USDA Natural Resources Conservation Service

Ecological site R028AY004UT
Alkali Flat (Black Greasewood)

Accessed: 04/30/2024

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.

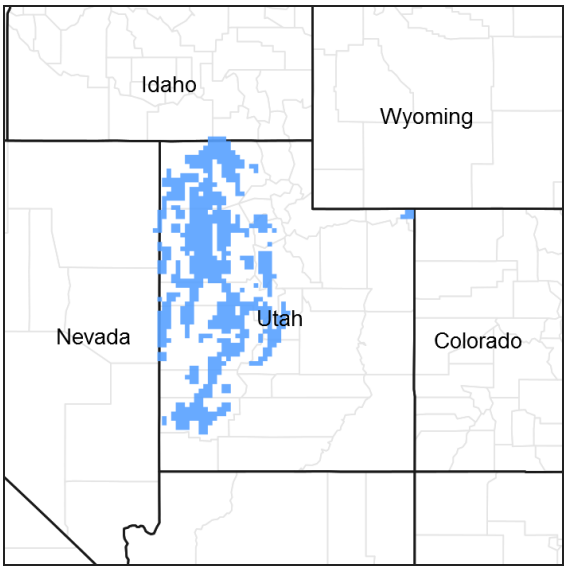


Figure 1. Mapped extent

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 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

R028AY001UT	**Alkali Bottom (Alkali Sacaton)**
R028AY006UT	**Loamy Bottom (Great Basin Wildrye)**
R028AY130UT	**Desert Salt Flat (Sickle Saltbush)**
R028AY332UT	**Upland Alkali Loam (Wyoming Big Sagebrush)**

Similar sites

R028AY332UT	**Upland Alkali Loam (Wyoming Big Sagebrush)**
R028AY001UT	**Alkali Bottom (Alkali Sacaton)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus*
Herbaceous	(1) *Elymus elymoides*

Physiographic features

This site is located on lake plains, lake terraces, flood plains, alluvial flats, and fan remnants. It occupies the elevational area just above the loamy bottom or alkali bottom ecological sites and just below the alkali loam ecological site. Slopes range from 0 to 5 percent but may occasionally reach 8 percent. This site may rarely flood during runoff periods. Runoff potential ranges from low to medium.

Table 2. Representative physiographic features

Landforms	(1) Delta (2) Lake plain (3) Flood plain
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare
Ponding frequency	None
Elevation	1,280–1,829 m
Slope	0–5%
Ponding depth	0 cm
Water table depth	76–183 cm
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 8 to 12 inches. April and May are typically the wettest months with July, August 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 54 degrees.

Table 3. Representative climatic features

Frost-free period (average)	129 days
Freeze-free period (average)	156 days
Precipitation total (average)	305 mm

Influencing water features

There are no water influencing features on this site.

Soil features

Characteristic soils in this site are deep and mostly moderately well to well drained. The soil moisture and temperature regimes are aridic and mesic respectively. The dry surface color is typically a very dark grayish brown. These soils formed in alluvium and/or lacustrine deposits derived mainly from mixed sources including sandstone, shale and sedimentry rock parent material. Soil textures are typically silt loams or silty clay loams but may

occasionally include fine sandy loams. They are very slighty to moderately saline and moderately to strongly alkaline. Available water capacity is 1.40 to 7.3 inches.

This site has been used in the following soil surveys and has been correlated to the following components:

UT601 - Box Elder County; Western Part - Mellor, Skumpah.
UT602 – Box Elder County; Eastern Part - Bram, Harding, Mellor, Uffens.
UT608 - Fairfield-Nephi - Cheebe, Harding, Manassa, Mellor.
UT611 - Tooele Area - Skumpah, Timpie, Tooele.
UT612 - Salt Lake Area - Jordan.
UT617 - West Millard-Juab area - Skumpah, Uvada.
UT618 - Millard County; East - Deseret, Manassa, Mellor, Oasis, Timpie, Uffens, Uvada.
UT621 - Utah County; Central Part -
UT626 - Beaver County, Western Part - Harding, Kessler, Thermosprings, Uvada.
UT627 - Sanpete Valley Area - Genola, Harding, Manassa, Mellor, Quaker, Skumpah.
UT632 - Delta Area - Abbott, Abraham, Anco, Deseret, Kessler, Lahonton, Penoyer, Poganeab, Shear.
UT634 - Iron/Washington Area - Antelope Springs, Bible Springs, Hatu, Woodrow.
UT640 - Beaver-Cove Fort Area - Antelope Springs, Oasis.

Typical Profile (Jordan):
A – 0-2 inches; silt loam; strongly effervescent; very slightly saline; strongly alkaline.
E – 2-5 inches; silty clay loam; strongly effervescent; very slightly saline; strongly alkaline.
Btn – 5-9 inches; silty clay loam; strongly effervescent; moderately saline; very strongly alkaline.
Btkn1 – 9-15 inches; silty clay; violently effervescent; strongly saline; strongly alkaline.
Btkn2 - 15-18 inches; silty clay; violently effervescent; strongly saline; strongly alkaline.
Czgl - 18-43 inches; silty clay; violently effervescent; strongly saline; strongly alkaline.
2Czg2 - 43-53 inches; silt loam; violently effervescent; strongly saline; strongly alkaline.
2Czg3 - 53-60 inches; silty clay loam; violently effervescent; strongly saline; strongly alkaline.

The water supplying capacity is 4 to 8 inches. Natural geological erosion in potential is approximately 0.2 tons/acre/year.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone, sandstone, and shale
Surface texture	(1) Silt loam (2) Silty clay loam (3) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderately rapid
Soil depth	152–183 cm
Surface fragment cover <=3"	0–7%
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	3.56–18.54 cm
Calcium carbonate equivalent (0-101.6cm)	0–40%
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–32
Soil reaction (1:1 water) (0-101.6cm)	7.9–9.6

Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

This ecological site occurs on deep soils in Major Land Resource Area (MLRA) D28A—The Great Salt Lake Area. It was influenced by the natural disturbances typically associated with that MLRA including native wildlife grazing and browsing, weather fluctuations, and periodic fire. Following a burn, greasewood immediately re-sprouts, but grasses typically dominate the community. After a few years of average precipitation, greasewood regains dominance on the site.

Due to modern disturbances such as brush treatments, invasive species, and OHV use, the resilience of this sites plant communities may be at risk. Any disturbances that reduce the presence of the perennial plant community can result in an opportunity for invasive annuals to enter into the system and shorten the fire interval. When this occurs this site may become dominated by annual invasive species. Following burn events, this site was often grazed.

Improper livestock grazing including continuous season long grazing and/or heavy stocking rates over long periods may cause this site to depart from the reference plant community. These practices may result in the loss of desirable grass species and can increase the chance for invasion by cheatgrass and invasive annual forbs. Other impacts including brush treatments, and the sites conversion to seeded rangeland have also impacted the resilience of this ecological site and its associated plant communities.

Soil salinity characteristics of this site are dynamic. Greasewood leaves concentrate salts, which over time are deposited into the soil. Thus, soil salinities are expected to be altered by the dominate shrub species of this site.

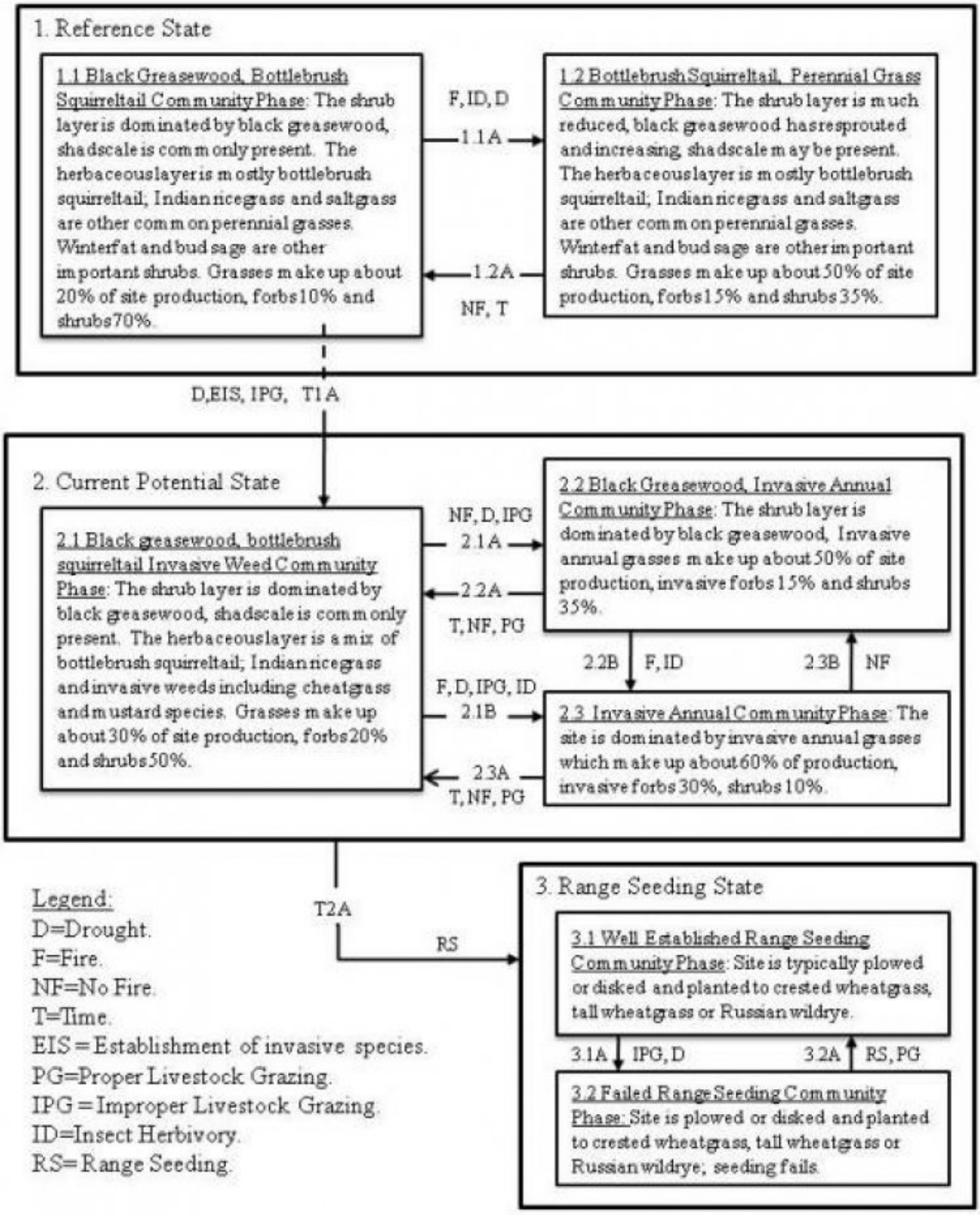
This site is suited for cattle and sheep grazing during spring, summer, fall, or winter and grazing suitability is good. It has been grazed by domestic livestock since they were first introduced into the area around 1860. This livestock introduction, including the use of fencing, and the development of reliable water sources, have had a major influence on the disturbance regime historically associated with this ecological site. This site often served, and still serves as wintering pastures for sheep and cattle producers.

As vegetative communities respond to changes in management or natural influences that move them from one state to another, a return to previous states may not be possible. The amount of energy needed to affect these vegetative shifts depends on present biotic and abiotic features and the desired results.

The following state and transition model diagram depicts some of the most commonly occurring plant communities found on this ecological site. These 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 for publication of the Box Elder County, Eastern Part, Soil Survey and the recent Eastern Shores update. Both ocular and measured data was collected and utilized. Range data collected by the NRCS since 1983 was also used.

State and transition model

State and Transition Model
State: Utah
Site Type: Rangeland
MLRA: D-28A-Basin and Range Province, Great Salt Lake Area
R028AY004UT–Alkali Flat (Black Greasewood, Bottlebrush squirreltail).



Legend:
D=Drought.
F=Fire.
NF=No Fire.
T=Time.
EIS=Establishment of invasive species.
PG=Proper Livestock Grazing.
IPG=Improper Livestock Grazing.
ID=Insect Herbivory.
RS=Range Seeding.

State 1
Reference State

The reference state represents the plant communities and ecological dynamics of the alkali flat (greasewood) site. This state includes the biotic communities that become established on the ecological site if all successional sequences are completed under the natural disturbance regime. The reference state is generally dominated by black greasewood and bottlebrush squirreltail. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. When natural disturbances occur, the rate of recovery is variable due to disturbance intensity. Once invasive plants establish, return to the reference state may not be possible. Reference State: Black greasewood/bottlebrush squirreltail state with natural fluctuations that form either a shrubland or grassland aspect following fire in the natural disturbance history. Indicators: A community dominated by greasewood and bottlebrush squirreltail. Feedbacks: Improper livestock grazing of perennial grasses and/or other disturbances that may allow for the establishment of invasive species. At-risk Community Phase: This state is at risk when native plants are stressed and nutrients become available for invasive plants to establish. Trigger: The establishment of invasive plant species

Community 1.1
Black Greasewood, Bottlebrush Squirreltail Community Phase.

This community is characterized by a shrub canopy of black greasewood, lesser amounts of winterfat and shadscale may also be present. Bottlebrush squirreltail dominates the herbaceous layer. Other commonly occurring grasses include saltgrass, basin wildrye and alkali sacaton. Other perennial grasses, shrubs, and forbs are also present. The composition by air-dry weight is approximately 20 percent perennial grasses, 10 percent forbs, and 70 percent shrubs. Bare ground is variable (40-60%) depending on the amount of biological crust (0 to 15), and plant cover. The following tables provide an example the typical vegetative floristics of a community phase 1.1 plant community.The dominant aspect of the plant community is greasewood.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	280	644	785
Grass/Grasslike	112	168	224
Forb	56	84	112
Total	**448**	**896**	**1121**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	6-15%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	10-20%	0-10%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	35-45%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 5. Plant community growth curve (percent production by month). UT0041, PNC. Excellent Condition.

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

Community 1.2
Bottlebrush Squirreltail, Perennial Grass Community Phase.

This community is characterized by a much reduced black greasewood canopy. Black greasewood has re-sprouted and is increasing in the community, lesser amounts of winterfat and shadscale may also present. Bottlebrush squirreltail dominates the site. Other commonly occurring grasses include saltgrass, basin wildrye and alkali sacaton. Other perennial grasses, shrubs, and forbs are also present. The composition by air-dry weight is approximately 50 percent perennial grasses, 15 percent forbs, and 35 percent shrubs. Bare ground is variable (40-60%) depending on the amount of biological crust (0 to 15), and plant cover. The following tables provide an example the typical vegetative floristics of a community phase 1.2 plant community.The dominant aspect of the plant community is greasewood.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	224	448	560
Shrub/Vine	140	336	420
Forb	84	112	140
Total	**448**	**896**	**1120**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	6-15%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%

Water	0%
Bare ground	0%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	10-20%	0-10%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	35-45%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 7. Plant community growth curve (percent production by month). UT0041, PNC. Excellent Condition.

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

Pathway 1.1A
Community 1.1 to 1.2

This community pathway occurs when any combination of fire, insect hervibory, and drought reduces the black greasewood dominance of this site and results in a grass dominated community.

Pathway 1.2A
Community 1.2 to 1.1

This community pathway occurs when fire is removed from the community for long periods of time. Insect and weather conditions return to within normal levels allowing black greasewood to resprout and regain dominance on the site.

State 2
Current Potential State.

The current potential state is similar to the reference state, however invasive grasses and/ or forbs are now present in all community phases. This state is still dominated by an canopy of black greasewood. Bottlebrush squirreltail, Indian ricegrass and basin wildrye are still the primary perennial grass species, however, cheatgrass, mustard species and other non-native invasive species now make up a significant portion of the herbaceous layer. Primary disturbance mechanisms include, fire, drought, and domestic livestock grazing. Timing of these disturbances dictates the ecological dynamics that occur. The current potential state is still self sustaining; but is losing resistance to change due to lower resilience following disturbances. When disturbances occur, the rate of recovery is variable depending on severity. Current Potential State: Black greasewood/ bottlebrush squirreltail state with variations caused by fire, insect damage and/or drought. Invasive plants are present. Indicators: A community dominated by greasewood and/or bottlebrush squirreltail where native perennial grasses and forbs are also present. Invasive grasses and/or forbs are present. Feedbacks: Frequent disturbances that may allow the dominance of annual invasive species such as cheatgrass to dominate. At-risk Community Phase: As increased disturbance frequency allows for the dominance of annual grasses, such as cheatgrass, this community is at greater risk. Trigger: Reoccurring disturbance that results in a dominance of annual grasses in the herbaceous layer.

Community 2.1
Black Greasewood, Bottlebrush Squirreltail, Invasive Weed Community Phase.

Figure 8. Community Phase 2.1

This community is characterized by a shrub canopy of black greasewood, lesser amounts of winterfat and shadscale may also be present. Bottlebrush squirreltail is still prominent in the herbaceous layer. Other commonly occurring grasses include cheatgrass, saltgrass, basin wildrye and alkali sacaton. Other non-native species are present including Russian thistle, various mustard species, alyssum and ragweed. The composition by air-dry weight is approximately 30 percent annual and perennial grasses, 20 percent forbs, and 50 percent shrubs. Bare ground is variable (40-60%) depending on the amount of biological crust (0 to 15), and plant cover. The following tables provide an example the typical vegetative floristics of a community phase 2.1 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	196	560	701
Grass/Grasslike	168	224	280
Forb	84	112	140
Total	**448**	**896**	**1121**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	6-15%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	10-20%	0-10%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	35-45%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 10. Plant community growth curve (percent production by month). UT0041, PNC. Excellent Condition.

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

Community 2.2
Black Greasewood, Invasive Weed Community Phase.

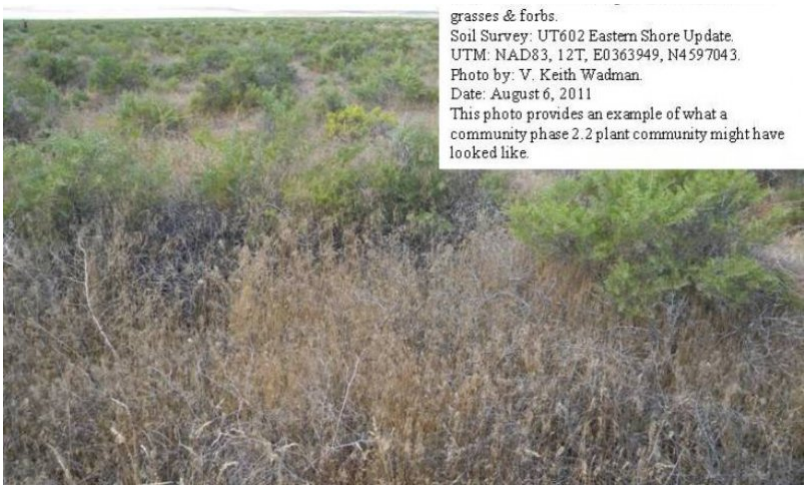


Figure 11. Community Phase 2.2

This community is characterized by a shrub canopy of black greasewood, lesser amounts of winterfat and shadscale may also be present. Most native perennial grasses are much reduced or missing. Cheatgrass dominates the herbaceous layer, other non-native species are also present including Russian thistle, various mustard species, alyssum and ragweed. The composition by air-dry weight is approximately 30 percent annual and perennial grasses, 20 percent forbs, and 50 percent shrubs. Bare ground is variable (40-60%) depending on the amount of biological crust (0 to 15), and plant cover. The following tables provide an example the typical vegetative floristics of a community phase 2.2 plant community.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	196	560	701
Grass/Grasslike	168	224	280
Forb	84	112	140
Total	**448**	**896**	**1121**

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	6-15%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	10-20%	0-10%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	35-45%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 13. Plant community growth curve (percent production by month). UT0041, PNC. Excellent Condition.

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

Community 2.3
Invasive Annual Weed Community Phase.

Figure 14. Community Phase 2.3

This community phase has had most of the black greasewood and other native shrubs removed from the site. Cheatgrass and a mixture of other non-native species including Russian thistle, fivehorn smotherweed, various mustard species, alyssum and ragweed dominate the site. The composition by air-dry weight is approximately 60 percent annual and perennial grasses, 30 percent forbs, and 10 percent shrubs. Bare ground is variable (40-60%) depending on the amount of biological crust (0 to 15), and plant cover. The following tables provide an example the typical vegetative floristics of a community phase 2.3 plant community.

Table 17. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	560	673
Forb	168	196	224
Shrub/Vine	28	84	112
Total	**644**	**840**	**1009**

Table 18. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-40%
Grass/grasslike foliar cover	6-15%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 19. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	10-20%	0-10%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	35-45%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 16. Plant community growth curve (percent production by month). UT0041, PNC. Excellent Condition.

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

Pathway 2.1A
Community 2.1 to 2.2

Black Greasewood, Bottlebrush Squirreltail, Invasive Weed Community Phase.

Black Greasewood, Invasive Weed Community Phase.

This community pathway occurs when any combination of drought and improper livestock grazing reduces the perennial grasses on this site and results in an increase in non-native annual grasses and forbs.

Pathway 2.1B
Community 2.1 to 2.3

Black Greasewood, Bottlebrush Squirreltail, Invasive Weed Community Phase.

Invasive Annual Weed Community Phase.

This community pathway occurs when any combination of fire, drought, insect damage and improper livestock grazing significantly reduces the black greasewood and native perennial grasses on this site and results in the dominance of non-native annual grasses and forbs.

Pathway 2.2A
Community 2.2 to 2.1

Black Greasewood, Invasive Weed Community Phase.

Black Greasewood, Bottlebrush Squirreltail, Invasive Weed Community Phase.

This community pathway occurs when fire is removed from the community for long periods of time. Insect and weather conditions return to within normal levels allowing black greasewood to resprout and regain dominance on the site. Proper grazing of the native perennial grasses will also allow them to increase.

Pathway 2.2B
Community 2.2 to 2.3

Black Greasewood, Invasive Weed Community Phase.

Invasive Annual Weed Community Phase.

This community pathway occurs when any combination of fire, insect hervibory, and drought reduces the black greasewood dominance of this site and results in a annual grass and forb dominated community.

Pathway 2.3A
Community 2.3 to 2.1

Invasive Annual Weed Community Phase.

Black Greasewood, Bottlebrush Squirreltail, Invasive Weed Community Phase.

This community pathway occurs when fire is removed from the community for long periods of time. Insect and weather conditions return to within normal levels allowing black greasewood to resprout and regain dominance on the site. Proper grazing of the native perennial grasses will also allow them to increase.

Pathway 2.3B
Community 2.3 to 2.2

Invasive Annual Weed Community Phase.

Black Greasewood, Invasive Weed Community Phase.

This community pathway occurs when fire is removed from the community for long periods of time. Insect and weather conditions return to within normal levels allowing black greasewood to resprout and regain dominance on the site.

State 3
Range Seeding State.

This state occurs when the site is plowed or disked and planted to various rangeland grasses. Tall wheatgrass,

crested wheatgrass and Russian wildrye are the most commonly seeded species. These seedings may be very clean and healthy or may have various amounts of non-native annuals including, but not limited to Russian thistle, cheatgrass, tansy mustard, broom snakeweed, alyssum, 5-horned smotherweed and annual Cryptantha. Invasive Forb State: Range seeding community phases influenced by livestock grazing practices and weather cycles. Indicators: Perennial rangeland seeding with annual, invasive forbs and grasses present in various amounts. Feedbacks: Livestock grazing practices and weather cycles that maintain or degrade the range seeding and suppress or increase the non-native annuals present in the community. Trigger: An increase of cheatgrass and other annuals that may shorten the sites fire interval, decrease perennial seeding production and increase bare ground.

Community 3.1
Well Established Range Seeding Community Phase.

Figure 17. Communith Phase 3.1

This community phase has been mechanically plowed, disked or burned and then seeded to rangeland grasses including crested wheatgrass, tall wheatgrass and/or Russian wildrye. Black greasewood, broom snakeweed and/or green rabbitbrush may be present in small amounts. Annuals including cheatgrass, halogeton, various mustard species and other non-native species are also present in small amounts and during above average moisture years, may become prominent enough in the stand to cause a fire hazard. Tall wheatgrass is sometimes irrigated. The following tables provide an example the typical vegetative floristics of a community phase 3.1 plant community.

Community 3.2
Failed Range Seeding Community Phase.

Figure 19. Community Phase 3.2

This community phase has been mechanically plowed, disked or burned and then seeded to rangeland grasses including crested wheatgrass, tall wheatgrass and/or Russian wildrye. Poor management and/or drought causes the seeding to fail. Black greasewood, broom snakeweed and/or green rabbitbrush may be present in small amounts. Annuals including cheatgrass, Russian thistle, halogeton, various mustard species and other non-native species are

present and dominate the community. During above average moisture years, these annual species may become prominent enough in the stand to cause a fire hazard. The following tables provide an example the typical vegetative floristics of a community phase 3.2 plant community.

Pathway 3.2A
Community 3.1 to 3.2

Well Established Range Seeding Community Phase.

Failed Range Seeding Community Phase.

This pathway occurs when events favor an decrease in seeded rangeland species and an increase in unwanted invasive annuals. Events may include extended drought and improper livestock grazing that increases annuals and decreases desirable perennials.

Pathway 3.2A
Community 3.2 to 3.1

Failed Range Seeding Community Phase.

Well Established Range Seeding Community Phase.

This pathway occurs when the site is reseeded the rangeland species combined with events favoring its establishment. Events may include normal weather patterns combined with good livestock grazing management.

Transition T1A
State 1 to 2

This transition is from the black greasewood/squirreltail community phase in the reference state to a state that now contains non-native, invasive species. Events may include the establishment of invasive grasses and forbs, and an increase in black greasewood, broom snakeweed and green rabbitbrush. Factors that drive such events include, improper livestock grazing of perennial grasses, prolonged drought, and the presence of a seed source for invasive species. Invasive species such as cheatgrass however have been known to invade intact perennial plant communities with little to no disturbance. Once invasive species are found in the plant community a threshold has been crossed.

Transition T2A
State 2 to 3

This transition is from the current potential state to a seeded rangeland community phase. Site is plowed, disked and/or burned, and seeded to adapted rangeland species including tall wheatgrass, crested wheatgrass or Russian wilrye. Factors that drive such events include, proper livestock grazing of perennial grasses, sufficient moisture for seeding establishment, and adequate control of unwanted invasive species. Once site is converted, a threshold has been crossed.

Additional community tables

Table 20. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			476–560	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	420–476	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	45–90	–
3	**Secondary Shrubs**			50–95	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	11–28	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	21–28	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	11–28	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	11–28	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	11–28	–
Grass/Grasslike					
0	**Primary Grasses**			112–168	
	squirreltail	ELEL5	*Elymus elymoides*	112–168	–
1	**Secondary Grasses**			45–90	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	11–28	–
	saltgrass	DISP	*Distichlis spicata*	11–28	–
	basin wildrye	LECI4	*Leymus cinereus*	11–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	11–28	–
	alkali sacaton	SPAI	*Sporobolus airoides*	11–28	–
Forb					
2				45–90	
	textile onion	ALTE	*Allium textile*	11–28	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–28	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	11–28	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	11–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–28	–
	desert princesplume	STPI	*Stanleya pinnata*	11–28	–
	Mojave seablite	SUMO	*Suaeda moquinii*	11–28	–

Table 21. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			252–336	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	112–224	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	22–90	–
3	**Secondary Shrubs**			48–95	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	10–29	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–29	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–29	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–29	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	10–29	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	10–29	–
Grass/Grasslike					
0	**Primary Grasses**			224–336	
	squirreltail	ELEL5	*Elymus elymoides*	224–336	–
1	**Secondary Grasses**			45–90	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	11–28	–
	saltgrass	DISP	*Distichlis spicata*	11–28	–
	basin wildrye	LECI4	*Leymus cinereus*	11–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	11–28	–
	alkali sacaton	SPAI	*Sporobolus airoides*	11–28	–
Forb					
2	**Forbs**			45–90	
	textile onion	ALTE	*Allium textile*	11–28	–
	tumbling saltweed	ATRO	*Atriplex rosea*	11–28	–
	fivehorn smotherweed	BAHY	*Bassia hyssopifolia*	11–28	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–28	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	11–28	–
	clasping pepperweed	LEPE2	*Lepidium perfoliatum*	11–28	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	11–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–28	–
	desert princesplume	STPI	*Stanleya pinnata*	11–28	–
	Mojave seablite	SUMO	*Suaeda moquinii*	11–28	–

Table 22. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			476–560	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	420–476	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	45–90	–
3	**Secondary Shrubs**			48–95	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	10–29	–

	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–29	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–29	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–29	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	10–29	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	10–29	–
Grass/Grasslike					
0	**Primary Grasses**			168–224	
	squirreltail	ELEL5	*Elymus elymoides*	112–168	–
	cheatgrass	BRTE	*Bromus tectorum*	84–140	–
1	**Secondary Grasses**			45–90	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	11–28	–
	saltgrass	DISP	*Distichlis spicata*	11–28	–
	basin wildrye	LECI4	*Leymus cinereus*	11–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	11–28	–
	alkali sacaton	SPAI	*Sporobolus airoides*	11–28	–
Forb					
2	**Forbs**			90–135	
	desert madwort	ALDE	*Alyssum desertorum*	11–28	–
	textile onion	ALTE	*Allium textile*	11–28	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–28	–
	tumbling saltweed	ATRO	*Atriplex rosea*	11–28	–
	fivehorn smotherweed	BAHY	*Bassia hyssopifolia*	11–28	–
	lambsquarters	CHAL7	*Chenopodium album*	11–28	–
	field bindweed	COAR4	*Convolvulus arvensis*	11–28	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–28	–
	herb sophia	DESO2	*Descurainia sophia*	11–28	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	11–28	–
	prickly lettuce	LASE	*Lactuca serriola*	11–28	–
	clasping pepperweed	LEPE2	*Lepidium perfoliatum*	11–28	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	11–28	–
	Russian thistle	SAKA	*Salsola kali*	11–28	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	11–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–28	–
	desert princesplume	STPI	*Stanleya pinnata*	11–28	–
	Mojave seablite	SUMO	*Suaeda moquinii*	11–28	–
	field pennycress	THAR5	*Thlaspi arvense*	11–28	–

Table 23. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			476–560	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	420–476	–

	greasewood	SAVE4	*Sarcobatus vermiculatus*	120–170	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	45–90	–
3	**Secondary Shrubs**			48–95	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	10–29	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–29	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–29	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–29	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	10–29	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	10–29	–
Grass/Grasslike					
0	**Primary Grasses**			280–392	
	cheatgrass	BRTE	*Bromus tectorum*	196–252	–
	squirreltail	ELEL5	*Elymus elymoides*	28–56	–
1	**Secondary Grasses**			45–90	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	11–28	–
	saltgrass	DISP	*Distichlis spicata*	11–28	–
	basin wildrye	LECI4	*Leymus cinereus*	11–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	11–28	–
	alkali sacaton	SPAI	*Sporobolus airoides*	11–28	–
Forb					
2	**Forbs**			90–135	
	desert madwort	ALDE	*Alyssum desertorum*	11–28	–
	textile onion	ALTE	*Allium textile*	11–28	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–28	–
	tumbling saltweed	ATRO	*Atriplex rosea*	11–28	–
	fivehorn smotherweed	BAHY	*Bassia hyssopifolia*	11–28	–
	lambsquarters	CHAL7	*Chenopodium album*	11–28	–
	field bindweed	COAR4	*Convolvulus arvensis*	11–28	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–28	–
	herb sophia	DESO2	*Descurainia sophia*	11–28	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	11–28	–
	prickly lettuce	LASE	*Lactuca serriola*	11–28	–
	clasping pepperweed	LEPE2	*Lepidium perfoliatum*	11–28	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	11–28	–
	Russian thistle	SAKA	*Salsola kali*	11–28	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	11–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–28	–
	desert princesplume	STPI	*Stanleya pinnata*	11–28	–
	Mojave seablite	SUMO	*Suaeda moquinii*	11–28	–
	field pennycress	THAR5	*Thlaspi arvense*	11–28	–

Table 24. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Primary Shrubs**			112–168	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	56–84	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	11–28	–
3	**Secondary Shrubs**			50–95	
	iodinebush	ALOC2	*Allenrolfea occidentalis*	10–29	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	10–29	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	10–29	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	10–29	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	10–29	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	10–29	–
Grass/Grasslike					
0	**Primary Grasses**			392–504	
	cheatgrass	BRTE	*Bromus tectorum*	280–392	–
	squirreltail	ELEL5	*Elymus elymoides*	28–56	–
1	**Secondary Grasses**			45–90	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–28	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	11–28	–
	saltgrass	DISP	*Distichlis spicata*	11–28	–
	basin wildrye	LECI4	*Leymus cinereus*	11–28	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11–28	–
	Sandberg bluegrass	POSE	*Poa secunda*	11–28	–
	alkali sacaton	SPAI	*Sporobolus airoides*	11–28	–
Forb					
2	**Forbs**			168–224	
	desert madwort	ALDE	*Alyssum desertorum*	11–28	–
	textile onion	ALTE	*Allium textile*	11–28	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	11–28	–
	tumbling saltweed	ATRO	*Atriplex rosea*	11–28	–
	fivehorn smotherweed	BAHY	*Bassia hyssopifolia*	11–28	–
	lambsquarters	CHAL7	*Chenopodium album*	11–28	–
	field bindweed	COAR4	*Convolvulus arvensis*	11–28	–
	western tansymustard	DEPI	*Descurainia pinnata*	11–28	–
	herb sophia	DESO2	*Descurainia sophia*	11–28	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	11–28	–
	prickly lettuce	LASE	*Lactuca serriola*	11–28	–
	clasping pepperweed	LEPE2	*Lepidium perfoliatum*	11–28	–
	fernleaf biscuitroot	LODI	*Lomatium dissectum*	11–28	–
	Russian thistle	SAKA	*Salsola kali*	11–28	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	11–28	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	11–28	–
	desert princesplume	STPI	*Stanleya pinnata*	11–28	–
	Mojave seablite	SUMO	*Suaeda moquinii*	11–28	–

	field pennycress	THAR5	*Thlaspi arvense*	11–28	–

Table 25. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grasses**			673–1121	
	tall wheatgrass	THPO7	*Thinopyrum ponticum*	0–1121	–
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–1121	–
	Russian wildrye	PSJU3	*Psathyrostachys juncea*	0–897	–
	western wheatgrass	PASM	*Pascopyrum smithii*	8–22	–
2	**Sub-Dominant Grasses**			224–336	
	cheatgrass	BRTE	*Bromus tectorum*	56–84	–
	saltgrass	DISP	*Distichlis spicata*	56–84	–
Forb					
3	**Forbs**			112–336	
	desert madwort	ALDE	*Alyssum desertorum*	28–56	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	28–56	–
	lambsquarters	CHAL7	*Chenopodium album*	28–56	–
	field bindweed	COAR4	*Convolvulus arvensis*	28–56	–
	herb sophia	DESO2	*Descurainia sophia*	28–56	–
	prickly lettuce	LASE	*Lactuca serriola*	28–56	–
	Russian thistle	SAKA	*Salsola kali*	28–56	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	28–56	–
	field pennycress	THAR5	*Thlaspi arvense*	28–56	–
Shrub/Vine					
4	**Shrubs**			56–168	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	0–112	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	28–112	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	22–45	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	22–45	–

Table 26. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
0	**Dominant Grasses**			560–673	
	cheatgrass	BRTE	*Bromus tectorum*	448–560	–
	saltgrass	DISP	*Distichlis spicata*	56–84	–
1	**Sub-Dominant Grasses**			112–168	
	crested wheatgrass	AGCR	*Agropyron cristatum*	0–112	–
	Russian wildrye	PSJU3	*Psathyrostachys juncea*	0–112	–
	tall wheatgrass	THPO7	*Thinopyrum ponticum*	0–112	–
	western wheatgrass	PASM	*Pascopyrum smithii*	6–22	–
Forb					
3	**Forbs**			112–336	
	desert madwort	ALDE	*Alyssum desertorum*	28–56	–
	annual ragweed	AMAR2	*Ambrosia artemisiifolia*	28–56	–
	lambsquarters	CHAL7	*Chenopodium album*	28–56	–
	field bindweed	COAR4	*Convolvulus arvensis*	28–56	–
	herb sophia	DESO2	*Descurainia sophia*	28–56	–
	prickly lettuce	LASE	*Lactuca serriola*	28–56	–
	Russian thistle	SAKA	*Salsola kali*	28–56	–
	tall tumblemustard	SIAL2	*Sisymbrium altissimum*	28–56	–
	field pennycress	THAR5	*Thlaspi arvense*	28–56	–
Shrub/Vine					
4	**Shrubs**			56–168	
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	0–112	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	28–112	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	22–45	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	22–45	–

Animal community

--Threatened and Endangered Species--
This section will be populated as more information becomes available.

--Wildlife Interpretation--

This ecological site, in its reference state, produced significant amounts of nutritious forage that was utilized by native herbivores including deer and 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 rabbit, coyote, badger, fox, and various waterfowl species.

In many locations, this ecological site and its associated wetland ecological sites provide critical habitat for migrating birds from both the Pacific and Central Flyways of North America. These areas can contain abundant food for birds.

--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 plant community is primarily grasses, with the majority of canopy cover being attributed to bottlebrush squirreltail and Indian ricegrass. Improper livestock grazing can cause these species to decrease while annual forbs, black greasewood, Wyoming big sage and rabbitbrush increase.

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

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group C. On these sites runoff potential is low to moderate and infiltration rates are moderate, depending on slope and ground cover/health (NRCS National Engineering Handbook). Hydrological groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. In areas similar to the reference state where ground cover is adequate infiltration is increased and runoff potential is decreased. In areas where ground cover is less than 50%, infiltration is reduced and runoff potential is increased. Heavy use by domestic livestock affects hydrology in two ways. Trampling increases bulk density and breaks down soil aggregates. This results in decreased infiltration rates and increased runoff. Heavy grazing can also alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but it affect is variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff.

Different plant communities affect hydrology in different ways. Weedy communities such as states 3 and 4 alter the hydrology by changing the surface soil texture. Soil surfaces will typically become siltier which reduces infiltration and increases runoff potential. (National Range and Pasture Handbook, 2003)

Recreational uses

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

Wood products

None

Other information

--Poisonous and Toxic Plant Communities--
Toxic plants associated with this site include black greasewood, woolly locoweed broom snakeweed and Russian thistle.

Black greasewood can be harmful to cattle and sheep when consumed in large amounts. Its leaves contain poisonous oxilates that when consumed by sheep can result in mortality. The toxicity of greasewood increases during the growing season (USU.edu, 2009). Additionally, the spines have been known to puncture the rumen of cattle (USU.edu, 2009).

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

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

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, 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. (Knight and Walter, 2001)

--Invasive Plant Communities--
Generally, as ecological conditions deteriorate and native vegetation decreases due to disturbance (fire, improper livestock grazing, drought, off road vehicle overuse, erosion, etc.) invasive species can establish on the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and 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.

--Fire Ecology--
Following a burn, greasewood immediately re-sprouts but grasses will dominate the community for a period of time. After a few years of average precipitation, greasewood regains dominance of the site. When fuel loads are low, this site burns more slowly and less intense. Such burns result in a perennial grassland and shrubland with grasses and greasewood being co-dominant.

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Rangeland health reference sheet

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

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

Indicators

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

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

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25 – 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. Large slick spots up to 100' may develop due to chemical reactions in the soil.

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5. **Number of gullies and erosion associated with gullies:** Gullies may be present, but are rare. They would usually be expected in the lowest part of the site where water flows concentrate and/or in locations where there are concentrated flows into the site from an adjacent site or watershed. Gullies may show signs of active erosion along steep side walls but the bottoms would be mostly stabilized with perennial vegetation. Additional erosion is to be expected where concentrated flow patterns enter the site from adjacent steep slopes or drainages.

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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.

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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 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.

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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):** Soil surface is moderately stable (average soil stability score of 3.5 -5)

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** This description is based on the modal soil (Skumpah, Sodic SIL, soil survey area: 601, West Box Elder). This site has 17 correlated soils, resulting in variation of each of these attributes. Unless working on a location with the modal soil, it is critical to supplement this description with the soil-specific information from the published soil survey.

   Soil surface horizon is typically 3 inches deep. Structure is typically weak platy. Color is typically very pale brown (10YR7/3, moist), brown (7.5YR 4/3), moist. An ochric horizon extends to a depth of 3 inches. An ochric horizon typically extends to a depth of 2 to 10 inches. The ochric horizon is a surface horizon lacking fine stratification and which is either light colored, or thin, or has an 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.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Bunchgrasses and shrubs 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.

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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. Naturally occurring soil horizons may be harder than the surface

because of an accumulation of clay and should not be considered as compaction layers.

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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: Perrenial bunchgrasses, short cool season (squirreltail), resprouting shrubs (greasewood)

    Sub-dominant: non resprouting shrubs (shadscale saltbush)

    Other: The perennial grass/sprouting shrub (greasewood) functioning group is expected on this site.

    Additional: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. crested wheatgrass and Russian wildrye may substitute for mid stature cool season perennial native bunchgrasses.). Biological soil crust is variable in its expression on this site and is measured as a component of ground cover. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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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 recent mortality or decadence apparent in either the shrubs or grasses. Some mortality of bunchgrass and other shrubs may occur during very severe (long-term) droughts. There may be partial mortality of individual bunchgrasses and shrubs during less severe drought. Long-lived species dominate site. Open spaces from disturbance are quickly filled by new plants through seedlings and reproductive reproduction (tillering).

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14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2” under canopies. Litter cover may increase to 20-30% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 750 #/acre.
    Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore, representative values are presented in a land management context.

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

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17. **Perennial plant reproductive capability:** Reproduction restricted by effective precipitation, rock cover, soil depth, and generally harsh growing conditions; all to be expected for site. Site provides harsh environment for seedling

establishment.