

Ecological site R035XY015UT **Sandy Bottom**

Accessed: 05/12/2025

General information

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

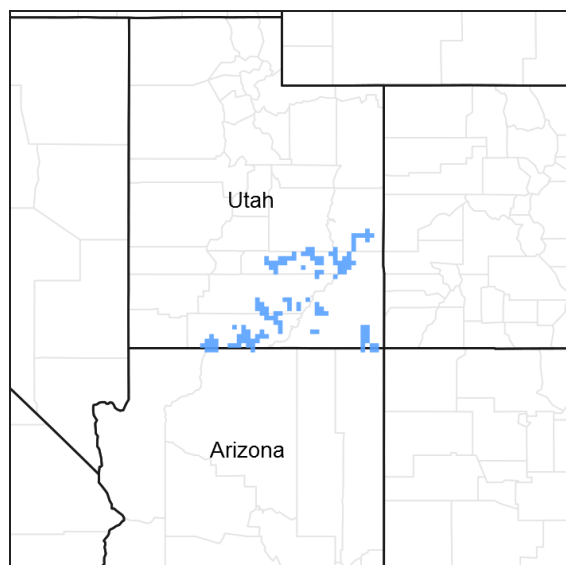


Figure 1. Mapped extent

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

Ecological site concept

Site concept: The Sandy Bottom (Fourwing Saltbush) ecological site receives extra run-in water due to its landscape position on flood plains, stream terraces, and valley flats. It is found in the desert and semidesert climate zones of the Colorado and Green River Plateaus region (MLRA 35). The soils are deep alluvial deposits derived primarily from sandstone parent material. Soil textures range from sandy loams to fine sands throughout the profile and may have small gravel lenses. These soils are most often classified as fluvents, with mesic soil moisture regimes and aridic soil temperature regimes (occasionally ustic aridic). The reference plant community is dominated by fourwing saltbush, Indian ricegrass, James' galleta, *Sporobolus* spp., and sometimes needle-and-thread. Herbivory, fire, drought, and invasive species are common drivers of plant community change on this site. Cheatgrass and Russian thistle are common invaders of the understory.

Associated sites

R035XY003UT	<p>Alkali Bottom (Greasewood)</p> <p>This site usually occurs on soils with finer textures and higher salt content, but the two sites can be found in the same drainages where gradients in soil texture and salinity occur.</p>
R035XY011UT	<p>Loamy Bottom (Basin Big Sagebrush)</p> <p>This site usually receives more annual precipitation and always occurs near a stream or drainageway. The two sites can occur together on stream terraces with sandy loam soil textures that average around 9 inches of precipitation.</p>

Similar sites

R035XY212UT	Semidesert Sand (Fourwing Saltbush) This site always has deep sandy soils and does not receive extra run-in water due to a more elevated landscape position. It usually has lower annual production and is less resistant to invasive species dominance and wind erosion.
R035XY215UT	Semidesert Sandy Loam (4-Wing Saltbush) This site does not receive extra run-in water due to its landscape position. It occurs on similar soils with annual precipitation as low as 8 inches, but it usually has lower total production and is less resistant to invasive annual dominance.
R035XY011UT	Loamy Bottom (Basin Big Sagebrush) This site is also a run-in site that can occur on deep, sandy loam alluvial deposits. However, this site averages 9-14 inches of annual precipitation and supports basin big sagebrush.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex canescens</i>
Herbaceous	(1) <i>Achnatherum hymenoides</i> (2) <i>Pleuraphis jamesii</i>

Physiographic features

This site receives extra run-in water due to its landscape position on flood plains, stream terraces, narrow valleys, and valley flats. Run off is low due to gentle slopes and highly permeable soils. The elevation ranges from 3800 to 6000 ft. This site usually does not have a seasonally high water table, but in some areas spring water table can be within 42 inches of the soil surface.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Valley (3) Channel
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	1,158–1,829 m
Slope	0–5%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by hot, dry summers and cool winters. Average annual precipitation ranges from 6.5 to 10 inches. Approximately 75% of the total precipitation occurs from March to October, mostly in the form of convection thunderstorms from July through October. June is typically the driest month during the growing season. Large fluctuations in daily temperatures are common. Summer temperatures are in the 90's and winter temperatures are in the 20's and 30's. In addition to the climate stations listed below, the PRISM climate model was used to refine annual precipitation information.

Table 3. Representative climatic features

Frost-free period (average)	182 days
Freeze-free period (average)	211 days
Precipitation total (average)	254 mm

Influencing water features

This site may be associated with riparian ecological sites, but does not support riparian-obligate vegetation.

Soil features

The soils are deep to very deep and well drained to somewhat excessively well drained. Surface and subsurface textures are generally fine sandy loams, loamy fine sands, and fine sands. There are typically few rock fragments on the soil surface and throughout the profile, but sometimes gravel lenses are present. These soils are usually formed in alluvium derived from sandstone parent materials. The soil temperature regime is mesic and the soil moisture regime is aridic (sometimes ustic aridic). Soils are nonsaline to slightly saline. Water-holding capacity ranges from 2.7 to 5.7 inches of water in the upper 40 inches of soil.

Major Soils Associated With This Site (Soil Survey Area + Series Name):

UT631 – Henry Mountains Area – Glenberg Family
UT633 – Canyonlands Area – Trail
UT638 – San Juan County, Central –Bankard Family
UT642 – Kane County – Trail
UT643 – San Juan County, Navajo Indian Reservation – Trail; Aneth
UT685 – Capital Reef National Park – Mido family;
UT686 – Escalante Grand Staircase National Monument – Trail; Suwanee
UT687 – Arches National Park – Livan Family
UT688 – Grand Canyon National Park – Sheppard

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone
Surface texture	(1) Fine sandy loam (2) Loamy fine sand (3) Fine sand
Family particle size	(1) Sandy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–11%
Surface fragment cover >3"	0–3%
Available water capacity (0-101.6cm)	6.86–14.48 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
Electrical conductivity (0-101.6cm)	0–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Subsurface fragment volume <=3" (Depth not specified)	0–12%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

This site is historically dominated by fourwing saltbush and a diverse perennial grass understory dominated by Indian ricegrass, James's Galleta, *Sporobolus* spp, and/or needle-and-thread. The historic fire return interval is presumed to be about 35-100 years (Howard 2003). Fourwing saltbush 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. Inundation, persistent heavy browsing, and/or insect herbivory would have resulted in reduced fourwing saltbush and a grass-dominated plant community.

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.

Invasive plant species, particularly cheatgrass, Russian thistle, and annual mustards, 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, although disturbances often provide germination sites and/or seed sources that accelerate invasion. When the ecological processes are altered due to improper grazing, prolonged drought, altered fire regime, invasive species dominance, and/or other disturbances, alternative states can occur that differ from the historic reference state in both plant community structure and ecological function.

State and transition model

R035XY015UT Sandy Bottom (Fourwing Saltbush)

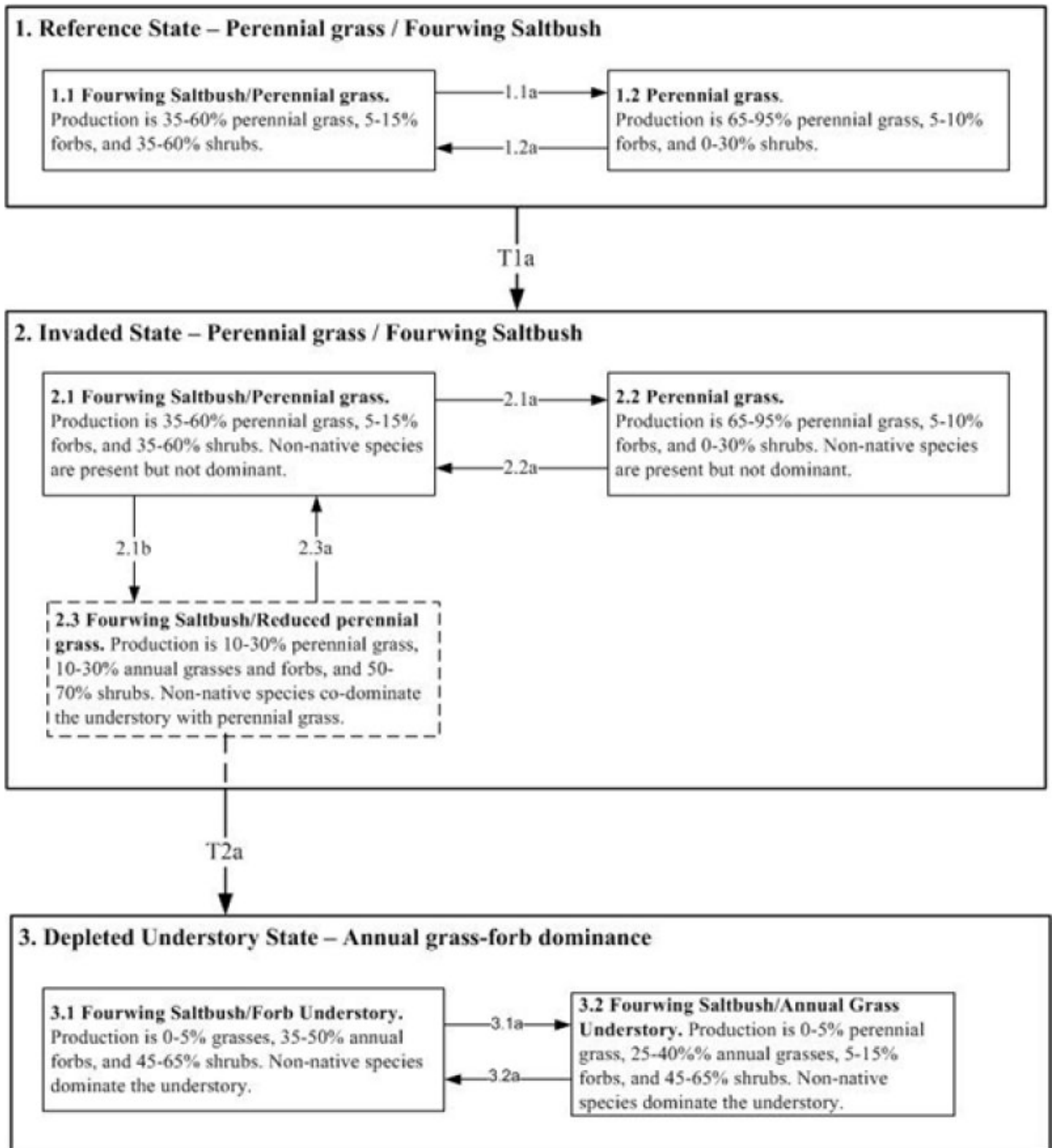


Figure 4. State-and-Transition Model

State 1

Reference State

The reference state contains plant communities presumed to occur on the Sandy Bottom site prior to the introduction of non-native plants, livestock grazing, and other modern disturbances. The reference state is generally dominated by fourwing saltbush and deep-rooted perennial bunchgrasses. Plant species are adapted to poorly developed, coarse soils. The reference state does not include any non-native or invasive plant species. Once invasive plants establish, return to the reference state may not be possible.

Community 1.1

Fourwing Saltbush/Perennial Grass



R035XY015UT—Sandy Bottom (Fourwing Saltbush) community 1.1—Fourwing Saltbush/Perennial grass.

Figure 5. Phase 1.1

Community phase 1.1 is characterized by a fourwing saltbush 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 fourwing saltbush and perennial grasses within one year following fire. Composition by air-dry weight is 35-60% grasses, 5-15% forbs, and 35-60% shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	168	280	392
Shrub/Vine	157	224	280
Forb	11	28	56
Total	336	532	728

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-25%
Grass/grasslike foliar cover	15-30%
Forb foliar cover	2-10%
Non-vascular plants	0%
Biological crusts	5-15%
Litter	15-30%
Surface fragments >0.25" and <=3"	0-12%
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	—	—	0-5%	0-5%
>0.15 <= 0.3	—	—	0-5%	0-5%
>0.3 <= 0.6	—	5-15%	10-25%	0-5%
>0.6 <= 1.4	—	10-20%	0-5%	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 1.2 Perennial Grass



R035XY015UT—Sandy Bottom (Fourwing Saltbush) community. Perennial grass. Cover is 32% grass, 2% forb,

Figure 7. Phase 1.2

Deep-rooted perennial bunchgrasses dominate the site. Fourwing saltbush is not dominant due to persistent heavy browsing over many years, insect herbivory, or prolonged anaerobic soil conditions (flooding). Percent composition by air-dry weight is 65-95% perennial grasses, 5-10% forbs, and 0-30% shrubs.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	336	560	785
Shrub/Vine	28	56	112
Forb	11	28	56
Total	375	644	953

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	25-40%
Forb foliar cover	2-10%
Non-vascular plants	0%
Biological crusts	5-20%

Litter	5-15%
Surface fragments >0.25" and <=3"	0-12%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	30-45%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-5%	0-5%
>0.15 <= 0.3	—	—	0-5%	0-5%
>0.3 <= 0.6	—	0-10%	20-40%	0-5%
>0.6 <= 1.4	—	0-5%	0-5%	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 1.1a Community 1.1 to 1.2



**Fourwing Saltbush/Perennial
Grass**



Perennial Grass

This community pathway occurs when persistent heavy browsing, insect herbivory, or prolonged inundation of fourwing saltbush results in a perennial grass-dominated plant community.

Pathway 1.2a Community 1.2 to 1.1



Perennial Grass



**Fourwing Saltbush/Perennial
Grass**

This pathway is the natural increase in fourwing saltbush until the shrub again co-dominates the site. It occurs when fourwing saltbush is not subjected to persistent heavy browse, insect herbivory, or inundation for many years.

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 incapable of recovering perennial grasses without significant management inputs.

Community 2.1

Fourwing Saltbush/Perennial Grass

Shrubland with fourwing saltbush, perennial grasses, and mesquite. Common mesquite is abundant. Saguaro Reef Soil Survey. NAD83 0507513 E. 44168302 N. Photo by Jake Owens, April 25, 2011.



Figure 9. 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 fourwing saltbush and perennial grasses. Percent composition by air-dry weight is 35-60% perennial grasses, 5-15% forbs, and 35-60% shrubs.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	168	280	392
Shrub/Vine	157	224	280
Forb	11	28	56
Total	336	532	728

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-25%
Grass/grasslike foliar cover	15-30%
Forb foliar cover	2-10%
Non-vascular plants	0%
Biological crusts	5-15%
Litter	15-30%
Surface fragments >0.25" and <=3"	0-12%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	20-30%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-5%	0-5%
>0.15 <= 0.3	—	—	0-5%	0-5%
>0.3 <= 0.6	—	5-15%	10-25%	0-5%
>0.6 <= 1.4	—	10-20%	0-5%	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 2.2

Perennial Shrubland/Grassland



Figure 11. Phase 2.2

This plant community is similar to phase 1.2 in structure and function, but it allows for non-native/invasive species to be present. Deep-rooted perennial bunchgrasses dominate the site. Fourwing saltbush is not dominant due to persistent heavy browsing over many years, insect herbivory, or prolonged anaerobic soil conditions (flooding). Percent composition by air-dry weight is 65-95% perennial grasses, 5-10% forbs, and 0-30% shrubs.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	336	560	785
Shrub/Vine	28	56	112
Forb	11	28	56
Total	375	644	953

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-10%
Grass/grasslike foliar cover	25-40%
Forb foliar cover	2-10%
Non-vascular plants	0%
Biological crusts	5-20%

Litter	5-15%
Surface fragments >0.25" and <=3"	0-12%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	30-45%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-5%	0-5%
>0.15 <= 0.3	—	—	0-5%	0-5%
>0.3 <= 0.6	—	0-10%	20-40%	0-5%
>0.6 <= 1.4	—	0-5%	0-5%	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Community 2.3

Fourwing Saltbush/Reduced Perennial Grasses



R035XY015UT—Sandy Bottom (Fourwing Saltbush) community 2.3—Fourwing Saltbush/Reduced Perennial

Figure 13. Phase 2.3

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. Percent composition by air-dry weight is 10-30% perennial grasses and forbs, 10-30% annual grasses and forbs, and 50-70% shrubs.

Table 17. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	168	224	280
Forb	28	84	140
Grass/Grasslike	56	84	112
Total	252	392	532

Table 18. Ground cover

Tree foliar cover	0-1%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	10-40%
Forb foliar cover	2-11%
Non-vascular plants	0%
Biological crusts	20-50%
Litter	3-7%
Surface fragments >0.25" and <=3"	0-13%
Surface fragments >3"	0-3%
Bedrock	0%
Water	0%
Bare ground	6-40%

Table 19. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	—	0-10%	0-10%
>0.15 <= 0.3	—	—	0-20%	5-10%
>0.3 <= 0.6	—	5-20%	10-20%	0-15%
>0.6 <= 1.4	—	5-10%	—	—
>1.4 <= 4	0-1%	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

Pathway 2.1a Community 2.1 to 2.2



**Fourwing Saltbush/Perennial
Grass**



**Perennial
Shrubland/Grassland**

This community pathway occurs when persistent heavy browsing, insect herbivory, or prolonged inundation of fourwing saltbush results in a perennial grass-dominated plant community.

Pathway 2.1b

Community 2.1 to 2.3



Fourwing Saltbush/Perennial Grass



Fourwing Saltbush/Reduced Perennial Grasses

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



Perennial Shrubland/Grassland



Fourwing Saltbush/Perennial Grass

This pathway is the natural increase in fourwing saltbush until the shrub again co-dominates the site. It occurs when fourwing saltbush is not subjected to persistent heavy browse, insect herbivory, or inundation for many years.

Pathway 2.3a

Community 2.3 to 2.2



Fourwing Saltbush/Reduced Perennial Grasses



Perennial Shrubland/Grassland

This pathway is facilitated by prescribed grazing that provides rest during the growth period for perennial grasses to improve their vigor and reproductive capacity. This will require at least one above average precipitation year, or many average precipitation years to complete.

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. Fire in perpetuates this state, since fourwing saltbush and invasive annuals are both capable of recovering quickly following fire.

Community 3.1

Fourwing Saltbush/Forb Understory



R035XY015UT—Sandy Bottom (Fourwing Saltbush) community 3.1—Fourwing Saltbush/Forb Understory.

Figure 15. Phase 3.1

This phase occurs when perennial grasses are no longer dominant in the understory and annual forbs dominate the shrub interspaces. Percent composition by air-dry weight is 0-5% grasses, 35-50% annual forbs, and 45-65% shrubs.

Community 3.2 Fourwing Saltbush/Annual Grass Understory

Recent spring rainfall and possibly increased cheatgrass dominance prior to fire and is expected to regain dominance. Canyonlands Soil Survey. NAD83 0593489 E. 4223893 N. Photo by Ashley Garreltz, 2008.



Figure 16. Phase 3.2

This community occurs when perennial grasses no longer dominate the understory and recent fire and/or above average spring precipitation favors cheatgrass reproduction and establishment.

Pathway 3.1a Community 3.1 to 3.2



Fourwing Saltbush/Forb Understory



Fourwing Saltbush/Annual Grass Understory

This pathway occurs when above average spring precipitation and below average summer precipitation favors cheatgrass over annual forbs.

Pathway 3.2a Community 3.2 to 3.1



Fourwing Saltbush/Annual Grass Understory



Fourwing Saltbush/Forb Understory

This pathway may occur in years with low spring moisture and high summer precipitation.

Transition T1a 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.

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 Shrubs			157–280	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	157–280	8–15
3	Sub-dominant shrubs			0–112	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–34	0–4
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	0–34	0–3
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–22	0–2
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–17	0–3
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	0–17	0–2
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–17	0–2
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0–11	0–2
	desert pepperweed	LEFR2	<i>Lepidium fremontii</i>	0–11	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	0–2
	frosted mint	POIN3	<i>Poliomintha incana</i>	0–11	0–2
	skunkbush sumac	RHTRT	<i>Rhus trilobata var. trilobata</i>	0–11	0–2
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–11	0–2
Grass/Grasslike					
0	Dominant Grasses			140–392	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–146	0–15
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–146	0–15
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–112	0–10
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–90	0–6
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–90	0–6

1	Sub-dominant Grasses			0–56	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–11	0–1
	contorted sphagnum	SPCO14	<i>Sphagnum contortum</i>	0–11	0–1
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–11	0–1
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–6	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–6	0–1
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–6	0–1
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–4	0–1
	giant dropseed	SPGI	<i>Sporobolus giganteus</i>	0–2	0–1
Forb					
2	Forbs			11–56	
	seepweed	SUAED	<i>Suaeda</i>	0–45	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–34	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–34	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	0–17	0–5
	povertyweed	IVAX	<i>Iva axillaris</i>	0–11	0–5
	Brenda's yellow cryptantha	CRFL5	<i>Cryptantha flava</i>	0–11	0–2
	flatspine bur ragweed	AMAC2	<i>Ambrosia acanthicarpa</i>	0–11	0–2
	Fendler's sandmat	CHFE3	<i>Chamaesyce fendleri</i>	0–9	0–2
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0–9	0–1
	Pacific aster	SYHC	<i>Symphyotrichum chilense</i> var. <i>chilense</i>	0–6	0–2
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–2
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	0–6	0–2
	rusty lupine	LUPU	<i>Lupinus pusillus</i>	0–6	0–2
	Crescent milkvetch	ASAM5	<i>Astragalus amphioxys</i>	0–6	0–1
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	0–6	0–1
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	0–6	0–1
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–3	0–1
	plains springparsley	CYAC	<i>Cymopterus acaulis</i>	0–3	0–1
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–3	0–1
	Fremont cottonwood	POFR2	<i>Populus fremontii</i>	0–3	–
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	0–2	0–1
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–2	0–1
	snowball sand verben	ABFR2	<i>Abronia fragrans</i>	0–2	0–1
	water hemlock	CICUT	<i>Cicuta</i>	0–1	0–1
	Jones' pepperweed	LEMOJ	<i>Lepidium montanum</i> var. <i>jonesii</i>	0–1	0–1
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–1	0–1

Table 21. Community 1.2 plant community composition

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

Grass/Grasslike

0	Dominant Grasses			336–785	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–560	0–20
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–560	0–20
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–224	0–15
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–112	0–6
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	45–90	0–5
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–45	0–3
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	19–37	–
1	Sub-Dominant Grass			0–56	
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–11	0–1
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–11	0–1
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–6	0–1
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–1	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–1	0–1
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–1	0–1
	contorted sphagnum	SPCO14	<i>Sphagnum contortum</i>	0–1	0–1
	giant dropseed	SPGI	<i>Sporobolus giganteus</i>	0–1	0–1
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–1	0–1
Forb					
2	Forbs			11–56	
	Mojave seablite	SUMO	<i>Suaeda moquinii</i>	0–45	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–34	0–3
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–34	0–3
	bastard toadflax	COUM	<i>Comandra umbellata</i>	0–17	0–2
	rayless tansyaster	MAGR2	<i>Machaeranthera grindelioides</i>	0–17	0–2
	Brenda's yellow cryptantha	CRFL5	<i>Cryptantha flava</i>	0–11	0–2
	povertyweed	IVAX	<i>Iva axillaris</i>	0–11	0–2
	flatspine bur ragweed	AMAC2	<i>Ambrosia acanthicarpa</i>	0–11	0–2
	Fendler's sandmat	CHFE3	<i>Chamaesyce fendleri</i>	0–9	0–3
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0–9	0–1
	Crescent milkvetch	ASAM5	<i>Astragalus amphioxys</i>	0–6	0–3
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	0–6	0–2
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–2
	rusty lupine	LUPU	<i>Lupinus pusillus</i>	0–6	0–2
	Pacific aster	SYHC	<i>Symphyotrichum chilense</i> var. <i>chilense</i>	0–6	0–2
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	0–6	0–1
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	0–6	0–1
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–6	0–1
	plains springparsley	CYAC	<i>Cymopterus acaulis</i>	0–3	0–1
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–3	0–1
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–3	0–1
	tufted evening	OECA10	<i>Oenothera caespitosa</i>	0–2	0–1

	primrose				
	snowball sand verben	ABFR2	<i>Abronia fragrans</i>	0–2	0–1
	water hemlock	CICUT	<i>Cicuta</i>	0–1	0–1
	Jones' pepperweed	LEMOJ	<i>Lepidium montanum var. jonesii</i>	0–1	0–1
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–1	0–1
Shrub/Vine					
3	Shrubs			28–112	
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	0–101	0–8
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–45	0–4
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–28	0–3
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	0–2
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–11	0–1
	desert pepperweed	LEFR2	<i>Lepidium fremontii</i>	0–6	0–2
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–6	0–2
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–2	0–1
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–2	0–1
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	0–1	0–1
Tree					
4	Trees			0–3	
	Fremont cottonwood	POFR2	<i>Populus fremontii</i>	0–3	–

Table 22. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrubs			157–280	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	157–280	8–15
3	Sub-Dominant Shrubs			0–112	
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	0–56	0–5
	desert pepperweed	LEFR2	<i>Lepidium fremontii</i>	0–45	0–2
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–34	0–3
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–22	0–2
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–17	0–2
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	0–17	0–2
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–17	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	0–2
	frosted mint	POIN3	<i>Poliomintha incana</i>	0–11	0–2
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–11	0–2
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0–11	0–1
Grass/Grasslike					
0	Dominant Grasses			140–392	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–146	0–15
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–146	1–15

	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–112	0–10
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–90	0–6
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–90	0–6
1	Sub-dominant Grasses			0–56	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–45	0–5
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–11	0–1
	contorted sphagnum	SPCO14	<i>Sphagnum contortum</i>	0–11	0–1
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–11	0–1
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–6	0–2
	saltgrass	DISP	<i>Distichlis spicata</i>	0–6	0–1
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–6	0–1
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–4	0–1
	giant dropseed	SPGI	<i>Sporobolus giganteus</i>	0–2	0–1
Forb					
2	Forbs			11–56	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	0–84	0–25
	seepweed	SUAED	<i>Suaeda</i>	0–45	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–34	0–3
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–34	0–3
	bastard toadflax	COUM	<i>Comandra umbellata</i>	0–17	0–5
	Brenda's yellow cryptantha	CRFL5	<i>Cryptantha flava</i>	0–11	0–2
	flatspine bur ragweed	AMAC2	<i>Ambrosia acanthicarpa</i>	7–11	0–2
	povertyweed	IVAX	<i>Iva axillaris</i>	0–11	0–2
	Fendler's sandmat	CHFE3	<i>Chamaesyce fendleri</i>	0–9	0–3
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0–9	0–1
	Pacific aster	SYHC	<i>Symphotrichum chilense</i> var. <i>chilense</i>	0–6	0–2
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–2
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	0–6	0–2
	rusty lupine	LUPU	<i>Lupinus pusillus</i>	0–6	0–2
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	0–6	0–1
	Crescent milkvetch	ASAM5	<i>Astragalus amphioxys</i>	0–6	0–1
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	0–6	0–1
	tansymustard	DESCU	<i>Descurainia</i>	0–3	0–5
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–3	0–1
	saltlover	HAGL	<i>Halogeton glomeratus</i>	0–3	0–1
	plains springparsley	CYAC	<i>Cymopterus acaulis</i>	0–3	0–1
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–3	0–1
	Fremont cottonwood	POFR2	<i>Populus fremontii</i>	0–3	–
	snowball sand verbena	ABFR2	<i>Abronia fragrans</i>	0–2	0–1
	rayless tansyaster	MAGR2	<i>Machaeranthera grindelioides</i>	0–2	0–1
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–2	0–1

	Jones' pepperweed	LEMOJ	<i>Lepidium montanum</i> var. <i>jonesii</i>	0–1	0–1
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–1	0–1

Table 23. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
0	Dominant Grasses			336–785	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–560	0–20
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–560	0–20
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–224	0–15
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–112	0–10
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	45–90	0–5
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	19–37	–
1				0–56	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	0–45	0–4
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–45	0–4
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–11	0–1
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–11	0–1
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–6	0–1
	giant dropseed	SPGI	<i>Sporobolus giganteus</i>	0–1	0–1
	contorted sphagnum	SPCO14	<i>Sphagnum contortum</i>	0–1	0–1
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–1	0–1
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–1	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–1	0–1
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–1	0–1
	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–1	0–1
Forb					
2	Forbs			11–56	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	0–84	0–10
	seepweed	SUAED	<i>Suaeda</i>	0–45	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–37	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–37	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	0–17	0–5
	Brenda's yellow cryptantha	CRFL5	<i>Cryptantha flava</i>	0–11	0–2
	povertyweed	IVAX	<i>Iva axillaris</i>	0–11	0–2
	annual ragweed	AMAR2	<i>Ambrosia artemisiifolia</i>	7–11	0–2
	rayless tansyaster	MAGR2	<i>Machaeranthera grindelioides</i>	0–11	0–1
	Fendler's sandmat	CHFE3	<i>Chamaesyce fendleri</i>	0–9	0–3
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0–9	0–1
	Crescent milkvetch	ASAM5	<i>Astragalus amphioxys</i>	0–6	0–3
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	0–6	0–2
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–2

	rusty lupine	LUPU	<i>Lupinus pusillus</i>	0–6	0–2
	Pacific aster	SYHC	<i>Symphyotrichum chilense</i> var. <i>chilense</i>	0–6	0–2
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	0–6	0–1
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	0–6	0–1
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–6	0–1
	tansymustard	DESCU	<i>Descurainia</i>	0–3	0–5
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–3	0–1
	plains springparsley	CYAC	<i>Cymopterus acaulis</i>	0–3	0–1
	saltlover	HAGL	<i>Halogeton glomeratus</i>	0–3	0–1
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–3	0–1
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–2	0–1
	snowball sand verben	ABFR2	<i>Abronia fragrans</i>	0–2	0–1
	water hemlock	CICUT	<i>Cicuta</i>	0–1	0–1
	Jones' pepperweed	LEMOJ	<i>Lepidium montanum</i> var. <i>jonesii</i>	0–1	0–1
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–1	0–1

Shrub/Vine

3	Shrubs			28–112	
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa</i> ssp. <i>nauseosa</i> var. <i>nauseosa</i>	0–101	0–8
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0–45	0–4
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–28	0–1
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	0–2
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	0–11	0–1
	desert pepperweed	LEFR2	<i>Lepidium fremontii</i>	0–6	0–2
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–6	0–2
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–6	0–1
	Stansbury cliffrose	PUST	<i>Purshia stansburiana</i>	0–2	0–1
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0–1	0–1

Table 24. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Grass			56–112	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	6–84	1–7
	cheatgrass	BRTE	<i>Bromus tectorum</i>	3–45	1–4
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	0–45	0–4
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–28	0–3
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–11	0–5
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	0–11	0–1
	contorted sphagnum	SPCO14	<i>Sphagnum contortum</i>	0–11	0–1
	saltgrass	DISP	<i>Distichlis spicata</i>	0–6	0–2
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	0–6	0–2

	needle and thread	HECO26	<i>Hesperostipa comata</i>	0–6	0–2
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	0–6	0–2
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–6	0–2
	low woollygrass	DAPU7	<i>Dasyochloa pulchella</i>	0–4	0–2
	giant dropseed	SPGI	<i>Sporobolus giganteus</i>	0–2	0–1
Forb					
2	Forbs			28–140	
	prickly Russian thistle	SATR12	<i>Salsola tragus</i>	11–140	0–12
	seepweed	SUAED	<i>Suaeda</i>	0–45	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–34	0–3
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–34	0–3
	bastard toadflax	COUM	<i>Comandra umbellata</i>	0–17	0–2
	povertyweed	IVAX	<i>Iva axillaris</i>	0–11	0–5
	Brenda's yellow cryptantha	CRFL5	<i>Cryptantha flava</i>	0–11	0–1
	flatspine bur ragweed	AMAC2	<i>Ambrosia acanthicarpa</i>	0–11	0–1
	Fendler's sandmat	CHFE3	<i>Chamaesyce fendleri</i>	0–9	0–1
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0–9	0–1
	Pacific aster	SYHC	<i>Symphyotrichum chilense</i> var. <i>chilense</i>	0–6	0–2
	rusty lupine	LUPU	<i>Lupinus pusillus</i>	0–6	0–2
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	0–6	0–2
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	0–6	0–2
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	0–6	0–1
	Crescent milkvetch	ASAM5	<i>Astragalus amphioxys</i>	0–6	0–1
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	0–6	0–1
	tansymustard	DESCU	<i>Descurainia</i>	0–3	0–5
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	0–3	0–1
	plains springparsley	CYAC	<i>Cymopterus acaulis</i>	0–3	0–1
	saltlover	HAGL	<i>Halogeton glomeratus</i>	0–3	0–1
	pale evening primrose	OEPA	<i>Oenothera pallida</i>	0–3	0–1
	hoary tansyaster	MACA2	<i>Machaeranthera canescens</i>	0–2	0–1
	tufted evening primrose	OECA10	<i>Oenothera caespitosa</i>	0–2	0–1
	snowball sand verbena	ABFR2	<i>Abronia fragrans</i>	0–2	0–1
	water hemlock	CICUT	<i>Cicuta</i>	0–1	0–1
	Jones' pepperweed	LEMOJ	<i>Lepidium montanum</i> var. <i>jonesii</i>	0–1	0–1
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–1	0–1
Shrub/Vine					
3	Shrubs			168–280	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	112–252	10–20
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0–78	0–3
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–45	0–4
	desert pepperweed	LEFR2	<i>Lepidium fremontii</i>	0–45	0–2
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0–34	0–3

	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0–28	0–3
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0–17	0–2
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	0–17	0–2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–11	0–2
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0–7	0–3

Table 25. Community 3.1 plant community composition

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

--Wildlife Interpretation--

Herds of mule deer, pronghorn antelope, and elk can be seen grazing/browsing on these sites, especially when near water sources and in the winter. The hot climate favors small mammals, which have an easier time finding shelter, food, and water. Many species of rats, mice, squirrels, bats, and chipmunks can be observed, along with coyotes and foxes. Lizards are the most visible and can be observed during the day. Species may include the northern whiptail, desert spiny, and the colorful western collard lizard. (NPS.gov, 2008)

--Grazing Interpretations--

This site provides good spring, fall, and winter grazing conditions for livestock due to accessibility and available nutritious forage. Yet, this site may lack natural perennial water sources, which can influence the suitability for livestock grazing. Perennial grasses provide good spring and fall grazing conditions for all classes of livestock. Shrubs, including fourwing saltbush, Cutler jointfir, and winterfat and provide good winter browse for cattle, sheep, and goats. Cutler jointfir is typically only browsed by livestock in the fall and winter due to poor nutritional value in the spring and summer. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

Recreational uses

Recreation activities include aesthetic value and good opportunities for hiking, horseback riding, hunting, and off-road vehicle use. Camping sites are usually limited due to lack of sheltering trees or rock outcrop.

Wood products

None

Other information

--Poisonous/Toxic Plant Species--

Toxic plants associated with this site include woolly locoweed, broom snakeweed, and sand sagebrush. Woolly locoweed is toxic to all classes of livestock and wildlife. This plant is palatable and has similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is unavailable. Many locoweed species contain swainsonine (indolizidine alkaloid) and are 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 will generally graze broom snakeweed when other forage is unavailable, typically in winter when toxicity levels are at their lowest. Sand sagebrush is toxic to horses, but not to other livestock and wildlife ruminants. This plant contains sesquiterpene lactones and monoterpenes, where toxic concentrations are greatest in the late fall and winter. Horses develop neurological signs and exhibit abnormal behavior, such as ataxia and the tendency to fall down, after eating sand sagebrush for several days. (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 perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) undesirable plants will invade the site. Of particular concern on this site are cheatgrass, Russian thistle, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible.

Cheatgrass and Russian thistle are common invaders to this site, especially in lower areas that concentrate nutrients and moisture. In some cases cheatgrass has been able to establish into an intact perennial grass and shrub community, but disturbed communities are more susceptible to invasion and domination by invasive plant species. If growing conditions are conducive to invaders and the disturbance is not removed, these plants can create monotypic stands that can alter the nutrient cycling, erosion rates and the fire regime of the area.

Other references

Howard, Janet L. 2003. *Atriplex canescens*. 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/> [2012, August 20].

Contributors

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Rangeland health reference sheet

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

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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, increasing as slope steepens. Rill development will increase following large storm events, but rills heal within a few months due to the very sandy soil textures on soils that have weak soil structure.

2. **Presence of water flow patterns:** Flow patterns will occur more often on soils with more structure (fine sandy loams), and less often on soils with less structure (sands). Flow patterns are usually sinuous and wind around perennial plant bases and show very minor evidence of erosion due to sandy texture of soil. They are expected to be short (3 to 6 feet), narrow (less than 1 foot), and somewhat widely spaced (> 15 feet). They are typically stable with only minor evidence of deposition. Evidence of flow will increase somewhat with a slope greater than 3 percent. This site is periodically inundated with runoff water (i.e. in flash floods) due to its geomorphic 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):** 30-45%. 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 crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground.

5. **Number of gullies and erosion associated with gullies:** Very few. 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 area. Gullies may show minor signs of active erosion but the sides and bottoms would be mostly stabilized with perennial vegetation. Gullies may show more indication of erosion on slopes greater than 3 percent, or as influenced by adjacent areas (watersheds) that may be providing concentrated flow patterns.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Slight wind generated soil movement is normal. Wind caused blowouts and deposition are rare. If present, they are mostly stable or have healed over. Coppice mounding around perennial vegetation may occur is typical.

7. **Amount of litter movement (describe size and distance expected to travel):** Due to the natural periodic concentration of runoff in this site, some fine litter movement is common. Often litter from adjacent sites/watershed contribute to litter noted on this ecological site. Litter removal may occur in 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 4 or 5 under the plant canopies and a rating of 3 to 4 in the

interspaces using the soil stability kit test. The average should be a 4. Surface texture is loamy sand to sandy 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 6 inches deep. Structure is typically moderate fine granular. Color is typically light brown (7.5YR6/4) to light brownish gray (10YR6/2). Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants are expected to break raindrop impact and splash erosion. Spatial distribution of vascular plants slows runoff by obstructing surface flows to help create sinuous flow patterns that dissipate energy and allow time for infiltration within the naturally receptive loamy sand to sandy loam soil textures. With the geomorphic location of the site being in low stream terraces, flood plains, alluvial bottoms, channels and valley flats, and alluvial fans this site is one of the terminal accumulation sites for runoff water. As such, infiltration is naturally facilitated. 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.
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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
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Perennial bunchgrasses (Indian ricegrass, Galleta, Sand dropseed) > non-sprouting shrubs (Fourwing saltbush)
- Sub-dominant: perennial and native annual forbs (Globemallow and others) > sprouting shrubs (Torrey tea, rabbitbrush, Sand sagebrush)
- 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, Smooth brome, 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.
- 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. Dominance by average annual production:
- 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. 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. Some mortality of bunchgrass and other shrubs may occur during very severe (long term) droughts. Snakeweed may normally die out on 7-10 year cycles.

14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2" under canopies. Litter cover may increase to 15-20% on some years due to increased plant production.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 550-650 #/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: Cheatgrass, filaree, other annual forbs, common ragweed, Russian thistle and common sunflower.
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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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