	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	60–100	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	60–100	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
4	Secondary Grasses			40–80	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	50–80	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	red brome	BRRU2	<i>Bromus rubens</i>	30–40	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	30–40	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	30–40	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	10–20	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	10–20	–
	crossflower	CHTE2	<i>Chorispora tenella</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	10–20	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–

	western waterleaf	HTOC	<i>Hydrophyllum occidentale</i>	10-20	-
	prickly lettuce	LASE	<i>Lactuca serriola</i>	10-20	-
	western stoneseed	LIRU4	<i>Lithospermum ruderae</i>	10-20	-
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10-20	-
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10-20	-
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10-20	-
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10-20	-
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10-20	-
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10-20	-
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10-20	-
	Russian thistle	SAKA	<i>Salsola kali</i>	10-20	-
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10-20	-
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	10-20	-
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossularifolia</i>	10-20	-
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10-20	-
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10-20	-
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10-20	-
Shrub/Vine					
3	Primary Shrubs			250-300	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	180-210	-
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	60-90	-
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	60-90	-
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60-90	-
5	Secondary Shrubs			30-60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20-40	-
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20-40	-
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20-40	-
	yellow rabbitbrush	CHV18	<i>Chrysothamnus viscidiflorus</i>	20-40	-
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20-40	-
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20-40	-
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20-40	-
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20-40	-
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20-40	-
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20-40	-
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20-40	-
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20-40	-
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20-40	-
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20-40	-

Table 16. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			200-250	

	cheatgrass	BRTE	<i>Bromus tectorum</i>	100–200	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	30–50	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	30–40	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	30–40	–
	red brome	BRRU2	<i>Bromus rubens</i>	30–40	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Russian thistle	SAKA	<i>Salsola kali</i>	40–80	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	30–50	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	30–50	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	30–50	–
	African mustard	MAAF	<i>Malcolmia africana</i>	30–50	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	30–50	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	10–20	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	10–20	–

	crossflower	CHTE2	<i>Chorispota tenella</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–
Shrub/Vine					
3	Primary Shrubs			250–300	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	250–350	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	60–90	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	60–90	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60–90	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–
	yellow rabbitbrush	CHV18	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20–40	–

Table 17. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			200–250	

	cheatgrass	BRTE	<i>Bromus tectorum</i>	100–200	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	30–50	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	30–40	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	30–40	–
	red brome	BRRU2	<i>Bromus rubens</i>	30–40	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Russian thistle	SAKA	<i>Salsola kali</i>	40–80	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	30–50	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	30–50	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	30–50	–
	African mustard	MAAF	<i>Malcolmia africana</i>	30–50	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	30–50	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	10–20	–
	lambquarters	CHAL7	<i>Chenopodium album</i>	10–20	–

	crossflower	CHTE2	<i>Chorispota tenella</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossularifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–
Shrub/Vine					
3	Primary Shrubs			250–300	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	250–350	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	60–90	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	60–90	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60–90	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20–40	–
Tree					
6	Trees			100–200	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	100–200	–

Table 18. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			400–500	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	250–300	–
	intermediate wheatgrass	THIN6	<i>Thinopyrum intermedium</i>	250–300	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	100–200	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	30–50	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	30–40	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	30–40	–
	red brome	BRRU2	<i>Bromus rubens</i>	30–40	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Russian thistle	SAKA	<i>Salsola kali</i>	40–80	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	30–50	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	30–50	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	30–50	–
	African mustard	MAAF	<i>Malcolmia africana</i>	30–50	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	30–50	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–

	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	10–20	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	10–20	–
	crossflower	CHTE2	<i>Chorisporea tenella</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–

Shrub/Vine

3	Primary Shrubs			200–250	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	75–100	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	60–90	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	60–90	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60–90	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–
	shortsnine horsebrush	TFSP2	<i>Tetradymia spinosa</i>	20–40	–

Table 19. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			200–250	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	100–200	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	30–50	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	30–40	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	30–40	–
	red brome	BRRU2	<i>Bromus rubens</i>	30–40	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Russian thistle	SAKA	<i>Salsola kali</i>	40–80	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	30–50	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	30–50	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	30–50	–
	African mustard	MAAF	<i>Malcolmia africana</i>	30–50	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	30–50	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–

	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	10–20	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	10–20	–
	crossflower	CHTE2	<i>Chorispura tenella</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–

Shrub/Vine

3	Primary Shrubs			100–150	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	50–70	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	30–60	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	30–60	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	30–60	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–
	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–

shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20–40	–
-----------------------	-------	---------------------------	-------	---

Table 20. Community 3.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	Primary Grasses			400–500	
	crested wheatgrass	AGCR	<i>Agropyron cristatum</i>	250–300	–
	intermediate wheatgrass	THIN6	<i>Thinopyrum intermedium</i>	250–300	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	100–200	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	30–50	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	30–50	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	30–50	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	30–50	–
4	Secondary Grasses			40–80	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	30–60	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	30–40	–
	bulbous bluegrass	POBU	<i>Poa bulbosa</i>	30–40	–
	red brome	BRRU2	<i>Bromus rubens</i>	30–40	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	20–30	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–30	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	20–30	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	20–30	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	20–30	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–30	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	20–30	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	20–30	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	20–30	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20–30	–
Forb					
2	Primary Forbs			30–60	
	Russian thistle	SAKA	<i>Salsola kali</i>	40–80	–
	tall tumbled mustard	SIAL2	<i>Sisymbrium altissimum</i>	30–50	–
	western tansymustard	DEPI	<i>Descurainia pinnata</i>	30–50	–
	herb sophia	DESO2	<i>Descurainia sophia</i>	30–50	–
	African mustard	MAAF	<i>Malcolmia africana</i>	30–50	–
	saltlover	HAGL	<i>Halogeton glomeratus</i>	30–50	–
	common sunflower	HEAN3	<i>Helianthus annuus</i>	10–20	–
	hairy false goldenaster	HEVI4	<i>Heterotheca villosa</i>	10–20	–
	western waterleaf	HYOC	<i>Hydrophyllum occidentale</i>	10–20	–
	prickly lettuce	LASE	<i>Lactuca serriola</i>	10–20	–
	western stoneseed	LIRU4	<i>Lithospermum ruderales</i>	10–20	–
	tailcup lupine	LUCA	<i>Lupinus caudatus</i>	10–20	–
	Forb, annual	2FA	<i>Forb, annual</i>	10–20	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	10–20	–

	common yarrow	ACMI2	<i>Achillea millefolium</i>	10–20	–
	low pussytoes	ANDI2	<i>Antennaria dimorpha</i>	10–20	–
	Utah milkvetch	ASUT	<i>Astragalus utahensis</i>	10–20	–
	Hooker's balsamroot	BAHO	<i>Balsamorhiza hookeri</i>	10–20	–
	northwestern Indian paintbrush	CAAN7	<i>Castilleja angustifolia</i>	10–20	–
	curveseed butterwort	CETE5	<i>Ceratocephala testiculata</i>	10–20	–
	lambsquarters	CHAL7	<i>Chenopodium album</i>	10–20	–
	crossflower	CHTE2	<i>Chorispura tenella</i>	10–20	–
	maiden blue eyed Mary	COPA3	<i>Collinsia parviflora</i>	10–20	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	10–20	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	10–20	–
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	10–20	–
	Tolmie's owl's-clover	ORTO	<i>Orthocarpus tolmiei</i>	10–20	–
	low beardtongue	PEHU	<i>Penstemon humilis</i>	10–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	10–20	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	10–20	–
	tall annual willowherb	EPBR3	<i>Epilobium brachycarpum</i>	10–20	–
	cushion buckwheat	EROV	<i>Eriogonum ovalifolium</i>	10–20	–
	shaggy fleabane	ERPU2	<i>Erigeron pumilus</i>	10–20	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	10–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	10–20	–
	yellow salsify	TRDU	<i>Tragopogon dubius</i>	10–20	–
	salsify	TRPO	<i>Tragopogon porrifolius</i>	10–20	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	10–20	–

Shrub/Vine

3	Primary Shrubs			200–250	
	black sagebrush	ARNO4	<i>Artemisia nova</i>	75–100	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	60–90	–
	Nevada jointfir	EPNE	<i>Ephedra nevadensis</i>	60–90	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	60–90	–
5	Secondary Shrubs			30–60	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20–40	–
	Wyoming big sagebrush	ARTRW8	<i>Artemisia tridentata ssp. wyomingensis</i>	20–40	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20–40	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	20–40	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	20–40	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	20–40	–
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	20–40	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	20–40	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	20–40	–
	bud sagebrush	PIDE4	<i>Picrothamnus desertorum</i>	20–40	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–40	–

	spineless horsebrush	TECA2	<i>Tetradymia canescens</i>	20–40	–
	Nuttall's horsebrush	TENU2	<i>Tetradymia nuttallii</i>	20–40	–
	shortspine horsebrush	TESP2	<i>Tetradymia spinosa</i>	20–40	–
Tree					
6	Trees			50–75	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	50–70	–

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 Indian ricegrass. 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 B with hydrology curve numbers ranging from 61 to 86. On these sites runoff potential is moderately low and infiltration rates are moderately, 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

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

Other products

None.

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, 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. 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 R11W S21
General legal description	SW ¼, NW ¼, Section 21, Township 9N, Range 11W

Other references

- Baily, R.G. 1995. Description of the ecoregions of the United States. Available http://www.fs.fed.us/land/ecosysmgmt/ecoreg1_home.html. Accessed February 27, 2008.
- Belnap, J. and S.L. Phillips. 2001. Soil biota in an ungrazed grassland: response to annual grass (*Bromus tectorum*) invasion. *Ecological Applications*. 11:1261-1275
- Chapin, S.F., B.H. Walker, R.J. Hobbs, D.U. Hooper, J.H. Lawton, O.E. Sala, and D. Tilman. 1997. Biotic control over the functioning of ecosystems. *Science*. 277:500-504
- Cox R.D. and V.J. Anderson. 2004. Increasing native diversity of cheatgrass-dominated rangeland through assisted succession. *Journal of Range Management*. 57:203-210,
- Howard, Janet L. 2003. *Atriplex canescens*. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/>. Accessed on February 25, 2008.
- Knight, A.P. and R.G. Walter. 2001. A guide to plant poisoning of animals in North America. Teton NewMedia. Jackson, WY.
- National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: <http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook>. Accessed February 25, 2008.
- NRCS Grazing Lands Technology Institute. 2003. National Range and Pasture Handbook. Fort Worth, TX, USA: US Department of Agriculture, Natural Resources Conservation Service, 190-VI-NRPH.
- Tilley, D.J. 2007. Reintroducing native plants to the American West. Aberdeen Plant Materials Center, Aberdeen, ID, USA: US Department of Agriculture. Available: <http://plant-materials.nrcs.usda.gov/idpmc/publications.html>. Accessed February 22, 2008.
- Utah Climate Summaries. 2008. Available: <http://www.wrcc.dri.edu/summary/climsmut.html>. Accessed on February 25, 2008.
- Utah Division of Wildlife Resources. 2007.
- Woods, A.J., D.A. Lammers, S.A. Bryce, J.M. Omernik, R.L. Denton, M. Domeier, and J.A. Comstock. 2001. Ecoregions of Utah (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:1,175,000).

Contributors

GR David J. Somorville
GR 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)	Jack Alexander, Range Specialist, Synergy Resource Solutions, Inc.; Julia Kluck, Soil Scientist, Synergy Resource Solutions, Inc.; Shane Green, State Range Specialist, Utah NRCS. Revised to include updated terminology and concepts by V. Keith Wadman (NRCS Retired).
Contact for lead author	Shane.Green@ut.usda.gov
Date	03/05/2013
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** A few rills present. Rills should be <1 inch deep, fairly short (<6 feet), and somewhat widely spaced (6 to 9 Feet). Rill development may increase slightly following large storm events or during spring runoff events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop).

- 2. Presence of water flow patterns:** Very Minor. Water flow patterns will be short (2-5') and meandering; interrupted by plants and exposed rocks. Some evidence of erosion or deposition associated with flow patterns. Where slopes exceed 5%, water flow patterns may be longer (5-10').

- 3. Number and height of erosional pedestals or terracettes:** Perennial plants may have small pedestals (1") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (3-6") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

Well-developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-35% bare ground (soil with no protection from raindrop impact). Herbaceous communities are most likely to have lower values. As species composition by shrubs increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to raindrop splash erosion should be recorded as bare ground. Very few if any bare spaces of greater than 1 square foot.

- 5. Number of gullies and erosion associated with gullies:** No gullies present 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 10% 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:** Very minor evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust. Gravel or desert pavement protects the site from wind scour.
-
7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water and wind movement. Very minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants. Some leaves, stems, and small twigs may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.
-
8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have an erosion rating of 5 or 6 under plant canopies and a rating of 4 to 5 in the interspaces with an average rating of 5 using the soil stability kit test.
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Hiko Peak) Soil surface horizon is typically 2 inches deep. Texture is a cobbly loam. Structure is typically weak thin platy. Color is light brownish gray (10YR 6/2). An ochric horizon extends to a depth of 7 inches. An ochric horizon is a surface horizon lacking fine stratification and which is either light colored, or thin, or has a low organic carbon content, or is massive and (very) hard when dry. The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces.
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Bunchgrasses and shrubs are equally important for increasing infiltration and reducing runoff. Litter plays a role in increasing infiltration and decreasing runoff. Plants provide microhabitat for seedlings, catch litter and soil, and slow raindrops and runoff. Vascular plants and/or well-developed biological soil crusts (where present) will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Interspaces between plants and any well-developed biological soil crusts (where present) may serve as water flow patterns during episodic runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced. Shrubs catch snow, slow wind evaporation, and provide microhabitat for seedling establishment.
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Naturally occurring soil horizons may be harder than the surface because of an accumulation of clay or calcium carbonate and should not be considered as compaction layers.
-
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Non-Sprouting shrubs (black sagebrush, shadscale), > Perennial bunchgrasses (bluebunch wheatgrass, Indian ricegrass) >> Sprouting Shrub (winterfat).
- Sub-dominant: Rhizomatous Grasses (blue grama, James galleta) > Perennial Forbs (Gooseberryleaf globemallow)

Other: A wide variety of other perennial grasses and both perennial and annual forbs are expected to occur on this site.

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

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. Some bunchgrass and shrub mortality may occur during severe droughts, particularly on the shallower and coarser soils associated with this site.
-

14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 15-25% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.
-

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 600#/acre on an average year but could range from 400 - 700#/acre during periods of prolonged drought or above average precipitation. Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.
-

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Cheatgrass, Russian thistle, halogeton, alyssum, various mustard species, and Utah juniper.
-

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
-