

Ecological site R035XY011UT Loamy Bottom (Basin Big Sagebrush)

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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 loamy bottom (basin big sagebrush) ecological site is a run-in site found on terraces near streams or washes. It is mostly in the semidesert climate zone (4,000-7,000 feet) of the Colorado and Green River Plateaus region (MLRA 35). The site occurs at the bottom of the watershed in areas that receive extra water and sediment from surrounding uplands. The soils are deep with very few rock fragments. Surface textures are usually sandy loams, but range from loams to loamy sands. These soils are most often classified as fluvents, with mesic soil moisture regimes and ustic aridic soil temperature regimes (can be aridic ustic in some areas). The reference plant community is dominated by basin big sagebrush, gooseberryleaf globemallow, Indian ricegrass, and needle-and-thread. Cheatgrass and Russian thistle are common invaders of the understory, and tamarisk is capable of dominating this site when it occurs on low stream terraces.

Associated sites

R035XY003UT	Alkali Bottom (Greasewood)
	The alkali bottom site is often found in the same landscape position as the loamy bottom site, but in areas
	with higher salinity and typically finer soil textures. In some areas, these two site intermingle as soils
	properties transition from saline to non-saline.

Table 1. Dominant plant species

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

Physiographic features

This site is usually associated with a stream or a wash. It commonly occurs on flood plains, stream terraces, alluvial flats, and drainageways at elevations between 4,000 and 7,000 ft. Slopes are gentle and runoff potential is low. This site may have a seasonally high water table in the spring within 3 to 6 feet of the soil surface.

Landforms	(1) Alluvial flat(2) Flood plain(3) Stream terrace
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None to rare
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to rare
Elevation	4,000–7,000 ft
Slope	0–8%
Aspect	Aspect is not a significant factor

Table 2. Representative physiographic features

Climatic features

Total annual precipitation for this site is typically 9 to 13 inches. The plant growing season is from mid March to mid October, and approximately 75% of the precipitaion occurs during the growing season. This site receives additional moisture during the growing season in the form of runoff or subsurface flow. January, February and June are typically the driest months; and April, August and October are the wettest months.

Table 3. Representative climatic features

Frost-free period (average)	162 days
Freeze-free period (average)	187 days
Precipitation total (average)	13 in

Influencing water features

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

Soil features

The soils for this site are deep and well drained with very few rock fragments on the soil surface. The surface horizon (A horizon) is usually less than 4 inches thick. Surface textures are usually fine sandy loams, but can range from loams to fine sands. These soils formed from alluvium derived primarily from sandstone, shale, limestone

and/or igneous parent materials. Subsoils are often stratified and are non-skeletal. Water holding capacity ranges from 2.5 to 6 inches of water in the upper 40 inches of soil. The soil temperature regime is mesic and the soil moisture regime is aridic or ustic aridic. Most often these soils are classified as fluvents.

Soils Associated with Site R035AY011UT

Organized by Soil Survey Area and Soil Components (Map units in parentheses):

Canyonlands Area (UT633)-Barnum (3); Jocity (43); Ustic Torrifluvents (97);

San Juan County, Central-(UT638) Gilco (12, 13, 14); Redbank family (42, 43); Suwanee (66);

San Juan County, Navajo (UT643)-Redbank (RED);

Capitol Reef National Park (UT685) -Begay, Mido family, Radnik;

Escalante Grand Staircase (UT686)-Baldfield family (5090); Escavda (5141); Flatnose (5120, 5210); Radnick, moist (5112, 5140, 5141, 5142, 5143, 5172, 5174);

Arches National Park (UT687)-Mido (110);

Canyonlands National Park (UT688)-Mido (22);

Typical Soil Profile: C1--0-4 inches; fine sandy loam; slightly alkaline C2--4-60 inches; stratified sandy loam; slightly alkaline

Table 4. Representative soil features

Parent material	(1) Alluvium–volcanic sandstone		
Surface texture	(1) Fine sandy loam(2) Loam(3) Fine sand		
Family particle size	(1) Loamy		
Drainage class	Well drained		
Permeability class	Moderately slow to moderately rapid		
Soil depth	60 in		
Surface fragment cover <=3"	0–3%		
Surface fragment cover >3"	0–2%		
Available water capacity (0-40in)	2.5–6 in		
Calcium carbonate equivalent (0-40in)	0–25%		
Electrical conductivity (0-40in)	0–4 mmhos/cm		
Sodium adsorption ratio (0-40in)	0–5		
Soil reaction (1:1 water) (0-40in)	7.4–9		
Subsurface fragment volume <=3" (Depth not specified)	0–15%		
Subsurface fragment volume >3" (Depth not specified)	0–5%		

Ecological dynamics

This site was historically dominated by basin big sagebrush and a diverse perennial understory, including Indian ricegrass, gooseberryleaf globemallow, and needle-and-thread. The historic fire return interval is presumed to be about 50-100 years (Fryer and Luensmann 2012). Native grasses would have dominated for several years following fire, with sprouting shrubs increasing in the community. Sagebrush will most commonly re-establish and in the community within 10 years after the fire and increase steadily for 10-20 years until it dominates the overstory. In addition to fire, drought or aroga moths may cause sagebrush to decrease in the community.

Today this site often burns less frequently due to fire suppression efforts and reduce fine fuel loads resulting from improper livestock grazing. In addition, improper livestock grazing 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 on low stream terraces. 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, this site has been used for cropland.

As stream channels are cut down, stream terraces occupied by the loamy bottom (basin big sagebrush) may cross an abiotic threshold into a semidesert sandy loam (Fourwing saltbush) site. This occurs when the site no longer recieves sufficient run-in moisture (via subsurface flow and/or runoff) to support a basin big sagebrush plant community. Fourwing saltbush dominance, stream downcutting, and a loss of skunkbrush sumac and other waterloving species indicate that a transition to a drier ecological site is occuring.

State and transition model

R035XY011UT Loamy Bottom (Basin Big Sagebrush)



Figure 4. State-and-Transition Model

State 1 Reference State

The reference state contains plant communities presumed to occur prior to the introduction of non-native plants,

livestock grazing, and other modern disturbances. Basin big sagebrush dominance depends on time since fire, aroga moth, or extended drought.

Community 1.1 Basin big sagebrush/Perennial grass



R035XY011UT—Loamy Bottom (Basin big sagebrush) community 1.1—Basin big sagebrush/Perennial grass.

Figure 5. phase 1.1



R035XY011UT—Loamy Bottom (Basin big sagebrush) community 1.1—Basin big sagebrush/Perennial grass.

Figure 6.



R035XY011UT—Loamy Bottom (Basin big sagebrush) community 1.1—Basin big sagebrush/Perennial grass.

Figure 7.

Phase 1.1 is dominated by basin big sagebrush and perennial grasses. Percent composition by air-dry weight is 25-60% perennial grasses, 5-15% forbs, and 40-70% shrubs. In the reference state, this is the most common community phase.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	250	350	500
Grass/Grasslike	200	300	400
Forb	25	50	100
Total	475	700	1000

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-25%
Grass/grasslike foliar cover	15-25%
Forb foliar cover	3-6%
Non-vascular plants	0%
Biological crusts	0-10%
Litter	10-20%
Surface fragments >0.25" and <=3"	0-3%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	30-45%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	-	-	-	-
>0.5 <= 1	-	-	-	0-5%
>1 <= 2	-	0-5%	0-5%	5-10%
>2 <= 4.5	-	10-20%	10-20%	-
>4.5 <= 13	-	5-20%	-	-
>13 <= 40	-	-	-	-
>40 <= 80	-	-	-	-
>80 <= 120	-	_	-	-
>120	-	_	-	_

Community 1.2 Perennial grass/Sprouting shrub

Phase 1.2 is dominated by perennial grasses. Percent composition by air-dry weight is 60-85% perennial grasses, 5-25% forbs, and 15-35% shrubs. Sprouting shrubs make up most of the shrub component. This phase is usually the result of stand-replacing fire that eliminates basin big sagebrush for the space of several years. Sagebrush may begin to re-establish in the community within 10 years following fire, and will steadily increase in the community until it becomes co-dominant with the perennial grass.

Pathway 1.1a Community 1.1 to 1.2

Stand-replacing fire is the most common cause of this community pathway. The fire return interval is highly variable

but usually occurs every 50-100 years (Fryer and Luensmann 2012). Sagebrush decreases and perennial grasses, forbs, and sprouting shrubs dominate the site. Aroga moth, low-intensity fires, and prolonged drought may also result in a substantial decrease in sagbrush, but do not necessarily eliminate it from the community.

Pathway 1.2a Community 1.2 to 1.1

This pathway results from the establishment and natural increase of basin big sagebrush into the plant community 10-30 years following a fire.

State 2 Invaded State--Basin big sagebrush/Perennial grass

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 recoving perennial grasses without significant management inputs.

Community 2.1 Basin big sagebrush/Perennial grass



R035XY011UT-Loamy Bottom (Basin big sagebrush) community 2.1-Invaded Basin big sagebrush/

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 basin big sagebrush and perennial grasses. Percent composition by air-dry weight is 25-60% perennial grasses, 5-15% forbs, and 40-70% shrubs.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	250	350	500
Grass/Grasslike	200	300	400
Forb	25	50	100
Total	475	700	1000

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-25%
Grass/grasslike foliar cover	15-25%
Forb foliar cover	3-6%

Non-vascular plants	0%
Biological crusts	0-10%
Litter	10-20%
Surface fragments >0.25" and <=3"	0-3%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	30-45%

Table 10. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	-	-	-	-
>0.5 <= 1	-	-	-	0-5%
>1 <= 2	-	0-5%	0-5%	5-10%
>2 <= 4.5	-	10-20%	10-20%	-
>4.5 <= 13	-	5-20%	-	-
>13 <= 40	-	-	-	-
>40 <= 80	-	-	-	-
>80 <= 120	_	_	_	_
>120		_	_	-

Community 2.2 Perennial grass/Sprouting shrub

Phase 2.2 is dominated by perennial grasses. It is similar to phase 1.2 in composition and ecological function, but allows for non-native/invasive species to be present. Percent composition by air-dry weight is 60-85% perennial grasses, 5-25% forbs, and 15-35% shrubs. Sprouting shrubs make up most of the shrub component. This phase is usually the result of stand-replacing fire that eliminates basin big sagebrush for the space of several years. Sagebrush may begin to re-establish in the community within 10 years following fire, and will steadily increase in the community until it becomes co-dominant with the perennial grass.

Community 2.3 Basin big sagebrush/Reduced perennial grass

most abundant understory species. NAD83 0619240 E. 4171541 N. Photo by Jamin Johanson July 26, 2011.



Figure 11. phase 2.3

Phase 2.3 is at-risk of crossing a threshold into the depleted understory state (state 3). 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 (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	250	350	500
Grass/Grasslike	75	150	225
Forb	25	50	100
Total	350	550	825

Pathway 2.1a Community 2.1 to 2.2

Stand-replacing fire is the most common cause of this community pathway. The fire return interval is highly variable but usually occurs every 50-100 years (Fryer and Luensmann 2012). Sagebrush decreases and perennial grasses, forbs, and sprouting shrubs dominate the site. Aroga moth, low-intensity fires, and prolonged drought may also result in a substantial decrease in sagbrush, but do not necessarily eliminate it from the community.

Pathway 2.1b Community 2.1 to 2.3





Basin big sagebrush/Perennial grass

Basin big sagebrush/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

This pathway results from the establishment and natural increase of basin big sagebrush into the plant community 10-30 years following a fire.

Pathway 2.3a Community 2.3 to 2.1



Basin big sagebrush/Reduced

perennial grass



Basin big sagebrush/Perennial grass

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

Conservation practices

State 3 Depleted Understory State--Basin big sagebrush/Annual grass-forb

The depleted understory state occurs when perennial grasses have been lost from the understory. Perennial forbs may also be reduced. This state is not as capable of carrying a stand replacing fire that removes big sagebrush due to a reduction in fine fules. As a result, sagebrush continues to increase and the understory continues to be reduced. Thinning of sagebrush by livestock trampling or other disturbance results in an increase in annual species in the understory.

Community 3.1 Basin big sagebrush/Limited understory



community 3.1—Basin big sagebrush/ Limited understory. Cover is 1% grass, 9% forb, 45% shrub, 10 % bare ground, 15% crust, and 20% litter. NAD83 0610519 E. 4204679 N Photo by Dana Truman May 14, 2007.

Figure 13. phase 3.1

Perennial grasses have been lost from the understory. Basin big sagebrush continues to increase beyond the natural fire return interval due to lack of fuel to carry a fire. Moss and biological soil crusts cover much of the soil surface.

Table 12. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	400	550	700
Forb	10	35	70
Grass/Grasslike	0	15	30
Total	410	600	800

Community 3.2 Basin big sagebrush/Annual understory



R035XY011UT—Loamy Bottom (Basin big sagebrush) community 3.2—Basin big sagebrush/Annual

Figure 15. phase 3.2

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

 Table 13. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	300	400	550
Forb	25	50	175
Grass/Grasslike	50	100	150
Total	375	550	875

Pathway 3.1a Community 3.1 to 3.2





Basin big sagebrush/Limited understory

Basin big sagebrush/Annual understory

Livestock trampling, mechanical treatment, or other disturbances reduces sagebrush cover and makes germination sites available for invasive annual species, particularly cheatgrass and Russian thistle.

Pathway 3.2a Community 3.2 to 3.1



Basin big sagebrush/Annual understory



Basin big sagebrush/Limited understory

This pathway occurs when basin big sagebrush is not reduced by trampling, mechanical treatment, fire, or other disturbances for many years. Sagebrush increases and annuals in the understory decrease.

State 4 Tamarisk State--Tamarisk-Basin big sagebrush

This state has only been documented on low stream terraces. The stream provides a corridor for tamarisk invasion, which spreads throughout the loamy bottom on low stream terraces, eventually dominating the site.

Community 4.1 Tamarisk-Basin big sagebrush



R035XY011UT—Loamy Bottom (Basin big sagebrush) community 4.1—Basin big sagebrush-Tamarisk. Cover

This community is co-dominated by basin big sagebrush and tamarisk. Production is 10-20% perennial and/or annual grasses, 10-20% forbs, 20-40% tamarisk, and 30-50% other shrubs.

Table 14. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	400	550	700
Forb	25	75	125
Grass/Grasslike	25	75	125
Total	450	700	950

Community 4.2 Tamarisk dominance



Figure 19. phase 4.2

This community occurs when tamarisk becomes the lone dominant species.

Table 15. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	400	600	1000
Forb	20	40	80
Grass/Grasslike	0	20	40
Total	420	660	1120

Pathway 4.1a Community 4.1 to 4.2





Tamarisk-Basin big sagebrush

Tamarisk dominance

This pathway occurs as tamarisk contiues to increase in the community by outcompeting basin big sagebrush as the dominant shrub.

Pathway 4.2a Community 4.2 to 4.1





Tamarisk dominance

Tamarisk-Basin big sagebrush

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 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.

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 basin big sagebrush.

Transition T3a State 3 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 basin big sagebrush.

Additional community tables

Table 16. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)	
Shrub	/Vine					
0	Dominant Shrubs			225–450		
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	200–400	_	
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	15–50	_	
3	Sub-dominant shrubs			25–100		
	skunkbush sumac	RHTRT	Rhus trilobata var. trilobata	0–60	-	
	greasewood	SAVE4	Sarcobatus vermiculatus	0–60	_	
	Shrub (>.5m)	2SHRUB	Shrub (>.5m)	10–50		
	fourwing saltbush	ATCA2	Atriplex canescens	0–30		
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–30	_	
	broom snakeweed	GUSA2	Gutierrezia sarothrae	0–25		
	winterfat	KRLA2	Krascheninnikovia lanata	0–15	_	
	plains pricklypear	OPPO	Opuntia polyacantha	0–15	_	
Grass	/Grasslike					
0	Dominant Grasses			100–300		
	needle and thread	HECO26	Hesperostipa comata	40–220	_	
	Indian ricegrass	ACHY	Achnatherum hymenoides	40–120	_	
1	Sub-dominant Grasses			50–150		
	blue grama	BOGR2	Bouteloua gracilis	0–55	_	
	Grass, perennial	2GP	Grass, perennial	15–50	_	
	sand dropseed	SPCR	Sporobolus cryptandrus	0–30	_	
	mesa dropseed	SPFL2	Sporobolus flexuosus	0–30	_	
	alkali sacaton	SPAI	Sporobolus airoides	0–25	_	
	squirreltail	ELEL5	Elymus elymoides	0–15	_	
	James' galleta	PLJA	Pleuraphis jamesii	0–15	-	
	purple threeawn	ARPU9	Aristida purpurea	0–15	_	
	Grass, annual	2GA	Grass, annual	0–10	_	
	sixweeks fescue	VUOC	Vulpia octoflora	0–5	-	
Forb						
2	Forbs			25–100		
	gooseberryleaf globemallow	SPGR2	Sphaeralcea grossulariifolia	5–50	-	
	Forb, perennial	2FP	Forb, perennial	10–30	_	
	silvery lupine	LUAR3	Lupinus argenteus	0–20	-	
	cleftleaf wildheliotrope	PHCR	Phacelia crenulata	0–20	_	
	lemon scurfpea	PSLA3	Psoralidium lanceolatum	0–20		
	tufted evening primrose	OECA10	Oenothera caespitosa	0–15		
	Utah milkvetch	ASUT	Astragalus utahensis	0–15		
	Pacific aster	SYCHC	Svmphvotrichum chilense var.	0–10	_	

		chilense		
Forb, annual	2FA	Forb, annual	2–10	-
yellow spiderflower	CLLUL	Cleome lutea var. lutea	0–5	-
Wright's bird's beak	COWR2	Cordylanthus wrightii	0–5	-
rosy ipomopsis	IPRO	Ipomopsis roseata	0–5	-
beardtongue	PENST	Penstemon	0–5	_

Table 17. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub	/Vine	4	L		
0	Dominant Shrubs			225–450	
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	200–400	_
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	15–50	
3	Sub-dominant shrubs	+	·	25–100	
	skunkbush sumac	RHTRT	Rhus trilobata var. trilobata	0–60	_
	greasewood	SAVE4	Sarcobatus vermiculatus	0–60	_
	Shrub (>.5m)	2SHRUB	Shrub (>.5m)	10–50	_
	fourwing saltbush	ATCA2	Atriplex canescens	0–30	_
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–30	_
	broom snakeweed	GUSA2	Gutierrezia sarothrae	0–25	_
	winterfat	KRLA2	Krascheninnikovia lanata	0–15	_
	plains pricklypear	OPPO	Opuntia polyacantha	0–15	_
Grass	/Grasslike	+			
0	Dominant Grasses			100–300	
	needle and thread	HECO26	Hesperostipa comata	40–220	_
	Indian ricegrass	ACHY	Achnatherum hymenoides	40–120	_
1	Sub-dominant Grasses	+		50–150	
	blue grama	BOGR2	Bouteloua gracilis	0–55	_
	Grass, perennial	2GP	Grass, perennial	15–50	_
	cheatgrass	BRTE	Bromus tectorum	5–40	
	sand dropseed	SPCR	Sporobolus cryptandrus	0–30	
	mesa dropseed	SPFL2	Sporobolus flexuosus	0–30	_
	alkali sacaton	SPAI	Sporobolus airoides	0–25	
	squirreltail	ELEL5	Elymus elymoides	0–15	
	James' galleta	PLJA	Pleuraphis jamesii	0–15	_
	purple threeawn	ARPU9	Aristida purpurea	0–15	
	Grass, annual	2GA	Grass, annual	0–10	_
	sixweeks fescue	VUOC	Vulpia octoflora	0–5	_
Forb		4	·	•	
2	Forbs			25–100	
	prickly Russian thistle	SATR12	Salsola tragus	0–50	
	gooseberryleaf globemallow	SPGR2	Sphaeralcea grossulariifolia	5–50	
	redstem stork's bill	ERCI6	Erodium cicutarium	0–35	_

 1	I	i i i i i i i i i i i i i i i i i i i	1	1
stickseed	LAPPU	Lappula	0–35	_
Forb, perennial	2FP	Forb, perennial	10–30	_
silvery lupine	LUAR3	Lupinus argenteus	0–20	_
cleftleaf wildheliotrope	PHCR	Phacelia crenulata	0–20	_
lemon scurfpea	PSLA3	Psoralidium lanceolatum	0–20	_
tufted evening primrose	OECA10	Oenothera caespitosa	0–15	_
Utah milkvetch	ASUT	Astragalus utahensis	0–15	_
Pacific aster	SYCHC	Symphyotrichum chilense var. chilense	0–10	_
Forb, annual	2FA	Forb, annual	2–10	_
rosy ipomopsis	IPRO	Ipomopsis roseata	0–5	_
yellow spiderflower	CLLUL	Cleome lutea var. lutea	0–5	_
Wright's bird's beak	COWR2	Cordylanthus wrightii	0–5	_
beardtongue	PENST	Penstemon	0–5	-

Table 18. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub	/Vine	1			
0	Dominant Shrubs			200–400	
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	200–400	-
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	15–50	_
3	Sub-dominant shrubs			25–100	
	skunkbush sumac	RHTRT	Rhus trilobata var. trilobata	0–60	_
	greasewood	SAVE4	Sarcobatus vermiculatus	0–60	_
	Shrub (>.5m)	2SHRUB	Shrub (>.5m)	10–50	_
	fourwing saltbush	ATCA2	Atriplex canescens	0–30	_
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–30	_
	broom snakeweed	GUSA2	Gutierrezia sarothrae	0–25	_
	plains pricklypear	OPPO	Opuntia polyacantha	0–15	_
Grass	/Grasslike		•		
0	Dominant Grasses			75–200	
	Indian ricegrass	ACHY	Achnatherum hymenoides	20–80	_
	needle and thread	HECO26	Hesperostipa comata	5–80	_
	cheatgrass	BRTE	Bromus tectorum	5–60	_
1	Sub-dominant Grasses			25–75	
	blue grama	BOGR2	Bouteloua gracilis	0–45	_
	Grass, perennial	2GP	Grass, perennial	0–30	_
	purple threeawn	ARPU9	Aristida purpurea	0–15	_
	James' galleta	PLJA	Pleuraphis jamesii	0–15	_
	alkali sacaton	SPAI	Sporobolus airoides	0–15	_
	sand dropseed	SPCR	Sporobolus cryptandrus	0–15	_
	mesa dropseed	SPFL2	Sporobolus flexuosus	0–15	_
	squirreltail	ELEL5	Elymus elymoides	0–10	-
	Cross appual	201	Cross annual	0.40	

	Grass, annuar	204	ษาสรร, สาแานสา	U-1U	_
	sixweeks fescue	VUOC	Vulpia octoflora	0–5	-
Forb	-	•			
2	Forbs			25–100	
	prickly Russian thistle	SATR12	Salsola tragus	5–90	_
	redstem stork's bill	ERCI6	Erodium cicutarium	0–35	_
	gooseberryleaf globemallow	SPGR2	Sphaeralcea grossulariifolia	2–25	_
	lemon scurfpea	PSLA3	Psoralidium lanceolatum	0–15	_
	yellow bush lupine	LUAR	Lupinus arboreus	0–15	_
	tufted evening primrose	OECA10	Oenothera caespitosa	0–10	_
	Forb, annual	2FA	Forb, annual	2–10	-
	Utah milkvetch	ASUT	Astragalus utahensis	0–10	_
	cleftleaf wildheliotrope	PHCR	Phacelia crenulata	0–10	_
	Pacific aster	SYCHC	Symphyotrichum chilense var. chilense	0–10	_
	yellow spiderflower	CLLUL	Cleome lutea var. lutea	0–5	_
	Wright's bird's beak	COWR2	Cordylanthus wrightii	0–5	_
	beardtongue	PENST	Penstemon	0–5	_
	rosy ipomopsis	IPRO	Ipomopsis roseata	0–5	_

Table 19. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)		
Shrub/Vine							
0	Dominant Shrubs			400–700			
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	350–700	-		
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	25–100	-		
3	Sub-dominant shrubs	;		50–150			
	fourwing saltbush	ATCA2	Atriplex canescens	0–100	-		
	greasewood	SAVE4	Sarcobatus vermiculatus	0–100	-		
	Shrub (>.5m)	2SHRUB	Shrub (>.5m)	10–60			
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–30			
	skunkbush sumac	RHTRT	Rhus trilobata var. trilobata	0–15			
	broom snakeweed	GUSA2	Gutierrezia sarothrae	0–5			
	plains pricklypear	OPPO	Opuntia polyacantha	0–5			
Grass	/Grasslike						
1	Grasses			0–30			
	Grass, annual	2GA	Grass, annual	0–30	-		
	Grass, perennial	2GP	Grass, perennial	0–15	-		
Forb							
2	Forbs			10–60			
	prickly Russian thistle	SATR12	Salsola tragus	0–60	_		
	tumblemustard	THELY3	Thelypodiopsis	0–40	_		
	Forb, annual	2FA	Forb, annual	0–30	-		
	Forb, perennial	2FP	Forb, perennial	0–20	-		
	madwort	ALYSS	Alyssum	0–10	-		
	goosefoot	CHENO	Chenopodium	0–10			
	tansymustard	DESCU	Descurainia	0–10			
	stickseed	LAPPU	Lappula	0–10			
	woolly plantain	PLPA2	Plantago patagonica	0–5			
	redstem stork's bill	ERCI6	Erodium cicutarium	0–5	-		
	yellow spiderflower	CLLU2	Cleome lutea	0–5			
	Wright's bird's beak	COWR2	Cordylanthus wrightii	0–5	-		

Table 20. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)	
Shrub	/Vine					
0	Dominant Shrubs			250–450		
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	225–400	_	
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	25–100	-	
3	Sub-dominant shrubs			25–100		
	skunkbush sumac	RHTRT	Rhus trilobata var. trilobata	0–60	-	
	greasewood	SAVE4	Sarcobatus vermiculatus	0–60	-	
	fourwing saltbush	ATCA2	Atriplex canescens	0–30	-	
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–30	-	
	broom snakeweed	GUSA2	Gutierrezia sarothrae	0–10	_	
	plains pricklypear	OPPO	Opuntia polyacantha	0–10	-	
Grass	Grass/Grasslike					
0	Dominant Grasses			25–125		
	cheatgrass	BRTE	Bromus tectorum	25–125	_	
1	Sub-dominant grasses			5–40		
	Grass, perennial	2GP	Grass, perennial	0–30	_	
	Indian ricegrass	ACHY	Achnatherum hymenoides	0–30	_	
	purple threeawn	ARPU9	Aristida purpurea	0–25	_	
	Grass, annual	2GA	Grass, annual	0–20	_	
Forb				•		
0	Dominant Forbs			25–125		
	prickly Russian thistle	SATR12	Salsola tragus	25–125	_	
	tumblemustard	THELY3	Thelypodiopsis	0–125	_	
2	Sub-dominant forbs			15–45		
	Forb, annual	2FA	Forb, annual	0–20	_	
	Forb, perennial	2FP	Forb, perennial	0–20	_	
	stickseed	LAPPU	Lappula	0–15	_	
	gooseberryleaf globemallow	SPGR2	Sphaeralcea grossulariifolia	0–15	_	
	tufted evening primrose	OECA10	Oenothera caespitosa	0–10	_	
	cleftleaf wildheliotrope	PHCR	Phacelia crenulata	0–5	_	

Table 21. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)	
Shrub	Shrub/Vine					
0	Dominant shrubs			350–600		
	five-stamen tamarisk	TACH2	Tamarix chinensis	150–350	-	
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	100–200	-	
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	25–75	_	
3	Sub-dominant Shrubs			25–75		
	fourwing saltbush	ATCA2	Atriplex canescens	0–40	_	
	skunkbush sumac	RHTRT	Rhus trilobata var. trilobata	0–40	_	
	greasewood	SAVE4	Sarcobatus vermiculatus	0–40	_	
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–20	_	
	broom snakeweed	GUSA2	Gutierrezia sarothrae	0–10	_	
	plains pricklypear	OPPO	Opuntia polyacantha	0–5	_	
Grass	/Grasslike	•		+		
0	Dominant grasses			25–125		
	needle and thread	HECO26	Hesperostipa comata	0–120	_	
	Indian ricegrass	ACHY	Achnatherum hymenoides	0–120	_	
	cheatgrass	BRTE	Bromus tectorum	5–100	-	
2	Sub-dominant grasses		5–50			
	Grass, perennial	2GP	Grass, perennial	5–50	-	
	Grass, annual	2GA	Grass, annual	0–10	-	
Forb	Forb					
1	Forbs			25–125		
	prickly Russian thistle	SATR12	Salsola tragus	0–100	-	
	canaigre dock	RUHY	Rumex hymenosepalus	0–40	-	
	Forb, annual	2FA	Forb, annual	0–30	-	
	Forb, perennial	2FP	Forb, perennial	0–30	-	
	lambsquarters	CHAL7	Chenopodium album	0–10	-	
	stickseed	LAPPU	Lappula	0–10	-	

Table 22. Community 4.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrubs			400–1000	
	five-stamen tamarisk	TACH2	Tamarix chinensis	400–1000	-
3	Sub-dominant shrubs		-	5–100	
	basin big sagebrush	ARTRT	Artemisia tridentata ssp. tridentata	5–100	-
	fourwing saltbush	ATCA2	Atriplex canescens	0–20	-
	rubber rabbitbrush	ERNA10	Ericameria nauseosa	0–20	-
	greasewood	SAVE4	Sarcobatus vermiculatus	0–20	-
	yellow rabbitbrush	CHVI8	Chrysothamnus viscidiflorus	0–10	-
Grass/Grasslike					
1	Grasses			0–40	
	cheatgrass	BRTE	Bromus tectorum	0–25	-
	Grass, perennial	2GP	Grass, perennial	0–20	-
	Indian ricegrass	ACHY	Achnatherum hymenoides	0–10	-
	sand dropseed	SPCR	Sporobolus cryptandrus	0–10	-
	sixweeks fescue	VUOC	Vulpia octoflora	0–10	-
	Grass, annual	2GA	Grass, annual	0–10	-
Forb					
2	Forbs			25–75	
	white sagebrush	ARLU	Artemisia ludoviciana	0–40	-
	Forb, annual	2FA	Forb, annual	0–30	-
	Forb, perennial	2FP	Forb, perennial	0–30	-
	tansymustard	DESCU	Descurainia	0–30	-
	stickseed	LAPPU	Lappula	0–10	-
	canaigre dock	RUHY	Rumex hymenosepalus	0–10	-
	lambsquarters	CHAL7	Chenopodium album	0–10	-
	Wright's bird's beak	COWR2	Cordylanthus wrightii	0–5	_

Animal community

This site is suited to proper grazing by cattle and sheep during spring, summer, and fall, but requires sufficient rest during the growing season to maintain perennial grass. This site provides food and cover for diverse wildlife species.

Wood products

None

Other references

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

Grand Staircase: Radnik, moist – E of Boulder, along the Burr Trail, in the Circle Cliffs area; 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; W of Big Water along Highway 89 in the Kitchen Corral Wash drainage; SE of Escalante in the headwaters of the Alvey Wash and Wahweap Creek drainages; E of Kanab along Fivemile Valley, north of Hwy. 89 in the Paria River drainage, near the Paria Town Site; SE of Cannonville in Butler Valley; S of Cannonville near Sheep Creek; and in drainages NE of Tropic, along Henderson Creek and North Creek. (Modal – Latitude: 37° 33' 45.52" N Longitude: 111° 19' 9.83" W) Escavada – SE of Escalante in the headwaters of the Alvey Wash and Wahweap Creek drainages; W of Big Water along Highway 89 in the Kitchen Corral Wash drainage; NE of Big Water in drainages on Window Sash Bench; N of Big Water in drainages around Long Flat, and in drainages NE of Tropic, along Henderson Creek around Long Flat, and in drainages NE of Tropic, along Henderson Creek drainages around Long Flat, and in drainages NE of Big Water in drainages around Long Flat, and in drainages NE of Tropic, along Henderson Creek drainages around Long Flat, and in drainages NE of Tropic, along Henderson Creek and North Creek. (Modal – Latitude: 37° 25' 22.80" N Longitude: 111° 43' 58.80" W) Flatnose – below the White Cliffs in the areas of Johnson Canyon and Nephi Pasture; along the Skutumpah Road from Skutumpah Terrace to Sheep

Creek Flat; and NE of Henrieville along Hwy. 12 along Henrieville Creek. (Modal – Latitude: 37° 9' 9.01" N Longitude: 112° 16' 3.30" W)

Capitol Reef: Begay Family – South Draw: 1,500 ft. W & 1,000 ft. N of the SE corner of Sec. 12, T. 30S. R. 7E. (Unsurveyed area, location description is estimated.)

East Coyote Wash, central part of San Juan County

Contributors

George Cook 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

 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 form 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.
- 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%.
- 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: Very minor evidence of wind generated soil movement Wind scoured (blowouts) and depositional areas are rarely if ever present.
- 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 an erosion rating of 5 or 6 under plant canopies and a rating of 4 to 5 in the interspaces using the soil stability kit test. The average should be a 5. Surface texture is sandy loam to silt loam to 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 0-4 inches deep. Structure is weak granular. Colors are reddish brown. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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. With the physiographic location of the site being in stream terraces, alluvial flats, drainage ways, and flood plains 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.

- 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, fans etc.), it accumulates fine particles such as sands, silts and clays. The associated soil structure is weak medium subangular blocky parting to weak fine to medium granular to weak thin to medium platy 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: Perennial bunchgrasses (Indian ricegrass, Needle and thread) > Non-sprouting shrubs (Basin big sagebrush, Fourwing saltbush)

Sub-dominant: sprouting shrubs (rabbitbrush, greasewood) > forbs (globemallow, asters, primrose)

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, 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 fire, insect, and floods that kill the non-sprouting shrubs. 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, flood or insects that remove 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.

- 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.
- 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 20-30% on some years due to increased plant production.

- 15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annualproduction): 600-1000 #/acre on an average year
- 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: Tamarisk, cheatgrass, tumble mustard, and Russian thistle.
- 17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.