USDA Natural Resources Conservation Service

Ecological site R035XY309UT
Upland Sand (Mormon Tea)

Accessed: 05/21/2024

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.

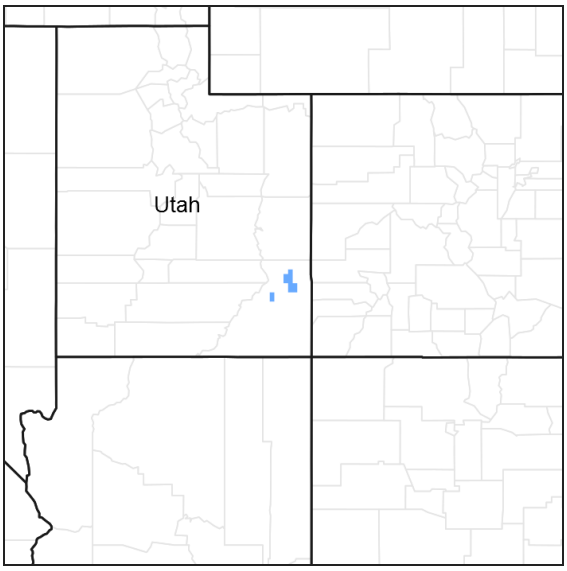


Figure 1. Mapped extent

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): 035X–Colorado Plateau

This ecological site occurs in the northern portion of MLRA 35, Colorado Plateau Province. It is found principally in the in the Canyonlands and High Plateaus of Utah sections within that MLRA. This area has been stucturally uplifted over time while rivers flowing across it were cutting down into its bedrock. Areas of shale, sandstone, limestone, dolomite, and volcanic rock outcrop are found throughout the region.

Classification relationships

Modal Soil: Mido LFS, Moist — mixed, mesic Ustic Torripsamments

Type Location: See Canyonlands Soil Survey Utah

Associated sites

R035XY306UT	**Upland Loam (Basin Big Sagebrush)**
R035XY312UT	**Upland Shallow Loam (Black sagebrush)**
R035XY315UT	**Upland Shallow Loam (Pinyon-Utah Juniper) AWC <3**

Similar sites

R035XY214UT	**Semidesert Sand (Cutler Jointfir)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ephedra viridis* (2) *Artemisia tridentata ssp. tridentata*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Hesperostipa comata*

Physiographic features

This site occurs on sand drifts and sand shadows on structural benches and cuestras. Slopes range from 0 to 8 percent. Runoff potential ranges from slight to low.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Cuesta (3) Dune
Flooding frequency	None
Ponding frequency	None
Elevation	1,859–1,951 m
Slope	2–8%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by cold, snowy winters and warm moist summers. About 45 percent of the precipitation comes as snow from November through March. On the average, May through June are the driest months and July through October are the wettest months, most of which occurs as convection thunderstorms. Mean annual air temperatures range from 48-50 degrees Fahrenheit. Soil temperatures are mesic. Precipitation is variable from month to month and year to year but averages between 13-18 inches. In average years, plants begin growth around March 10 and end growth around October 10.

Table 3. Representative climatic features

Frost-free period (average)	121 days
Freeze-free period (average)	148 days
Precipitation total (average)	381 mm

Influencing water features

There are no influencing water features on this ecological site.

Soil features

This sites soils are classified as deep Ustic Torripsamments and are excessively drained. They formed in eolian deposits derived mainly from sandstone parent materials. The dry surface color is typically a reddish brown. Runoff potential is low. The soil temperature and moisture regimes are mesic and ustic respectively. Surface and subsurface textures are generally loamy fine sands. Soils are nonsaline and the water supplying capacity is 4.8 to 6.6 inches. Surface rock fragments are unusual. This site has been used in the following soil surveys and has been

correlated to the following components:

UT633 – Canyonlands Area – Mido

Typical soil profile (Mido):

A--0-2 inches; reddish brown (5YR 5/4) loamy fine sand; single grain, loose structure; slightly effervescent; moderately alkaline.

C--2-60 inches; reddish brown (5YR 5/4) loamy fine sand; single grain, soft, very friable structure; moderately effervescent; moderately alkaline.

Table 4. Representative soil features

Parent material	(1) Eolian deposits–sandstone
Surface texture	(1) Loamy fine sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Rapid
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.11–9.65 cm
Calcium carbonate equivalent (0-101.6cm)	1–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1–5
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site occurs on deep to very deep, somewhat poorly developed sandy soils found on structural benches and cuestas in Major Land Resource Area (MLRA) 35-The Colorado Plateau. Mormon tea, fourwing saltbush and basin big sage are the most common shrubs. A mixture of warm and cool season grasses including Indian ricegrass, needle-and-thread and blue grama form a dense herbaceous layer.

This site is small in extent, mostly occurring north of Monticello, Utah. The site developed under Colorado Plateau climatic conditions and included natural influences of herbivory, fire, and climate. The natural disturbance regime consisted of fairly frequent fires ignited by both natural causes and Native Americans. It is estimated that the historic fire return interval was 35-100+ years depending on fine fuel accumulations (Howard, 2003).

This ecological site has been grazed by domestic livestock since they were first introduced into the area. This livestock introduction, with its the use of fencing and the development of reliable water sources influenced the disturbance regime historically associated with this ecological site.

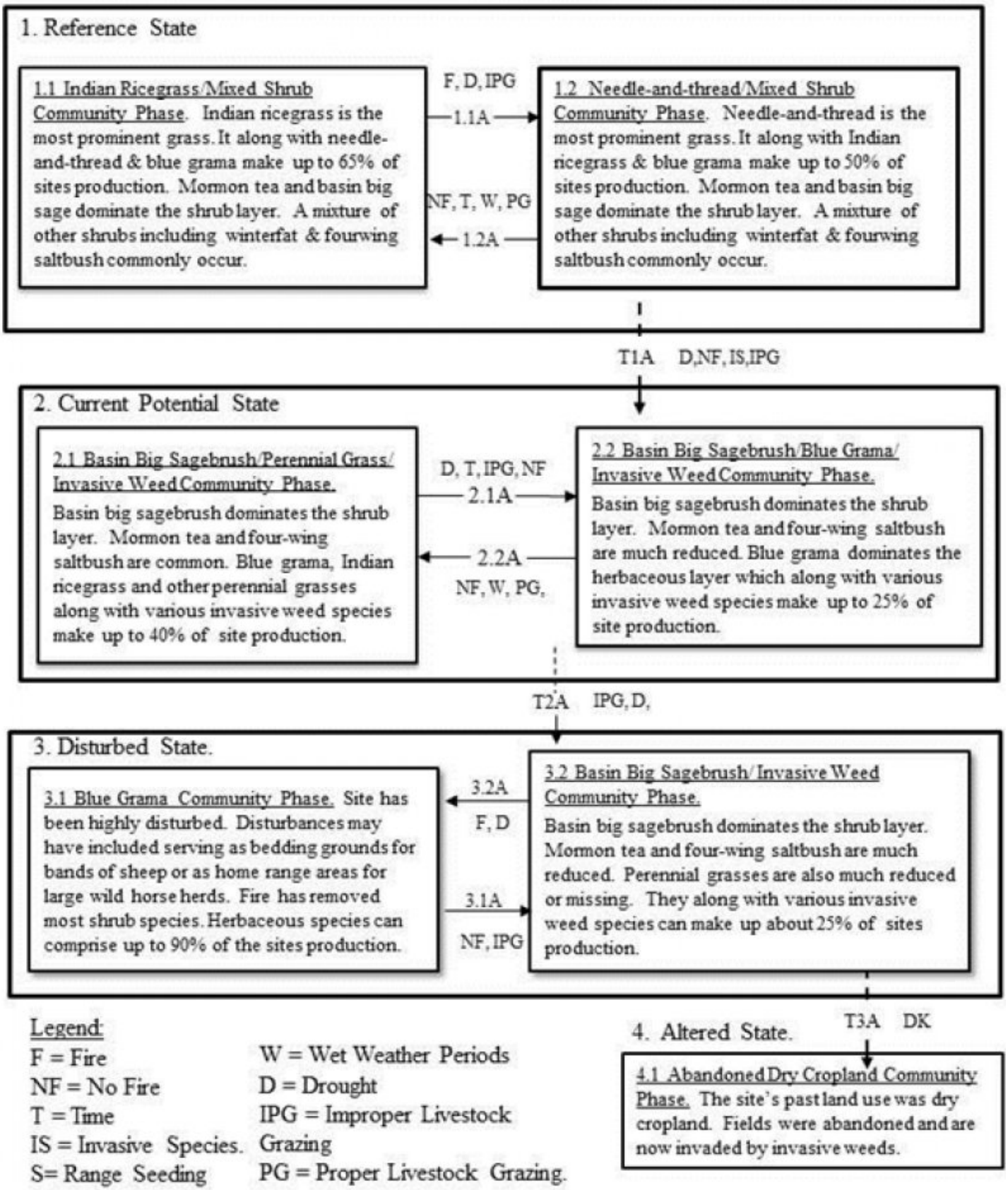
Fire would most typically occur on this site following good moisture years which would create sufficient fine fuels for burning, followed by a source of ignition such as lightening. In some cases, the introduction of domestic livestock reduced these fine fuels, increasing fire periods. In addition to influencing this sites fire regime, improperly managed livestock grazing, where it occurred, may have caused this site to depart from the reference plant community. Continued improper domestic livestock grazing likely removed the native perennial grasses and shrubs from the system creating bare interspaces, which increased erosion, active duning, and created opportunities for invasive plants to establish.

Other disturbance mechanisms including extended drought, changes in the site's drainage patterns, alluvial deposition, insect herbivory, off road vehicle use, and prolonged rodent activity can facilitate this sites transition into different plant communities or cause the transition from one stable state to another. Once these changes occur, a return to previous states may not be possible without major energy inputs.

The following State and Transition diagram describes the most common plant communities found on this site. They do 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. Both ocular and measured data was collected and utilized in developing this model.

State and transition model

State and Transition Model
State: Utah
Site Type: Rangeland
MLRA: D-35- Colorado Plateau
R035XY309UT – Upland Sand (Mormon Tea)



Legend:
F = Fire
NF = No Fire
T = Time
IS = Invasive Species.
S= Range Seeding
DK= Disking
W = Wet Weather Periods
D = Drought
IPG = Improper Livestock Grazing
PG = Proper Livestock Grazing.

Figure 6. R035XY309UT

State and Transition Model
State: Utah
Site Type: Rangeland
MLRA: D-35- Colorado Plateau
R035XY309UT – Upland Sand (Mormon Tea)

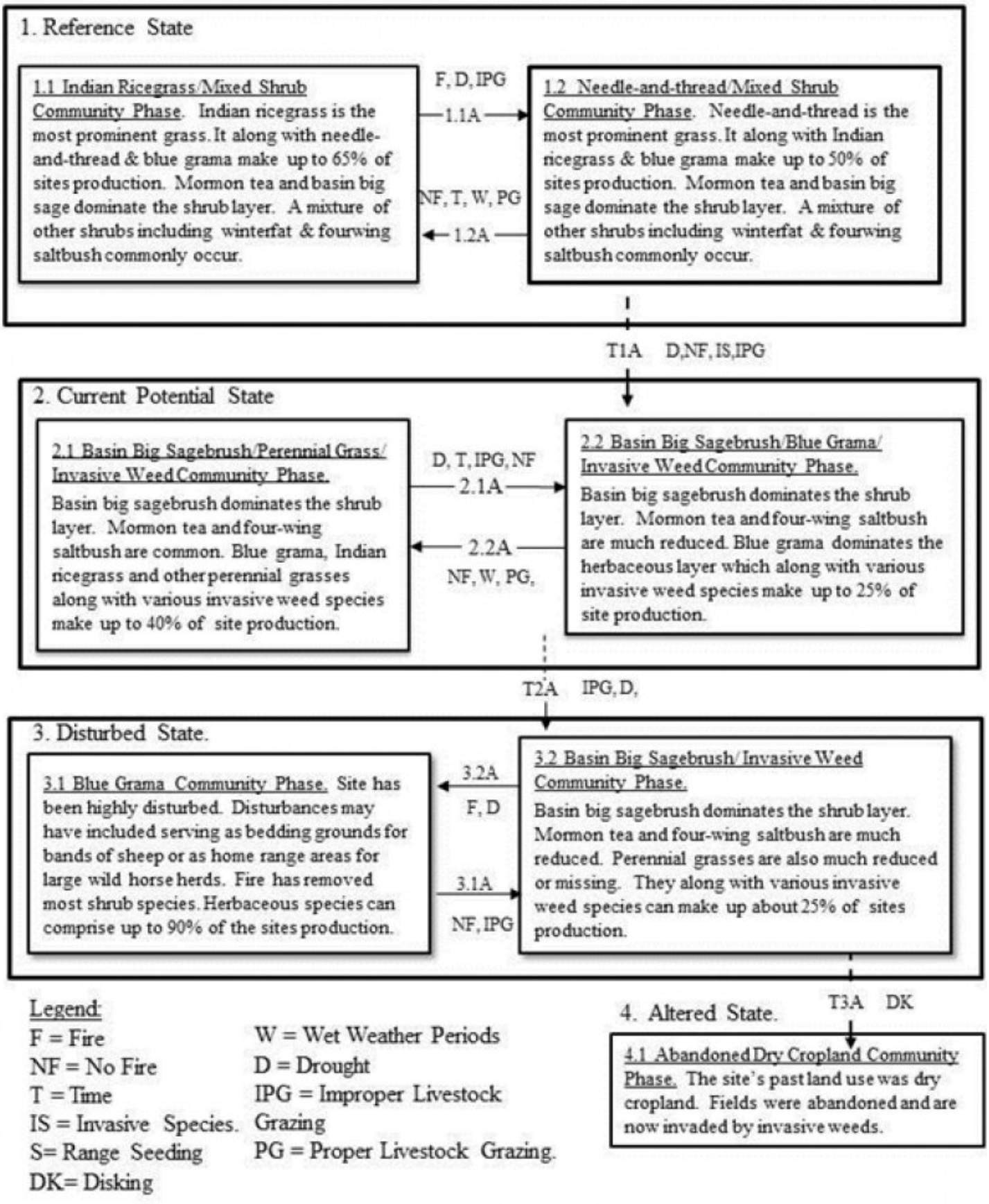


Figure 7. R035XY309UT

State 1
Reference State

This Reference State describes the natural range of variability as influenced by the ecological dynamics of this site. This state includes those biotic communities that will become established when all successional sequences are completed under a natural disturbance regime. This state has a well developed shrub layer with Mormon tea and basin big sagebrush dominating. A mixture of other shrubs including fourwing saltbush, Torrey jointfir and green rabbitbrush are common. The herbaceous layer is composed of both warm and cool season grasses with Indian ricegrass, needle-and-thread and blue grama dominating. A wide range of forbs are commonly found. Two-needle pinyon has been known to invade this site when it is in close proximity to a seed source. Primary disturbance mechanisms for this site include fire, grazing by native herbivores, prolonged rodent activity, insect herbivory, alluvial deposition and changes in the sites drainage patterns. These disturbances coupled with weather events dictate the dynamics that occur within the natural range of variability. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience after natural disturbances. When natural disturbances occur, the rate of recovery is relatively rapid due to niches being filled with highly adapted native vegetation. Terminology: Reference State: Community phases influenced by fire, native herbivore grazing, insect herbivory, alluvial deposits, time without disturbance, and climate. Indicators: A well developed native perennial warm and cool season grass community with a diverse shrub overstory. Feedbacks: Establishment of non-native invasive species in the understory. Regular fires that maintain the perennial grass understory and the establishment of shrubs. At-risk Community Phase: All communities are at risk for invasion by non-native plants. Trigger: Establishment of non-native plant species.

Community 1.1
Indian Ricegrass, Mixed Shrub Community Phase.

Figure 8. Community Phase 1.1

This community phase of the ecological site is characterized by a shrub layer dominated by Mormon tea, fourwing saltbush and basin big sagebrush. A wide array of other shrubs are also commonly present. Indian ricegrass, needle-and-thread and blue grama dominate the herbaceous layer. Other commonly occurring herbaceous species include sand dropseed, bottlebrush squirreltail and scarlet globemallow. The appearance of most forbs is episodic in nature and is closely tied to precipitation events. Air dry weight is approximately 35 percent shrubs, 10 percent forbs, and 55 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the vegetative floristics of a community phase 1.1 plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	673	1009
Shrub/Vine	280	364	560
Forb	56	84	112
Total	**784**	**1121**	**1681**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Needle-and-thread, Mixed Shrub Community Phase.

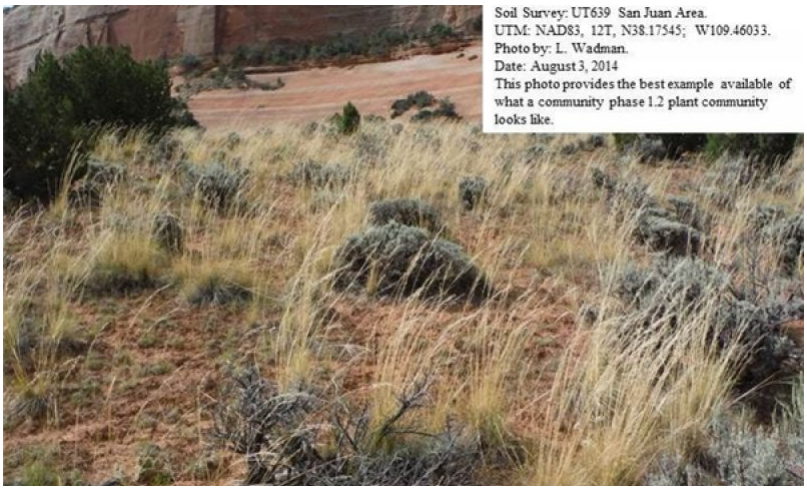


Figure 10. Community Phase 1.2

This community phase of the ecological site is characterized by a shrub layer dominated by Mormon tea, fourwing saltbush and basin big sagebrush. A wide array of other shrubs are also commonly present. Needle-and-thread, Indian ricegrass and blue grama dominate the herbaceous layer. Other commonly occurring herbaceous species

include sand dropseed, bottlebrush squirreltail and scarlet globemallow. The appearance of most forbs is episodic in nature and is closely tied to precipitation events. Air dry weight is approximately 50 percent shrubs, 10 percent forbs, and 40 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the vegetative floristics of a community phase 1.2 plant community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	673	1009
Shrub/Vine	280	364	560
Forb	56	84	112
Total	**784**	**1121**	**1681**

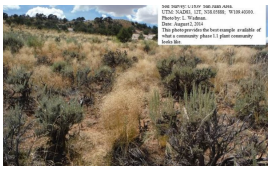
Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2



Indian Ricegrass, Mixed Shrub Community Phase.

Needle-and-thread, Mixed Shrub Community Phase.

This pathway describes the affects of any combination of fire activity and dry weather periods which may decrease Indian ricegrass and basin big sage and increase needle-and-thread and warm season grasses. Improper livestock management and heavy wildlife browsing may allow for increases in less palatable species.

Pathway 1.2A
Community 1.2 to 1.1

Needle-and-thread, Mixed Shrub Community Phase.

Indian Ricegrass, Mixed Shrub Community Phase.

This pathway describes the affects of any combination of no fire activity for long periods of time and wet weather periods which may increase the amount palatable herbaceous vegetation. Good livestock management and moderate wildlife browsing will allow for improved vigor in herbaceous species.

State 2
Current Potential State.

The Current Potential State is similar to the reference state except that non-native plant species are now present in all plant community phases. The primary disturbance mechanisms in this state can be natural or human induced. Events, such as improper livestock grazing, prolonged rodent activity, changes in historic fire regimes, improper OHV use, insect herbivory, or drought may influence this site. Any shift in species composition will affect nutrient cycling, soil-water relationships, hydrology, and soil stability. Dominant grasses include both warm and cool season; however many times heavy spring grazing will remove the cool season grasses and heavy late summer and early fall grazing will remove the warm season grasses. This state is losing resistance to disturbances and resilience after disturbance. Invasive plants are beginning to fill the niches and establish on the site. Terminology: Current Potential State: Plant communities influenced by both natural and man influenced events, including rodent activity, improper OHV use, livestock grazing, insect herbivory, fire, time with out disturbances, and climatic fluctuations. Indicators: A perennial cool and warm season grass understory with basin big sage or fourwing saltbush forming the dominant visual aspect. Non-native species are now present in all plant communities. Feedbacks: Extended drought, improper livestock grazing, or other disturbance that changes the ecological dynamics of the site. Regular fires or properly managed domestic livestock grazing to maintain the understory and the establishment of shrubs. At-risk Community Phase: All communities are at risk; however plant community 2.2 is most at risk due to its limited understory. Trigger: Disturbance that facilitates the dominance of invasive forbs and/or grasses.

Community 2.1
Basin Big Sage, Perennial Grass, Invasive Weed Community Phase.

Figure 12. Community Phase 2.1

This community phase of the ecological site is characterized by a shrub layer dominated by basin big sagebrush. A wide array of other shrubs are also commonly present. Indian ricegrass, needle-and-thread and blue grama dominate the herbaceous layer. Other commonly occurring herbaceous species include sand dropseed, bottlebrush squirreltail and scarlet globemallow. Invasive weed species including Russian thistle, ragweed and Russian knapweed are present in the plant community. Air dry weight is approximately 60 percent shrubs, 10 percent forbs, and 30 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the vegetative floristics of a community phase 2.1 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	673	1009
Shrub/Vine	280	364	560
Forb	56	84	112
Total	**784**	**1121**	**1681**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Basin Big Sage, Blue Grama, Invasive Weed Community Phase.

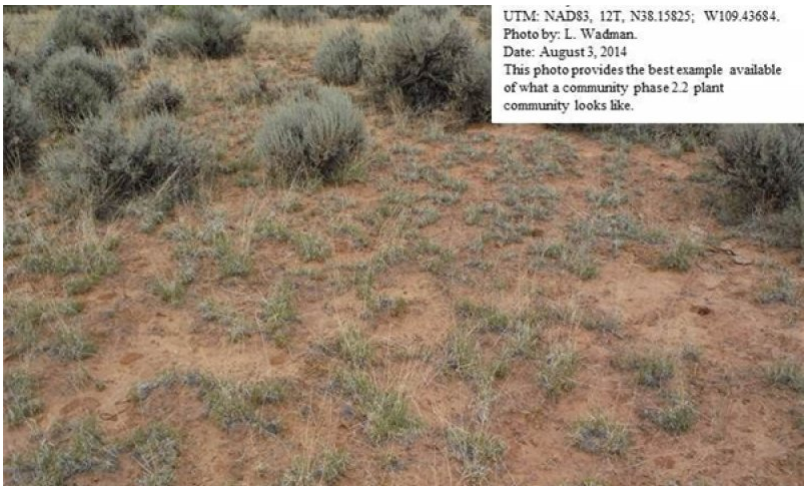


Figure 14. Community Phase 2.2

This community phase of the ecological site is characterized by a shrub layer dominated by basin big sagebrush. Other shrubs are much reduced or missing. Blue grama dominates the herbaceous layer. Other perennial herbaceous species are much reduced. Invasive weed species including Russian thistle, ragweed and Russian knapweed are present in the plant community. Air dry weight is approximately 75 percent shrubs, 5 percent forbs, and 20 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the vegetative floristics of a community phase 2.2 plant community.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	673	1009
Shrub/Vine	280	364	560
Forb	56	84	112
Total	**784**	**1121**	**1681**

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%

Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

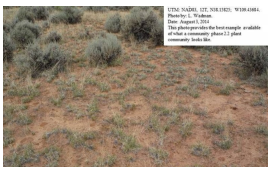
Pathway 2.1A
Community 2.1 to 2.2

Basin Big Sage, Perennial Grass, Invasive Weed Community Phase.

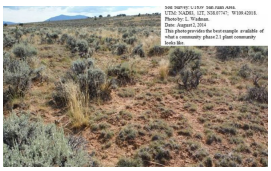
Basin Big Sage, Blue Grama, Invasive Weed Community Phase.

This pathway describes the affects of a long term drought that may not allow for sufficient precipitation to support herbaceous species and/or long periods without fire. Heavy wildlife browsing can allow for non-palatable shrubs to increase. Heavy livestock grazing will reduce palatable herbaceous species.

Pathway 2.2A
Community 2.2 to 2.1



Basin Big Sage, Blue Grama, Invasive Weed Community Phase.



Basin Big Sage, Perennial Grass, Invasive Weed Community Phase.

This pathway describes the affects of any combination of no fire activity for long periods of time and wet weather periods which may increase the amount palatable herbaceous vegetation. Good livestock management and moderate wildlife browsing will allow for improved vigor in herbaceous species.

State 3
Disturbed State.

The Disturbed State of this ecological site has undergone major change. These changes have removed most of the sites original perennial vegetation. Part of this state may have served as bedding grounds for bands of sheep or as home range for wild horse herds. Fire may have removed shrub species including basin big sage and other native shrubs from the site. Terminology: Current Potential State: Plant communities influenced by events including overgrazing, disking, rodent activity and climatic fluctuations. Indicators: Non-native species are now present in all plant communities. Feedbacks: Extended drought and other disturbance that changes the ecological dynamics of the site. At-risk Community Phase: All communities are at risk. Trigger: Disturbance that facilitates the dominance of invasive forbs and/or grasses.

Community 3.1
Blue Grama Community Phase.

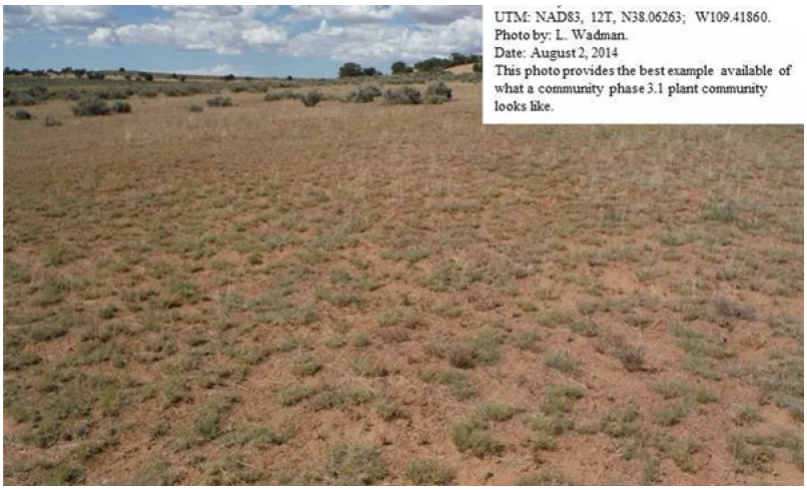


Figure 16. Community Phase 3.1

This community phase of this ecological site has undergone major change. These changes have removed most of the sites original perennial vegetation. This site may have served as bedding grounds for bands of sheep or as home range for wild horse herds. Blue grama dominates the sites biomass while most other native perennial species are missing. Invasive weed species including Russian thistle, ragweed and Russian knapweed are present in the plant community. Air dry weight is approximately 5 percent shrubs, 5 percent forbs, and 90 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the vegetative floristics of a community phase 3.1 plant community.

Table 17. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	673	1009
Shrub/Vine	280	364	560
Forb	56	84	112
Total	**784**	**1121**	**1681**

Table 18. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%

Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 19. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 3.2
Basin Big Sage, Invasive Weed Community Phase.

Figure 18. Community Phase 3.2

This community phase of the ecological site is characterized by a shrub layer dominated by basin big sagebrush. Other shrubs are much reduced or missing. Other perennial herbaceous species are much reduced. Invasive weed species including Russian thistle, ragweed and Russian knapweed are present and may the herbaceous layer. Air dry weight is approximately 75 percent shrubs, 5 percent forbs, and 20 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the vegetative floristics of a community phase 3.2 plant community.

Table 20. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	673	1009
Shrub/Vine	280	364	560
Forb	56	84	112
Total	**784**	**1121**	**1681**

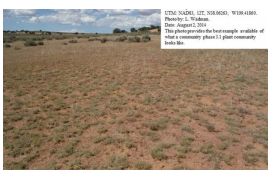
Table 21. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 22. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 3.2A
Community 3.1 to 3.2

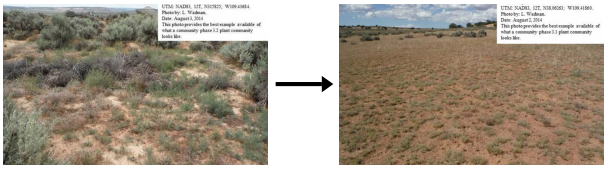


Blue Grama Community Phase.

Basin Big Sage, Invasive Weed Community Phase.

This pathway describes the affects of long term drought that may not allow for sufficient precipitation to support herbaceous species. Fire at this time can remove the basin big sage, leaving a stand of blue grama.

Pathway 3.1A
Community 3.2 to 3.1



Basin Big Sage, Invasive Weed Community Phase.

Blue Grama Community Phase.

This pathway describes the affects of long term drought that may not allow for sufficient precipitation to support herbaceous species. A lack of fire at this time can increase the amount basin big sage.

State 4
Altered State.

The Altered State of this ecological site has been mechanically disked to remove all perennial vegetation. The site was then typically converted to dry cropland. Where this cropland has been abandoned, invasive weeds may dominate the site. This state has lost significant resistance to natural disturbances. Terminology: Current Potential State: Plant communities influenced by man influenced events including disking, rodent activity and climatic fluctuations. Indicators: Non-native species now dominate all plant communities. Feedbacks: Extended drought and other disturbance that changes the ecological dynamics of the site. At-risk Community Phase: All communities are at risk. Trigger: Disturbance that facilitates the dominance of invasive forbs and/or grasses.

Community 4.1
Abandoned Dry Cropland Community Phase.

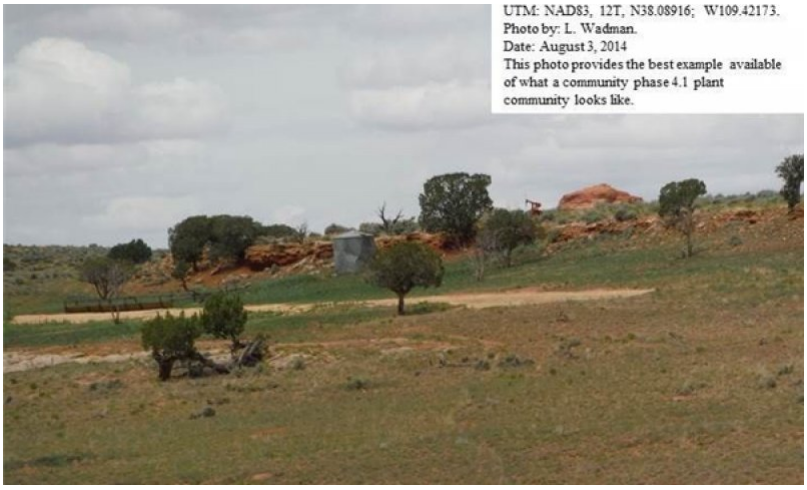


Figure 20. Community Phase 4.1

This community phase of the ecological site has been deep disked to remove all vegetation. The site was then used for dry cropland. Over time, these fields were abandoned and are now invaded by various invasive weed species. The following tables present a typical example of the vegetative floristics of a community phase 4.1 plant community.

Table 23. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	112	168	224
Total	**112**	**168**	**224**

Table 24. Ground cover

Tree foliar cover	0%

Shrub/vine/liana foliar cover	19-21%
Grass/grasslike foliar cover	39-41%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 25. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	–	39-41%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Transition T1A
State 1 to 2

This pathway describes the affects of long term drought that may not allow for sufficient precipitation to support herbaceous species and/or long periods without fire. Heavy wildlife browsing can allow for non-palatable shrubs to increase. Heavy livestock grazing will reduce palatable herbaceous species. Invasive species may invade the site.

Transition T2A
State 2 to 3

This pathway describes the affects of long term drought that may not allow for sufficient precipitation to support herbaceous species and/or long periods without fire. Heavy wildlife browsing can allow for non-palatable shrubs to increase. Heavy livestock grazing will reduce palatable herbaceous species. Invasive species may increase on the site.

Transition T3A
State 3 to 4

This transition occurs when the site is deep disked to remove all vegetation. These sites were used for dry cropland production for years and then abandoned.

Additional community tables

Table 26. Community 1.1 plant community composition

				Annual Production	Foliar Cover

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			336–560	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	168–280	–
	needle and thread	HECO26	*Hesperostipa comata*	112–168	–
	blue grama	BOGR2	*Bouteloua gracilis*	56–112	–
2	**Sub-Dominant Grasses**			112–247	
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	34–56	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	11–34	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–34	–
	spike dropseed	SPCO4	*Sporobolus contractus*	11–34	–
Forb					
3	**Forbs**			202–493	
	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	11–34	–
	bastard toadflax	COUM	*Comandra umbellata*	11–34	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	11–34	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–34	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	11–34	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	11–34	–
	pale evening primrose	OEPA	*Oenothera pallida*	11–34	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	11–34	–
	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	–
	low beardtongue	PEHU	*Penstemon humilis*	11–34	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	11–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–34	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	11–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–34	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	11–34	–
Shrub/Vine					
4	**Dominant Shrubs**			168–392	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–168	–
	mormon tea	EPVI	*Ephedra viridis*	56–168	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	56–112	–
5	**Sub-Dominant Shrubs**			78–191	

	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	34–56	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	Great Basin fishhook cactus	SCPU6	*Sclerocactus pubispinus*	11–34	–

Table 27. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			336–560	
	needle and thread	HECO26	*Hesperostipa comata*	168–280	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	112–168	–
	blue grama	BOGR2	*Bouteloua gracilis*	56–112	–
2	**Sub-Dominant Grasses**			112–247	
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	34–56	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	11–34	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–34	–
	spike dropseed	SPCO4	*Sporobolus contractus*	11–34	–
Forb					
3	**Forbs**			202–493	
	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	11–34	–
	bastard toadflax	COUM	*Comandra umbellata*	11–34	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	11–34	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–34	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	11–34	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	11–34	–
	pale evening primrose	OEPA	*Oenothera pallida*	11–34	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	11–34	–
	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	–
	low beardtongue	PEHU	*Penstemon humilis*	11–34	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	11–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–34	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	11–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	

	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–34	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	11–34	–
Shrub/Vine					
4	**Dominant Shrubs**			168–392	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–168	–
	mormon tea	EPVI	*Ephedra viridis*	56–168	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	56–112	–
5	**Sub-Dominant Shrubs**			78–191	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	34–56	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	Great Basin fishhook cactus	SCPU6	*Sclerocactus pubispinus*	11–34	–

Table 28. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			336–560	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	56–112	–
	blue grama	BOGR2	*Bouteloua gracilis*	56–112	–
	cheatgrass	BRTE	*Bromus tectorum*	56–112	–
	needle and thread	HECO26	*Hesperostipa comata*	56–112	–
2	**Sub-Dominant Grasses**			112–247	
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	34–56	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	11–34	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–34	–
	spike dropseed	SPCO4	*Sporobolus contractus*	11–34	–
Forb					
3	**Forbs**			202–493	
	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–34	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	lambsquarters	CHAL7	*Chenopodium album*	11–34	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	11–34	–
	bastard toadflax	COUM	*Comandra umbellata*	11–34	

	bastard toadflax	COUM	*Comandra umbellata*	11–34	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	11–34	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–34	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–34	–
	herb sophia	DESO2	*Descurainia sophia*	11–34	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	11–34	–
	common sunflower	HEAN3	*Helianthus annuus*	11–34	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	11–34	–
	pale evening primrose	OEPA	*Oenothera pallida*	11–34	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	11–34	–
	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	–
	low beardtongue	PEHU	*Penstemon humilis*	11–34	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	11–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–34	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	11–34	–
	Russian thistle	SAKA	*Salsola kali*	11–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–34	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	11–34	–
Shrub/Vine					
4	**Dominant Shrubs**			168–392	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	168–280	–
	mormon tea	EPVI	*Ephedra viridis*	56–168	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	56–112	–
5	**Sub-Dominant Shrubs**			78–191	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	34–56	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	Great Basin fishhook cactus	SCPU6	*Sclerocactus pubispinus*	11–34	–

Table 29. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			336–560	
	blue grama	BOGR2	*Bouteloua gracilis*	56–112	–
	cheatgrass	BRTE	*Bromus tectorum*	56–112	–
	needle and thread	HECO26	*Hesperostipa comata*	28–56	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	28–56	–
2	**Sub-Dominant Grasses**			112–247	

	sand dropseed	SPCR	*Sporobolus cryptandrus*	34–56	–
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–34	–
	spike dropseed	SPCO4	*Sporobolus contractus*	11–34	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	11–34	–
Forb					
3	**Forbs**			202–493	
	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–34	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	lambsquarters	CHAL7	*Chenopodium album*	11–34	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	11–34	–
	bastard toadflax	COUM	*Comandra umbellata*	11–34	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	11–34	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–34	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–34	–
	herb sophia	DESO2	*Descurainia sophia*	11–34	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	11–34	–
	common sunflower	HEAN3	*Helianthus annuus*	11–34	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	11–34	–
	pale evening primrose	OEPA	*Oenothera pallida*	11–34	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	11–34	–
	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	–
	low beardtongue	PEHU	*Penstemon humilis*	11–34	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	11–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–34	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	11–34	–
	Russian thistle	SAKA	*Salsola kali*	11–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–34	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	11–34	–
Shrub/Vine					
4	**Dominant Shrubs**			168–392	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	336–673	–
	mormon tea	EPVI	*Ephedra viridis*	56–168	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	56–112	–
5	**Sub-Dominant Shrubs**			78–191	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	34–56	–

	slender buckwheat	ERMI4	*Eriogonum microthecum*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	Great Basin fishhook cactus	SCPU6	*Sclerocactus pubispinus*	11–34	–

Table 30. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			336–560	
	blue grama	BOGR2	*Bouteloua gracilis*	224–336	–
	cheatgrass	BRTE	*Bromus tectorum*	56–112	–
	needle and thread	HECO26	*Hesperostipa comata*	28–56	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	28–56	–
2	**Sub-Dominant Grasses**			112–247	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	34–56	–
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–34	–
	spike dropseed	SPCO4	*Sporobolus contractus*	11–34	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	11–34	–
Forb					
3	**Forbs**			202–493	
	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–34	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	lambsquarters	CHAL7	*Chenopodium album*	11–34	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	11–34	–
	bastard toadflax	COUM	*Comandra umbellata*	11–34	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	11–34	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–34	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–34	–
	herb sophia	DESO2	*Descurainia sophia*	11–34	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	11–34	–
	common sunflower	HEAN3	*Helianthus annuus*	11–34	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	11–34	–
	pale evening primrose	OEPA	*Oenothera pallida*	11–34	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	11–34	–
	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	

	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	–
	low beardtongue	PEHU	*Penstemon humilis*	11–34	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	11–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–34	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	11–34	–
	Russian thistle	SAKA	*Salsola kali*	11–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–34	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	11–34	–
Shrub/Vine					
4	**Dominant Shrubs**			168–392	
	mormon tea	EPVI	*Ephedra viridis*	56–168	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	56–112	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	56–112	–
5	**Sub-Dominant Shrubs**			78–191	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	34–56	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	Great Basin fishhook cactus	SCPU6	*Sclerocactus pubispinus*	11–34	–

Table 31. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			336–560	
	cheatgrass	BRTE	*Bromus tectorum*	56–112	–
	needle and thread	HECO26	*Hesperostipa comata*	28–56	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	28–56	–
	blue grama	BOGR2	*Bouteloua gracilis*	28–56	–
2	**Sub-Dominant Grasses**			112–247	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	34–56	–
	Grass, annual	2GA	*Grass, annual*	34–56	–
	Grass, perennial	2GP	*Grass, perennial*	34–56	–
	purple threeawn	ARPU9	*Aristida purpurea*	11–34	–
	squirreltail	ELEL5	*Elymus elymoides*	11–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	11–34	–
	spike dropseed	SPCO4	*Sporobolus contractus*	11–34	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	11–34	–
Forb					
3	**Forbs**			202–493	
	Forb, annual	2FA	*Forb, annual*	56–112	

	Forb, annual	2FA	*Forb, annual*	56–112	–
	Forb, perennial	2FP	*Forb, perennial*	56–112	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–34	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	11–34	–
	lambsquarters	CHAL7	*Chenopodium album*	11–34	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	11–34	–
	bastard toadflax	COUM	*Comandra umbellata*	11–34	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	11–34	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	11–34	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–34	–
	herb sophia	DESO2	*Descurainia sophia*	11–34	–
	sand buckwheat	ERLE9	*Eriogonum leptocladon*	11–34	–
	common sunflower	HEAN3	*Helianthus annuus*	11–34	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	11–34	–
	pale evening primrose	OEPA	*Oenothera pallida*	11–34	–
	lobeleaf groundsel	PAMU11	*Packera multilobata*	11–34	–
	scarlet bugler	PECE2	*Penstemon centranthifolius*	11–34	–
	low beardtongue	PEHU	*Penstemon humilis*	11–34	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	11–34	–
	woolly plantain	PLPA2	*Plantago patagonica*	11–34	–
	canaigre dock	RUHY	*Rumex hymenosepalus*	11–34	–
	Russian thistle	SAKA	*Salsola kali*	11–34	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–34	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	11–34	–
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	11–34	–
Shrub/Vine					
4	**Dominant Shrubs**			168–392	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	336–673	–
	mormon tea	EPVI	*Ephedra viridis*	56–168	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	56–112	–
5	**Sub-Dominant Shrubs**			78–191	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	34–56	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	11–34	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	11–34	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–34	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	11–34	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–34	–
	Great Basin fishhook cactus	SCPU6	*Sclerocactus pubispinus*	11–34	–

Table 32. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Forb					
1	**Invasive Forbs**			112–336	
	Russian thistle	SAKA	*Salsola kali*	67–135	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	34–67	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	34–67	–
	lambsquarters	CHAL7	*Chenopodium album*	34–67	–
	crossflower	CHTE2	*Chorispora tenella*	34–67	–
	western tansymustard	DEPI	*Descurainia pinnata*	34–67	–
	herb sophia	DESO2	*Descurainia sophia*	34–67	–
	common sunflower	HEAN3	*Helianthus annuus*	34–67	–
	silverleaf phacelia	PHHA	*Phacelia hastata*	34–67	–

Animal community

--Livestock and Wildlife Grazing--

This site provides good grazing conditions for livestock and wildlife during spring, summer, and fall when in good ecological condition due to accessibility and nutritious forage. However, this site often lacks natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. Reseeding and/or restoration are possible, but the major limiting factor is the lack of precipitation at critical times. This site may occur in mule deer and elk habitat; however in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily grasses, including sand dropseed, Indian ricegrass, blue grama, and needleandthread, which provide desirable grazing conditions for all classes of livestock and wildlife. The presence of shrubs, including jointfir, winterfat, and fourwing saltbush provide good browse for cattle, sheep, goats, elk, and mule deer. Cattle typically will only use mormontea in the late fall and winter when nutrition needs can not be met by palatable shrubs and dormant grasses alone. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

Hydrological functions

The soils associated with this ecological site are generally in Hydrological Soil Group A. On these sites runoff potential is low and infiltration rates are high, depending on slope and ground cover/health (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 greater and runoff potential is lower. 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. Heavy grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but its impact is variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff. (National Range and Pasture Handbook, 2003)

Recreational uses

This site has fair to good values for aesthetics and natural beauty. Hunting is fair for deer, upland game, and rabbits. Potential is poor to fair for camping and picnicking on the basis of vegetation.

Wood products

None

Other information

--Poisonous/Toxic Plant Communities--

Broom snakeweed is the only known toxic plant associated with this site. This plant 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.

Potentially toxic plants associated with this site include fourwing saltbush, some buckwheat species, and basin big sagebrush. Fourwing saltbush and some buckwheat species may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs. Basin big sagebrush contains sesquiterpene lactones and monoterpenes which have been suspected of being toxic to sheep. An experimental dosage of ¾ lbs of big sagebrush fed to sheep for three days was found to be lethal.

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, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. 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, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, kochia, halogeton, 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. Pinyon pine and Utah juniper are natural invaders if stands are found adjacent to this site. Trees left uncontrolled can form dense stands and eventually dominate the site.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on the 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. Many plant communities in the Colorado Plateau may have evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

The fire regime of jointfir dominated sites depends primarily on the adjacent plant communities. Jointfir can readily resprout from seed and surviving meristematic tissue after a fire, however the occurrence of this plant species is relatively low. Fire is fairly uncommon in jointfir dominated sites due to low fuel load presence.

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Contributors

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Rangeland health reference sheet

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

Author(s)/participant(s)	Author(s)/participant(s): Fee Busby (USU), Dana Truman (NRCS), Paul Curtis (BLM), Shane A. Green (NRCS), Randy Beckstrand (BLM), Robert Stager (BLM). Revised to incorporate new terminology and concepts by V. Keith Wadman (NRCS, Retired).
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Date	07/25/2014
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference state on the gentler slopes. Few rills present on slopes exceeding 10% are likely to form below adjacent exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion. Rills present should be less than 1 inch deep and less than 6 feet in length. The number of rills can increase immediately following large storm events but should not persist more than one or two seasons due to coarse soil textures and frost-heave recovery.

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2. **Presence of water flow patterns:** The occurrence of water flow patterns is rare (0-3% cover) on all slopes in the reference state, and are typically less than 3 feet long. As slopes increase (>10%) water flow pattern occurrence (3-8% cover) and length (3-5ft) also increases. An increase in water flow patterns is also expected after disturbance events such as precipitation events and increased wildlife use, which increases the percent of bare ground and erosion potential.

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3. **Number and height of erosional pedestals or terracettes:** The occurrence of pedestalling or terracetting in the reference state is rare; however 1 inch pedestalling of shrubs is acceptable, but there should be no exposed roots.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** In the reference state bare ground is variable (20-60%) throughout all plant community phases. Bare ground is associated with water flow patterns, rodent activity, and plant interspaces. Areas with poorly developed biological soils crust that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground. This site can have up to 5% surface rock cover.

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5. **Number of gullies and erosion associated with gullies:** Active gullies are generally nonexistent; however, stable gullies may occur in landscape settings where increased runoff may have accumulated (such as areas below exposed bedrock). Any gully development is expected to be limited to steeper slopes, show little sign of accelerated erosion, and be stabilized with perennial vegetation.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Some wind generated soil movement is normal. Wind caused blowouts and depositions are mostly small, stable and have healed over. Some coppice mounding around Cutler mormontea, when present is common. Increased wind generated soil movement can occur after severe (multi-year) drought or severe wind events.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement and wind. Fine litter (<¼ inch in diameter) may be moved up to 2-3 ft and usually occurs in water flow patterns and rills, with deposition occurring at obstruction. The majority of litter accumulates at the base of plants or in soil depressions adjacent to the plant. Woody stems (those greater than .25 inch in diameter) are not likely to move under normal conditions.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 3-4 throughout the site. Surface texture varies from sand to loamy fine sand. As sites depart from the reference state to a state dominated by invasive annuals soil surfaces textures are expected to have less structure.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Mido) Soil surface 0-2 inches deep and structure is loose single grain. The A-horizon color ranges from a reddish brown (5YR 5/4) to a reddish brown (5YR 4/4)when moist. Surface textures are typically loamy fine sands. The A-horizon typically exhibits minimal development. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The presence of shrubs, and perennial grasses break raindrop impact and splash erosion. The spatial distribution of vascular plants, non-vascular communities (when present), and interspaces provide detention storage and surface roughness that slows down runoff, allowing time for infiltration. When shrubs and perennial grasses decrease, reducing ground cover and increasing bare ground, runoff can increase and infiltration would be reduced.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Soil may have some textural variation within their profiles that could be mistaken for a compaction layer.

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

    Dominant: Sprouting shrubs (Mormon tea > non-sprouting shrubs (broom snakeweed/ basin big sage) > Perennial grasses (Sand dropseed/Indian ricegrass/blue grama).

    Sub-dominant: Sprouting shrubs (rubber and/or green rabbitbrush) = forbs (globemallow, milkvetch) > Biological soil crust.

    Other: Biological soil crust is variable in it's occurrence on this site and when present, is measured as a component of ground cover.
    Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Temporal variability is caused by drought, insects, large precipitation events, and infrequent fire. Spatial variability is caused by soil textures, proximity to runoff producing sites, etc.
    Following a major disturbance such as drought or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may increase in the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase, competing with the perennial herbaceous understory species. In either case, these conditions reflect a community phase within the reference state.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be very little mortality or decadence apparent in either shrubs or grasses. Many plants may die during a multi-year drought. Some (up to 20%) perennial bunch grass mortality is expected during severe drought

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14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) ranges from 10-20%, nearly all of which should fine litter. Variability is due to the herbaceous production differences from one year to the next. Depth is generally 1 leaf thickness in the interspaces and up to .25 inch under plant canopies. Litter can increase up to 20%

immediate following leaf drop or after favorable conditions increase native annual forb production.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** This site will produce approximately 1000 lbs/acre on an average year. Production could vary from 700 lbs. to 1500 lbs. during drought or above average years.

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

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except during drought.

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18. **Supporting Data::** NRCS (Dana Truman/Ashley Garrelts) 2006/2007 ESD data from Arches and Canyonlands National Parks.
