

Ecological site R035XY003UT Alkali Bottom (Greasewood)

Accessed: 05/12/2024

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.

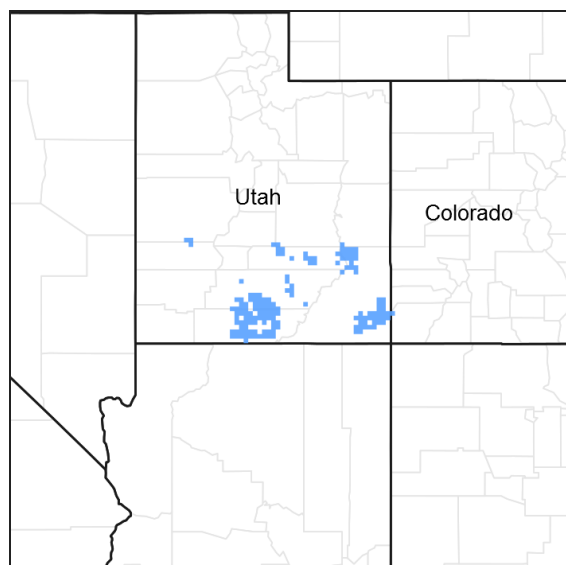


Figure 1. Mapped extent

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

Site Concept: The Alkali Bottom ecological site occurs on salt-affected soils that receive extra water or have a seasonally high water table within 72 inches of the soil surface. It is found in the desert and semidesert climate zones (4,200-6,500 feet) of the Colorado and Green River Plateaus region (MLRA 35). Soils may be clay loams to sandy loams that occur on stream terraces, floodplains and valley bottoms. Annual precipitation ranges from 6 to 12 inches. The historic plant community is characterized by greasewood (*Sarcobatus vermiculatus*) and dropseed bunchgrasses (*Sporobolus* spp) with a fire return interval of 35-100 years. Greasewood maintains dominance of this site by bringing salts to the soil surface and by vigorous resprouting following disturbance events. Cheatgrass and Russian thistle are common invaders of the understory, but do not typically dominate the site. Tamarisk is capable of dominating this site when it occurs on low stream terraces.

Associated sites

R035XY009UT	Alkali Flat (Greasewood) The Alkali Flat may be adjacent to the Alkali Bottom in response to a natural gradient in water table depth; either due to gentle slopes, distinct terrace heights, or hilly terrain.
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R035XY011UT	Loamy Bottom (Basin Big Sagebrush) Since the Loamy Bottom and Alkali Bottom occupy similar landscape positions with similar hydrology, they are often found in complex with each other when soil salt content is relatively low and patchy.
R035XY012UT	Semiwet Saline Streambank (Fremont Cottonwood)

Similar sites

R035XY011UT	Loamy Bottom (Basin Big Sagebrush) This site occupies the same landscape position and has similar water table characteristics. However, it is not salt-affected and mostly occurs on sandy loam soils, while the Alkali Bottom occurs mostly on finer textured soils.
R028AY004UT	Alkali Flat (Black Greasewood)
R035XY009UT	Alkali Flat (Greasewood) This site occurs on salt affected soils and is typically dominated by greasewood, but it occurs in areas with a water table greater than 72 inches. Alkali Flat is often more sodic, with higher pH, and significantly less total production than Alkali Bottom. Greasewood plants are smaller and shrub interspaces are often sparsely vegetated.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Sarcobatus vermiculatus</i>
Herbaceous	(1) <i>Sporobolus airoides</i>

Physiographic features

This site occurs on flood plains, stream terraces, near stream channels, and in valley floors. It is a run-in site that receives extra moisture from surrounding uplands, and often has a seasonally high water table within 72 inches of the soil surface. Runoff is very low to high. Slopes typically range from 0-8%, and elevations are generally 4200 to 6500 ft.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Stream terrace (3) Valley floor
Flooding duration	Extremely brief (0.1 to 4 hours) to very brief (4 to 48 hours)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	1,280–1,829 m
Slope	0–8%
Water table depth	107–183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by hot summers and cool to warm winters. Large fluctuations in daily temperatures are common. Mean annual high temperatures range from 63-71 degrees Fahrenheit and mean annual low temperatures range from 39-63 degrees Fahrenheit. Approximately 70-75% occurs as rain from March through October. On the average, April, May, and June are the driest months and August through October are the wettest months. Precipitation is extremely variable from month to month and from year to year but averages between 7-11 inches. Much of the summer precipitation occurs as convection thunderstorms. This is a run-in site that receives additional moisture from adjacent sites and occasional flooding.

Table 3. Representative climatic features

Frost-free period (average)	159 days
Freeze-free period (average)	185 days
Precipitation total (average)	279 mm

Influencing water features

This site may occur near stream channels and is often influenced by a seasonally high water table. However, this site does not support riparian obligate plant species.

Soil features

The soils of this site are very deep alluvial deposits, primarily derived from sedimentary materials. The defining characteristics of these soils are a seasonally high water table and high salt content, which results in high production of halophytic plants. Surface and subsurface textures can range from clay loams to sandy loams. Water holding capacity in the upper 40 inches of soil also has a broad range; from 3.7 inches in coarse soils to 7.4 in fine textured soils. These soils are well-drained with slow to rapid permeability. Rock fragments range from 0 to 10 percent on the surface and throughout the profile. The soil temperature regime is mesic and the soil moisture regime can be aridic (torric) or ustic aridic.

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

UT626 – Beaver County – Saltair;
 UT631 – Henry Mountains Area – Glenberg Family;
 UT638 – San Juan County, Central – Bankard Family ;
 UT636 – Panguitch Area – Borollic Natragids;
 UT642 – Kane County Area – Billings;
 UT685 - Capitol Reef National Park - Uzona, Henrieville, Befar;
 UT686 – Escalante Grand Staircase National Monument – Suwanee, Jocity, Billings;
 UT688 – Canyonlands National Park – Mido;

Typical Profile:

A – 0-5 inches; loamy sand; moderately alkaline

C – 5-80 inches; loamy vey fine sand; moderately alkaline

Table 4. Representative soil features

Parent material	(1) Alluvium—sandstone and shale
Surface texture	(1) Fine sandy loam (2) Loam (3) Clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–3%
Available water capacity (0-101.6cm)	9.4–18.8 cm

Calcium carbonate equivalent (0-101.6cm)	1–30%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–10
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–10%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

This site was historically dominated by greasewood and a diverse perennial understory, including seepweed, pale evening primrose, Indian ricegrass, *Sporobolus* spp, and James' galleta. The historic fire return interval is presumed to be about 35-100 years (Anderson 2004). Greasewood and native grasses would have resprouted within one year following fire and maintained dominance of the site. There is no evidence that prolonged drought would dramatically alter the species composition of the site in reference condition, although production is expected to be lower.

Today this site often burns less frequently due to fire suppression efforts and reduced fine fuel loads resulting from livestock grazing. In addition, excessive livestock grazing during the spring and summer can cause native grasses and forbs to lose vigor or disappear from the community completely.

Cheatgrass and Russian thistle commonly establish on this site, and Tamarisk can become dominant when the site occurs near stream and drainage corridors. When the ecological processes are altered due to improper grazing, prolonged drought, altered fire regime, invasive species dominance, or other disturbances, alternative states can occur that differ from the historic reference state in both plant community structure and ecological function. In areas where irrigation is possible and salinity problems are addressed, this site has been used for cropland with mixed success.

State and transition model

R035XY003UT Alkali Bottom (Black Greasewood)

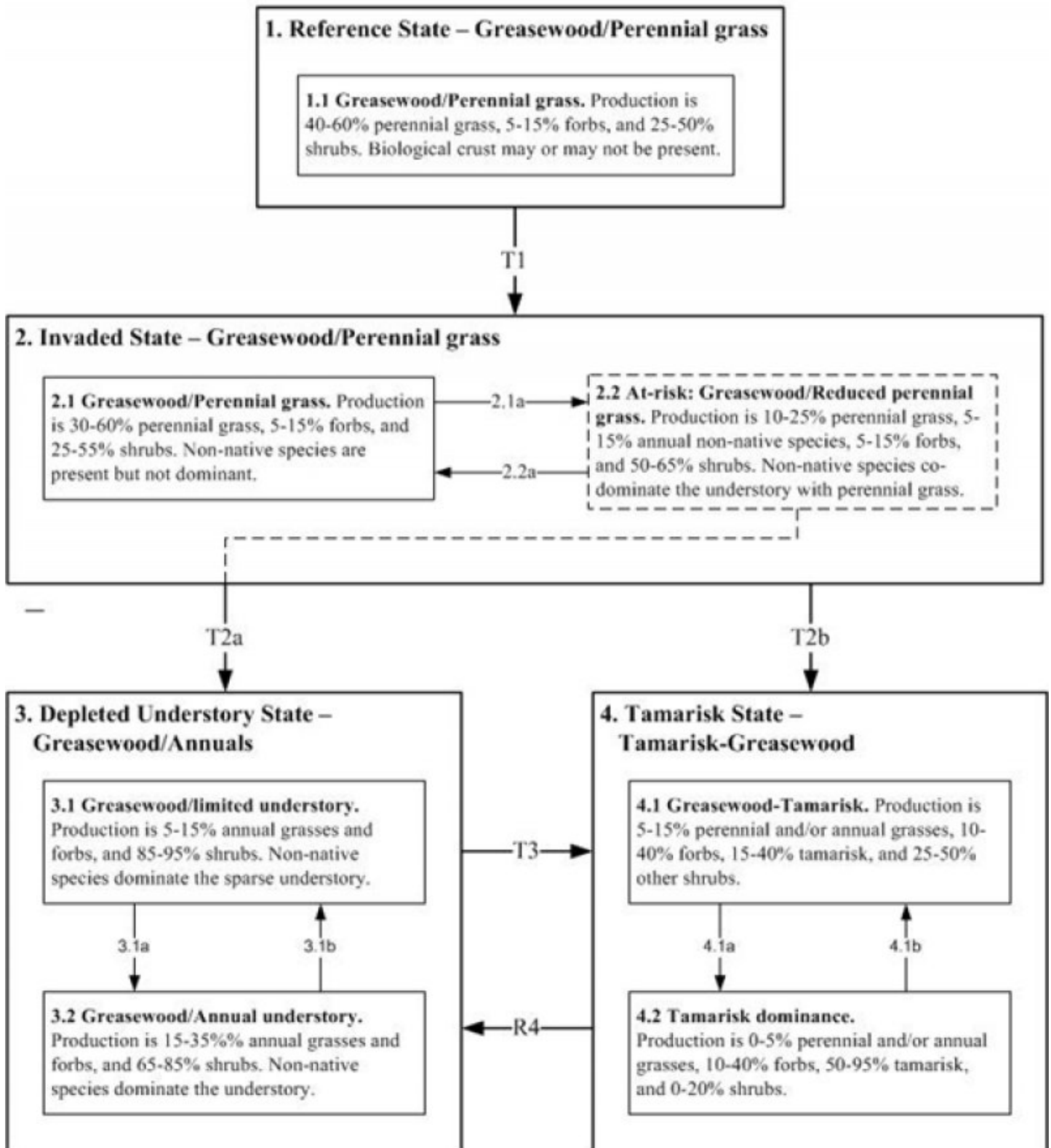


Figure 4. State-and-Transition Model

State 1 Reference State

The reference state contains plant communities presumed to occur on the Alkali Bottom site prior to the introduction of non-native plants, livestock grazing, and other modern disturbances. The reference state is generally dominated by greasewood and deep-rooted perennial bunchgrasses. Greasewood harvests salts from the soil profile and concentrates them in its leaves. As a result, salts are deposited on the soil surface when the leaves are dropped or burned, which increases salinity and pH under greasewood plants. Seepweed commonly establishes in the harsh

soils under greasewood plants, while perennial grasses and forbs tend to dominate the spaces between shrubs. Invasive plant species, particularly cheatgrass and Russian thistle, can establish on the site given a seed source and germination sites in disturbed soil. These invasive annuals require little or no disturbance to establish. Once invasive plants establish, return to the reference state may not be possible.

Community 1.1

Greasewood/Perennial grass



R035XY003UT—Alkali Bottom (Greasewood) community 1.1—Greasewood/Perennial grass. Cover is 30%

Figure 5. Phase 1.1

Community phase 1.1 is characterized by a greasewood canopy with diverse perennial grasses and forbs in the interspaces. The fire-return interval for this phase is 35-100 years, which triggers vigorous re-sprouting of greasewood and perennial grasses within one year following fire. Composition by air-dry weight is 40-60% grasses, 5-15% forbs, and 25-50% shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	280	392	560
Shrub/Vine	168	280	392
Forb	28	56	84
Total	476	728	1036

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	10-30%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0-20%
Litter	5-10%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	20-30%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	0%	0-5%	0-5%
>0.15 <= 0.3	—	0-5%	0-5%	0-5%
>0.3 <= 0.6	—	5-10%	0-10%	0-2%
>0.6 <= 1.4	—	0-20%	0-5%	—
>1.4 <= 4	—	0-20%	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

State 2 Invaded State

The invaded state is similar to the reference state in composition and ecological function, but allows for non-native species to be present. It also includes an at-risk plant community with reduced perennial grass production. When perennial grasses are losing vigor and the ability to propagate themselves, this state is at risk of transitioning to the depleted understory state, which is not capable of recovering perennial grasses without significant management inputs.

Community 2.1 Greasewood/Perennial Grass



R035XY003UT—Alkali Bottom (Greasewood) community 2.1—Invaded Greasewood/Perennial grass. Cover is

Figure 7. Phase 2.1

Phase 2.1 is similar to the reference plant community in composition and ecological function, but it allows for the presence of non-native/invasive species. It is dominated by greasewood and perennial grasses. Percent composition by air-dry weight is 30-60% perennial grasses, 5-15% forbs, and 25-55% shrubs.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	280	392	560
Shrub/Vine	168	280	392
Forb	28	50	84
Total	476	722	1036

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	10-25%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0-20%
Litter	5-10%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	20-30%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	0-5%	0-5%	0-5%
>0.15 <= 0.3	—	0-5%	0-5%	0-5%
>0.3 <= 0.6	—	5-10%	0-10%	0-2%
>0.6 <= 1.4	—	0-20%	0-5%	—
>1.4 <= 4	—	0-20%	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 2.2

At-risk: Greasewood/Reduced perennial grass

Washburn et al. (2008) found that the amount of perennial grass and shrub cover is decreasing in the community. NAD83 585353 E. 4256291 N. Photo by Ashley Garrelts Sept. 24, 2008.



Figure 9. Phase 2.2

This plant community is at-risk of crossing a threshold into the depleted understory state (state 3). Years of excessive grazing of perennial grasses during growth has favored non-native invasive species, primarily cheatgrass and/or Russian thistle, to co-dominate the understory. Prescribed grazing is required to improve the reproductive capability of perennial grasses and avoid the transition to state 3.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	224	392	560
Grass/Grasslike	140	196	252
Forb	28	84	140
Total	392	672	952

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	20-40%
Grass/grasslike foliar cover	5-15%
Forb foliar cover	5-25%
Non-vascular plants	0%
Biological crusts	0%
Litter	3-15%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	20-50%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	0-5%	0-5%	0-5%
>0.15 <= 0.3	—	0-5%	0-5%	0-5%
>0.3 <= 0.6	—	5-10%	0-10%	0-2%
>0.6 <= 1.4	—	0-20%	0-5%	—
>1.4 <= 4	—	0-20%	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 2.1a Community 2.1 to 2.2



Greasewood/Perennial Grass



At-risk: Greasewood/Reduced perennial grass

This pathway occurs when perennial grasses are reduced in the understory due to excessive grazing during the growing period. Perennial grasses are losing their ability to propagate themselves, and non-native species may co-

dominate the understory.

Pathway 2.2a Community 2.2 to 2.1



At-risk: Greasewood/Reduced perennial grass



Greasewood/Perennial Grass

Prescribed grazing that provides rest during the growth period for perennial grasses to improve their vigor and reproductive capacity.

State 3 Depleted Understory State

The depleted understory state occurs when perennial grasses have been lost from the understory. Perennial forbs may also be reduced. Interspaces may be sparsely vegetated or dominated by Russian thistle or other annual invasive species. This state is not as capable of carrying fire due to a reduction in fine fuels. As a result, greasewood may continue to increase as the understory continues to be reduced.

Community 3.1 Greasewood/Limited understory



Figure 11. Phase 3.1



R035XY003UT—Alkali Bottom (Greasewood) community 3.1—Greasewood/Limited Understory after

Figure 12. 3.1 after tamarisk removal

Phase 3.1 is characterized by greasewood dominance and a sparse understory that results from continued overgrazing. Increased size and production of greasewood plants may result in increased soil salinity in surface

layers, further reinforcing greasewood dominance on the site.

Community 3.2

Greasewood/Annual understory



Figure 13. Phase 3.2

This phase is dominated by greasewood in the overstory and annual grasses and/or forbs in the understory.

Pathway 3.1a

Community 3.1 to 3.2



Greasewood/Limited understory



Greasewood/Annual understory

Removal of livestock may allow invasive annuals to dominate shrub interspaces.

Pathway 3.2a

Community 3.2 to 3.1



Greasewood/Annual understory



Greasewood/Limited understory

This pathway occurs when livestock use reduces the annual invasive species between shrubs. It may also be reinforced by an increase in salt deposits on the soil surface from increased greasewood production.

State 4

Tamarisk State

This state primarily occurs on low stream terraces. The stream provides a corridor for tamarisk invasion, which spreads throughout the alkali bottom on low stream terraces, eventually dominating the site.

Community 4.1

Greasewood-Tamarisk



R035XY003UT—Alkali Bottom (Greasewood) community 4.1—Greasewood-Tamarisk. Cover is 1% grass, 20%

Figure 14. Phase 4.1

This community phase is characterized by the establishment and persistence of tamarisk. Greasewood is co-dominant with tamarisk in this phase.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	336	504	673
Forb	112	196	280
Grass/Grasslike	28	84	224
Total	476	784	1177

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	20-30%
Non-vascular plants	0%
Biological crusts	0%
Litter	5-10%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-3%
Bedrock	40-60%
Water	0%
Bare ground	40-65%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	0-5%	0-5%	0-5%
>0.15 <= 0.3	—	0-10%	0-5%	0-15%
>0.3 <= 0.6	—	0-5%	0-5%	0-10%
>0.6 <= 1.4	—	0-5%	—	—
>1.4 <= 4	—	5-10%	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 4.2 Tamarisk Dominated

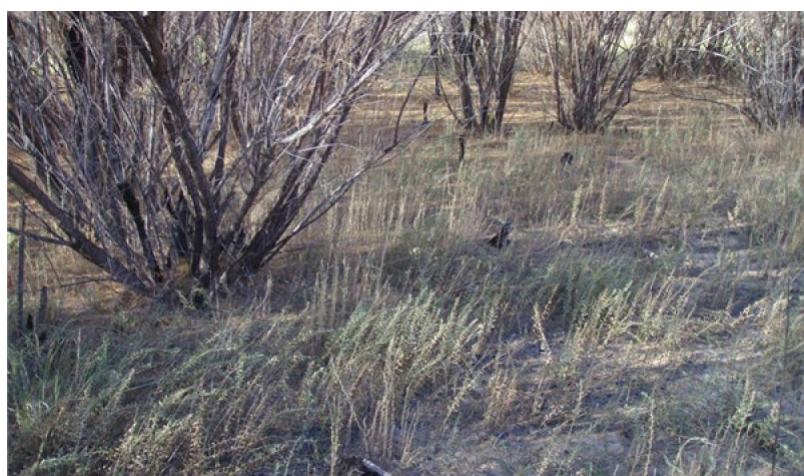


Figure 16. Phase 4.2

This community phase is characterized by dominance of tamarisk. Greasewood is not dominant in this phase, but may be present as a sub-dominant shrub. Invasive grasses and forbs are often present in this phase.

Table 17. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	224	336	448
Forb	112	196	280
Grass/Grasslike	28	112	168
Total	364	644	896

Table 18. Ground cover

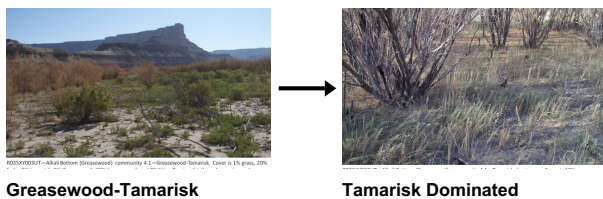
Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-15%
Grass/grasslike foliar cover	5-10%
Forb foliar cover	30-40%
Non-vascular plants	0%
Biological crusts	0%
Litter	10-15%

Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-3%
Bedrock	40-60%
Water	0%
Bare ground	20-30%

Table 19. Canopy structure (% cover)

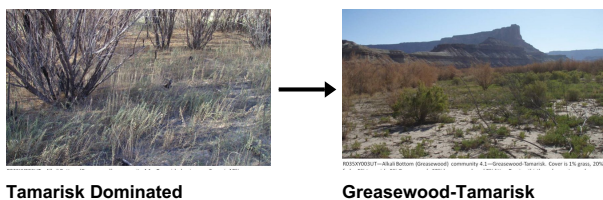
Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	0-5%	0-5%	0-10%
>0.15 <= 0.3	—	0-5%	0-5%	0-20%
>0.3 <= 0.6	—	0-5%	0-5%	0-10%
>0.6 <= 1.4	—	0-10%	—	—
>1.4 <= 4	—	5-10%	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 4.1a Community 4.1 to 4.2



This pathway occurs without disturbance, but may occur more quickly with major disturbances such as fire, heavy livestock grazing, or a combination of the two.

Pathway 4.2a Community 4.2 to 4.1



This community pathway may occur with tamarisk control efforts, either mechanical or biological. The saltcedar leaf beetle (*Diorhabda elongata*) can cause enough stress to kill tamarisk in 5-7 years (Richman, Biological Control Field Guide for Utah).

Transition T1 State 1 to 2

Establishment and persistence of non-native species results in a transition from the reference state to the invaded state.

Transition T2a

State 2 to 3

This transition occurs when perennial grasses are reduced by improper grazing to the point that they can no longer self-propagate. Few remnant plants may still persist under shrubs, but re-establishment and dominance by perennial grasses will not occur following a fire, or with the removal of livestock grazing.

Transition T2b

State 2 to 4

This transition only occurs when the site is on low stream terraces. The stream provides a corridor for tamarisk invasion, which spreads to low terraces dominated by greasewood.

Transition T3a

State 3 to 4

This transition most commonly occurs when the site is on low stream terraces. The stream provides a corridor for tamarisk invasion, which spreads to greasewood-dominated floodplains.

Restoration pathway R4

State 4 to 3

This community pathway may occur with tamarisk control efforts, either mechanical or biological. The saltcedar leaf beetle (*Diorhabda elongata*) can cause enough stress to kill tamarisk in 5-7 years (Richman, Biological Control Field Guide for Utah).

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	Dominant Shrub			140–308	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	112–224	10–20
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–84	0–10
3	Sub-Dominant Shrubs			0–84	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0–56	0–5
	Shrub, other	2S	<i>Shrub, other</i>	0–34	0–2
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–28	0–3
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–17	0–1
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0–11	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–6	0–2
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–6	0–1
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–6	0–1
	valley saltbush	ATCU	<i>Atriplex cuneata</i>	0–6	0–1
Grass/Grasslike					
0	Dominant Grasses			224–504	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–135	0–8
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–135	0–8
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–135	0–8
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–135	0–8
	Indian ricegrass	ACHV	<i>Achnatherum hymenoides</i>	11–135	0–8

	Indian ricegrass	ACR11	<i>Acridatherum hymenoides</i>	11–135	0–8
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–135	0–8
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	11–112	0–6
1	Sub-Dominant Grasses			56–112	
	Grass, perennial	2GP	<i>Grass, perennial</i>	11–56	1–5
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–34	0–2
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	1–22	0–2
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–22	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–11	0–1
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–6	0–1
Forb					
2	Forbs			28–84	
	Mojave seablite	SUMO	<i>Suaeda moquinii</i>	0–56	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	6–28	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–28	–
	tansymustard	DESCU	<i>Descurainia</i>	0–13	0–2
	thicksepal cryptantha	CRCR3	<i>Cryptantha crassiseppala</i>	0–11	0–3
	sand gilia	ALLE7	<i>Aliciella leptomeria</i>	0–11	0–2
	primrose	PRIMU	<i>Primula</i>	0–11	1–2
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–11	0–1
	madwort	ALYSS	<i>Alyssum</i>	0–9	0–6
	common pepperweed	LEDE	<i>Lepidium densiflorum</i>	0–9	0–2
	snowball sand verberna	ABFR2	<i>Abronia fragrans</i>	0–9	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	3–7	0–2
	gilia	GILIA	<i>Gilia</i>	0–7	0–1
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–6	0–2
	ragwort	SENEC	<i>Senecio</i>	0–6	0–2
	Townsend daisy	TOWNS	<i>Townsendia</i>	0–6	0–1
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–1
	yellow spiderflower	CLLU2	<i>Cleome lutea</i>	0–3	0–1
	longbeak streptanthella	STLO4	<i>Streptanthella longirostris</i>	0–2	0–1

Table 21. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrub			140–308	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	112–224	10–20
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–84	0–10
3	Sub-dominant Shrubs			0–84	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0–56	0–5
	Shrub, other	2S	<i>Shrub, other</i>	0–34	0–3
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–28	0–3

	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–17	0–1
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0–11	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–6	0–2
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–6	0–1
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–6	0–1
	valley saltbush	ATCU	<i>Atriplex cuneata</i>	0–6	0–1
Grass/Grasslike					
0	Dominant Grasses			224–504	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	11–135	0–8
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–135	0–8
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–135	0–8
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–135	0–8
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–135	0–8
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–135	0–8
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	11–112	0–6
1	Sub-dominant Grasses			56–112	
	Grass, perennial	2GP	<i>Grass, perennial</i>	11–56	1–5
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–34	0–3
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–34	0–3
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	1–22	0–2
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–22	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–11	0–1
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–6	0
Forb					
2	Forbs			28–84	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	0–56	0–8
	Forb, annual	2FA	<i>Forb, annual</i>	6–45	0–3
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–28	0–2
	saltlover	HALOG	<i>Halogeton</i>	0–22	0–5
	tansymustard	DESCU	<i>Descurainia</i>	0–13	0–2
	Mojave seablite	SUMO	<i>Suaeda moquinii</i>	0–13	1–2
	thicksepal cryptantha	CRCR3	<i>Cryptantha crassisejala</i>	0–11	0–3
	sand gilia	ALLE7	<i>Aliciella leptomeria</i>	0–11	0–2
	primrose	PRIMU	<i>Primula</i>	0–11	1–2
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–11	0–1
	madwort	ALYSS	<i>Alyssum</i>	0–9	0–6
	common pepperweed	LEDE	<i>Lepidium densiflorum</i>	0–9	0–2
	snowball sand verben	ABFR2	<i>Abronia fragrans</i>	0–9	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	3–7	0–2
	gilia	GILIA	<i>Gilia</i>	0–7	0–1
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–6	0–2
	ragwort	SENEC	<i>Senecio</i>	0–6	0–2
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–1

	Townsend daisy	TOWNS	<i>Townsendia</i>	0–6	0–1
	redstem stork's bill	ERCI6	<i>Erodium cicutarium</i>	0–6	0
	yellow spiderflower	CLLU2	<i>Cleome lutea</i>	0–3	0–1
	longbeak streptanthella	STLO4	<i>Streptanthella longirostris</i>	0–2	0–1

Table 22. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrubs			224–560	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	224–560	15–25
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–84	0–10
3	Sub-Dominant Shrubs			0–84	
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0–56	0–5
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–39	0–3
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–28	0–3
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–17	0–1
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0–11	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–6	0–2
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–6	0–1
	valley saltbush	ATCU	<i>Atriplex cuneata</i>	0–6	0–1
Grass/Grasslike					
0	Dominant Grasses			112–252	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–67	0–4
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–67	0–4
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–67	0–4
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–67	0–4
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–67	0–4
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–67	0–4
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–34	0–3
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–34	0–1
1	Sub-dominant Grasses			28–84	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–45	0–3
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–34	0–3
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–34	0–3
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–22	0–2
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–22	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–11	0–1
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	1–11	0–1
Forb					
2	Forbs			28–140	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	28–140	5–15
	tansymustard	DESCU	<i>Descurainia</i>	0–56	0–3

	Forb, annual	2FA	<i>Forb, annual</i>	6–45	0–2
	saltlover	HALOG	<i>Halogeton</i>	0–22	0–5
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–17	0–1
	Mojave seablite	SUMO	<i>Suaeda moquinii</i>	0–13	1–2
	thicksepal cryptantha	CRCR3	<i>Cryptantha crassiseppala</i>	0–11	0–3
	sand gilia	ALLE7	<i>Aliciella leptomeria</i>	0–11	0–2
	primrose	PRIMU	<i>Primula</i>	0–11	1–2
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–11	0–1
	common pepperweed	LEDE	<i>Lepidium densiflorum</i>	0–9	0–2
	madwort	ALYSS	<i>Alyssum</i>	0–9	0–1
	snowball sand verberna	ABFR2	<i>Abronia fragrans</i>	0–9	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	0–7	0–1
	gilia	GILIA	<i>Gilia</i>	0–7	0–1
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–6	0–2
	ragwort	SENEC	<i>Senecio</i>	0–6	0–2
	Townsend daisy	TOWNS	<i>Townsendia</i>	0–6	0–1
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–1
	burningbush	BASC5	<i>Bassia scoparia</i>	0–6	0–1
	yellow spiderflower	CLLU2	<i>Cleome lutea</i>	0–3	0–1
	longbeak streptanthella	STLO4	<i>Streptanthella longirostris</i>	0–2	0–1

Table 23. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrubs			308–644	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	157–224	10–15
	five-stamen tamarisk	TACH2	<i>Tamarix chinensis</i>	112–224	10–15
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–67	0–6
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	13–34	1–2
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–22	0–1
3	Sub-Dominant Shrubs			0–28	
	Shrub, other	2S	<i>Shrub, other</i>	6–28	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–6	0–5
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	0–6	0–1
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0–2	0–1
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–2	0–1
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–1	0–1
Grass/Grasslike					
0	Grasses			28–224	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–168	0–5
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–56	0–2

Forb

2	Forbs			112–280	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	0–168	0–15
	povertyweed	IVAX	<i>Iva axillaris</i>	0–157	0–30
	Mojave seablite	SUMO	<i>Suaeda moquinii</i>	0–157	1–2
	Bartlett daisy	BASC	<i>Bartlettia scaposa</i>	0–112	0–15
	Forb, annual	2FA	<i>Forb, annual</i>	39–90	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	39–90	–
	saltlover	HALOG	<i>Halogeton</i>	0–22	0–5
	tansymustard	DESCU	<i>Descurainia</i>	0–13	0–2
	thicksepal cryptantha	CRCR3	<i>Cryptantha crassiseppala</i>	0–11	0–3
	sand gilia	ALLE7	<i>Aliciella leptomeria</i>	0–11	0–2
	primrose	PRIMU	<i>Primula</i>	0–11	1–2
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–11	0–1
	madwort	ALYSS	<i>Alyssum</i>	0–9	0–6
	common pepperweed	LEDE	<i>Lepidium densiflorum</i>	0–9	0–2
	snowball sand verbena	ABFR2	<i>Abronia fragrans</i>	0–9	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	3–7	0–2
	gilia	GILIA	<i>Gilia</i>	0–7	0–1
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–6	0–2
	ragwort	SENEC	<i>Senecio</i>	0–6	0–2
	Townsend daisy	TOWNS	<i>Townsendia</i>	0–6	0–1
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–1
	yellow spiderflower	CLLU2	<i>Cleome lutea</i>	0–3	0–1
	longbeak streptanthella	STLO4	<i>Streptanthella longirostris</i>	0–2	0–1

Table 24. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrub			168–392	
	five-stamen tamarisk	TACH2	<i>Tamarix chinensis</i>	168–392	10–30
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–67	0–6
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–34	1–2
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–22	0–1
3	Sub-Dominant Shrubs			0–56	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–56	0–5
	Shrub, other	2S	<i>Shrub, other</i>	0–22	0–2
Grass/Grasslike					
0	Grasses			28–168	
	Grass, perennial	2GP	<i>Grass, perennial</i>	28–140	–
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–56	0–3
Forb					
2	Forbs			112–280	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	0–168	0–15
	povertyweed	IVAX	<i>Iva axillaris</i>	0–157	0–30
	Mojave seablite	SUMO	<i>Suaeda moquinii</i>	0–157	1–2
	Bartlett daisy	BASC	<i>Bartlettia scaposa</i>	0–112	0–15
	Forb, annual	2FA	<i>Forb, annual</i>	39–90	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	39–90	–
	saltlover	HALOG	<i>Halogeton</i>	0–22	0–5
	tansymustard	DESCU	<i>Descurainia</i>	0–13	0–2
	thicksepal cryptantha	CRCR3	<i>Cryptantha crassiseppala</i>	0–11	0–3
	sand gilia	ALLE7	<i>Aliciella leptomeria</i>	0–11	0–2
	primrose	PRIMU	<i>Primula</i>	0–11	1–2
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–11	0–1
	madwort	ALYSS	<i>Alyssum</i>	0–9	0–6
	common pepperweed	LEDE	<i>Lepidium densiflorum</i>	0–9	0–2
	snowball sand verbena	ABFR2	<i>Abronia fragrans</i>	0–9	0–1
	cryptantha	CRYPT	<i>Cryptantha</i>	3–7	0–2
	gilia	GILIA	<i>Gilia</i>	0–7	0–1
	scrambled eggs	COAU2	<i>Corydalis aurea</i>	0–6	0–2
	ragwort	SENEC	<i>Senecio</i>	0–6	0–2
	Townsend daisy	TOWNS	<i>Townsendia</i>	0–6	0–1
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–1
	yellow spiderflower	CLLU2	<i>Cleome lutea</i>	0–3	0–1
	longbeak streptanthella	STLO4	<i>Streptanthella longirostris</i>	0–2	0–1

Animal community

This site is suited to sheep and cattle during fall, winter, and spring. This site provides food and cover for wildlife. Wildlife using this site includes jackrabbit, coyote, bobcat, ferruginous hawk, kangaroo rat, mice and snake.

Hydrological functions

The soil is in hydrologic group a. The hydrologic curve numbers range from 49 to 68 depending on hydrologic condition of the watershed.

Recreational uses

Recreation uses in this site are hiking and hunting. Natural beauty values are found in the botanical diversity of the vegetation. Trafficability over unsurfaced roads is only fair because of the frequency of flooding and the deep gullies and stream channels.

Wood products

None

Other information

The following references explain management options for greasewood:

Ogle, D., Benson, B., Tilley, D., St. John, L., Green, S., and Briggs, J. (2007, February 07). Plant guide to black greasewood. Retrieved from ftp://ftp-fc.sc.egov.usda.gov/ID/programs/plant/black_greasewood_pg.pdf

Benson, B., Ogle, D., Tilley, D., and St. John, L. (2007, February 01). Technical note: Managing black greasewood sites. Retrieved from ftp://ftp-fc.sc.egov.usda.gov/ID/programs/technotes/black_greasewood.pdf

Other references

Anderson, Michelle D. 2004. *Sarcobatus vermiculatus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [].

General Description: Comb wash, Dirty Devil River, and Hackberry Creek

Richman, Amber. Biological Control Fieldguide for Utah. USDA-APHIS-PPQ.

Utah Climate Summaries. 2008. Available: <http://www.wrcc.dri.edu/summary/climsmut.html>. Accessed on February 25, 2008.

San Juan: Bankard Family – modal not in this site.

Henry Mountains: Glenberg Family – Alluvial floodplains of the Fremont, Muddy and Dirty Devil Rivers (modal not in this site)

Grand Staircase: Billings – near the Paria River in the Cockscomb area, along the Cottonwood Road. (Modal – Latitude: 37° 8' 28.46" N Longitude: 111° 55' 1.95" W) Jocity, saline – near the Paria River in the Cockscomb area, along the Cottonwood Road. (Modal – Latitude: 37° 10' 46.22" N Longitude: 111° 54' 47.72" W) Suwanee, saline – N of Hwy. 89 in the Paria River drainage, near the Paria Town Site; W of Big Water along Highway 89 in the Kitchen Corral Wash drainage; NE of Big Water in the Rogers Canyon Drainage on Fiftymile Mountain and drainages on Window Sash Bench; N of Big Water in drainages around Long Flat; SE of Escalante in the headwaters of the Alvey Wash and Wahweap Creek drainages; and in drainages NE of Tropic, along Henderson Creek and North Creek. (Modal – Latitude: 37° 9' 12.5" N Longitude: 112° 5' 41.88" W)

Contributors

Jamin Johanson
Susanne Mayne

Rangeland health reference sheet

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

Author(s)/participant(s)	Shane A. Green (NRCS), Robert D. Stager (BLM), Dana Truman (NRCS), Paul Curtis (BLM) and Randy Beckstrand (BLM).
Contact for lead author	shane.green@ut.usda.gov
Date	09/10/2008
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Very minor rill development in sparsely vegetated areas. Rills present should be widely spaced, and not connected. Rill development will increase following large storm events, but rills heal within a few years through frost heaving. Rill development may increase where the site is adjacent to other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, etc.)

2. **Presence of water flow patterns:** Few throughout the site. Flow patterns are usually sinuous and wind around perennial plant bases. They may be long (10 to 20 feet), and less than one foot wide, and spaced from 5 to 15 feet apart. They are stable with only minor evidence of deposition. Evidence of flow will increase somewhat on slopes greater than 3 percent. This site is periodically inundated with runoff water due to its physiographic location. During very high flow events in adjacent channels (lotic, wash, etc.), this site may act as a filter and trap sediment, sometimes up to a foot or more.

3. **Number and height of erosional pedestals or terracettes:** Plants may show very minor pedestalling where they are adjacent to water flow patterns, but there should never be any exposed roots. Terracettes should be very few and stable, occurring behind pieces of woody litter blocking water flow patterns.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20- 30% Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Ground cover + bare ground = 100%. Poorly developed biological soil crust that is interpreted as functioning as bare ground and therefore would be susceptible to raindrop splash erosion should be recorded as bare ground.

5. **Number of gullies and erosion associated with gullies:** Present, but 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 should show some signs of active erosion often with steep side walls but the bottoms would be mostly stabilized with perennial vegetation. Gullies may show more indication of erosion as the slope

gets greater than 3 percent, or as influenced by adjacent steep sites or watersheds that may be providing concentrated flow patterns.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of 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 or with biological crust.
-
7. **Amount of litter movement (describe size and distance expected to travel):** Due to the natural periodic concentration of runoff in this site, water flow patterns would be expected to be common with associated visible evidence of litter movement. Often litter from adjacent sites or watershed s contribute to litter noted on site. Litter removal may occur in water flow patterns with deposition occurring at points of obstruction, especially following large storm events. Litter movement is expected to increase with slopes over 3 percent.
-
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 2 or 3 under plant canopies and a rating of 2 to 3 in the interspaces using the soil stability kit test. The average should be 2-3. Surface texture varies from loamy sand to silty clay loam. Vegetation cover, litter, and surface rock reduce erosion.
-
9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon is typically 3 to 11 inches deep. Structure is typically weak fine to medium granular. Color is typically light brownish gray (2.5Y6/2) reddish brown (5YR5/4). Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.
-
10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants are expected to break raindrop impact and splash erosion. Spatial distribution of vascular plants slows runoff somewhat by obstructing surface flows to help create sinuous flow patterns that dissipate energy and allow time for some infiltration. With the physiographic location of the site being in channels, bottoms, floodplains, alluvial flats, stream terraces and valley floors, this site is one of the terminal accumulation sites for runoff water. As such, infiltration is naturally facilitated; however the amount of sodium in the soil will reduce the infiltration and facilitate puddling on the surface. Natural erosion would be expected in severe thunder storms or heavy spring runoff. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.
-
11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Due to this sites lower placement (bottoms etc.), it accumulates fine particles such as silts and clays. The associated blocky and massive structures formed from these soil textures often confer naturally occurring hard layers in the soil subsurface. These should not be considered to be compaction layers.
-
12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Plant community 50-100 years following a disturbance: Sprouting Shrubs (i.e. Greasewood, rabbitbrush) > Perennial Bunch Grasses (i.e. Alkali sacaton, Bottlebrush squirreltail)

Sub-dominant: Plant community 50-100 years following a disturbance: Perennial Forbs (i.e. Shrubby seepweed) >= non-sprouting shrubs = rhizomatous grasses > annual forbs

Other: 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, Intermediate wheatgrass, etc.)

Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover.

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

Additional: Assumed disturbance regime includes insects, very infrequent fire, and flooding that kills the non-sprouting shrub species.

Temporal variability is caused by fires, droughts, insects, etc. and spatial variability is caused by adjacency to other sites that produce runoff, soil pH levels, and topography.

Following a recent disturbance such as fire, drought, or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community until the sprouting shrubs come back. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out 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 recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought that affects groundwater levels, up to 20% of the greasewood plants may die. Some mortality of bunchgrass and other shrubs may also occur during severe droughts. There may be partial mortality of individual bunchgrasses and other shrubs during less severe drought.
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14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1 leaf thickness in the interspaces and up to ¼" under canopies.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600-700 #/acre on an average year.
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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:** Russian thistle, halogeton, mustard, filarie, other native and non-native annual forbs and cheatgrass.
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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 in drought years.
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