USDA Natural Resources
Conservation Service

Ecological site R035XY211UT
Semidesert Sand (Dune)

Accessed: 05/13/2025

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.

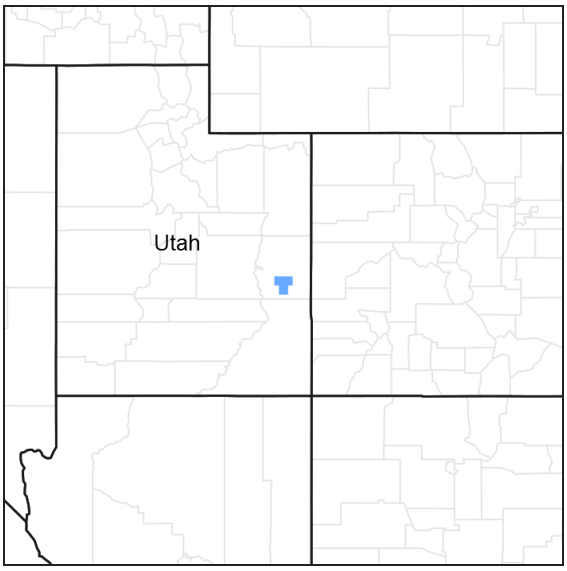


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

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

Associated sites

R035XY212UT	**Semidesert Sand (Fourwing Saltbush)**
R035XY233UT	**Semidesert Shallow Sandy Loam (Blackbrush)**

Similar sites

R035XY212UT	**Semidesert Sand (Fourwing Saltbush)**

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Artemisia filifolia* (2) *Quercus havardii*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Pleuraphis jamesii*

Physiographic features

This site occurs on dunes, shrub-coppice dunes, climbing dunes, and mesas. Run off is medium. Slopes typically range from 5-30%. Elevations are generally 4100 to 5500 ft.

Table 2. Representative physiographic features

Landforms	(1) Dune
Elevation	4,100–5,660 ft
Slope	5–30%
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is 8 to 10 inches. Approximately 77 percent occurs as rain from March through October. On the average, February, May, and June are the driest months and August, September, and October are the wettest months. The mean annual air temperature is 43-71 degrees Fahrenheit. The average frost-free period is 184 to 212 days. Precipitation is extremely variable from month to month and from year to year. Much of the summer precipitation occurs as convection thunder storms.

Table 3. Representative climatic features

Frost-free period (average)	212 days
Freeze-free period (average)	239 days
Precipitation total (average)	10 in

Influencing water features

There are no influencing water features found on this site.

Soil features

The soils are deep to very deep. Typically the surface layer is reddish brown. Surface soil texture is fine sand. These soils are excessively drained. The soil temperature regime is mesic and moisture regime is ustic aridic. Runoff is medium. Due to the dune nature of these soils, they are often mobile. This site has been used in the following soils surveys and has been correlated to the following components:

UT685 - Capitol Reef National Park - Mido, Earlweed, Bipen;
UT687 — Arches National Park — Mido;

Table 4. Representative soil features

Parent material	(1) Eolian sands–sandstone
Surface texture	(1) Fine sand
Family particle size	(1) Sandy
Drainage class	Excessively drained

Permeability class	Rapid
Soil depth	40–60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	2–3.1 in
Calcium carbonate equivalent (0-40in)	0–5%
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed under Colorado Plateau climatic conditions and included natural influences of herbivory and climate. In average years, plants begin growth around March 1 and end growth around October 15. The dominant aspect of this community varies depending upon location. In typical locations, this community is comprised of a variety of shrub species including resinbush, Havard oak, mormon tea, sand sagebrush, and frosted mint. However, in locations where this site is in canyon bottoms and along cliffs, the sand is stabilized and appears to receive more shade. Such areas produce more grass and appear like grasslands with a variety of shrubs. The amount of Indian ricegrass, needle-and-thread and other perennial grasses present is dependant on weather patterns (summer or winter precipitation)and the stability of the sites soil surface. The less structure in the soil, the fewer herbaceous species.

There is little historical evidence to indicate that this site maintained a short burn frequency. Large gaps between plants (discontinuous fuels)in relic areas indicate that this site may have rarely burned. Until further research indicates that fire played a significient role in the ecosystem processes of this site, this ecological site description will not include fire as a disturbance in the reference state. However, due to modern disturbances such as improper livestock grazing, brush treatments and harmful OHV use, the resilience of the historical vegetation may be at risk. Disturbances that result in an opportunity for invasive annuals to enter the system, and possibly produce sufficient fuel loads for fire, can cause the site to become at risk to burn. Cheatgrass, red brome, and Russian thistle are most likely to invade this site.

This ecological site has been grazed by domestic livestock since they were first introduced into the area around 1860. It is highly resistant to grazing due to the unpalatable nature of sand sagebrush, Harvard oak, and on some sites, a lack of forage plants. The introduction of domestic livestock and the use of fencing and reliable water sources have therefore only minimally influenced the historic disturbance regime associated with this ecological site.

Where this site is grazed, improper livestock grazing including, season long grazing and\or heavy stocking rates, may cause this site to depart from the reference plant community. As ecological condition deteriorates, perennial grasses and jointfir species may decrease while yellow cryptantha, locoweed, and snakeweed may increase. Improper grazing may also increase the chance for invasion by cheatgrass, red brome and invasive annual forbs. On the Colorado Plateau, however, these species are capable of establishing themselves on some sites even in the abscence of disturbance, but rarely increase to a point where they dominate in blackbrush communities.

Management practices that maintain or improve the rangeland vegetation include prescribed grazing and the proper

location of water developments. Severe drought may adversely affect the production of the herbaceous perennial vegetation.

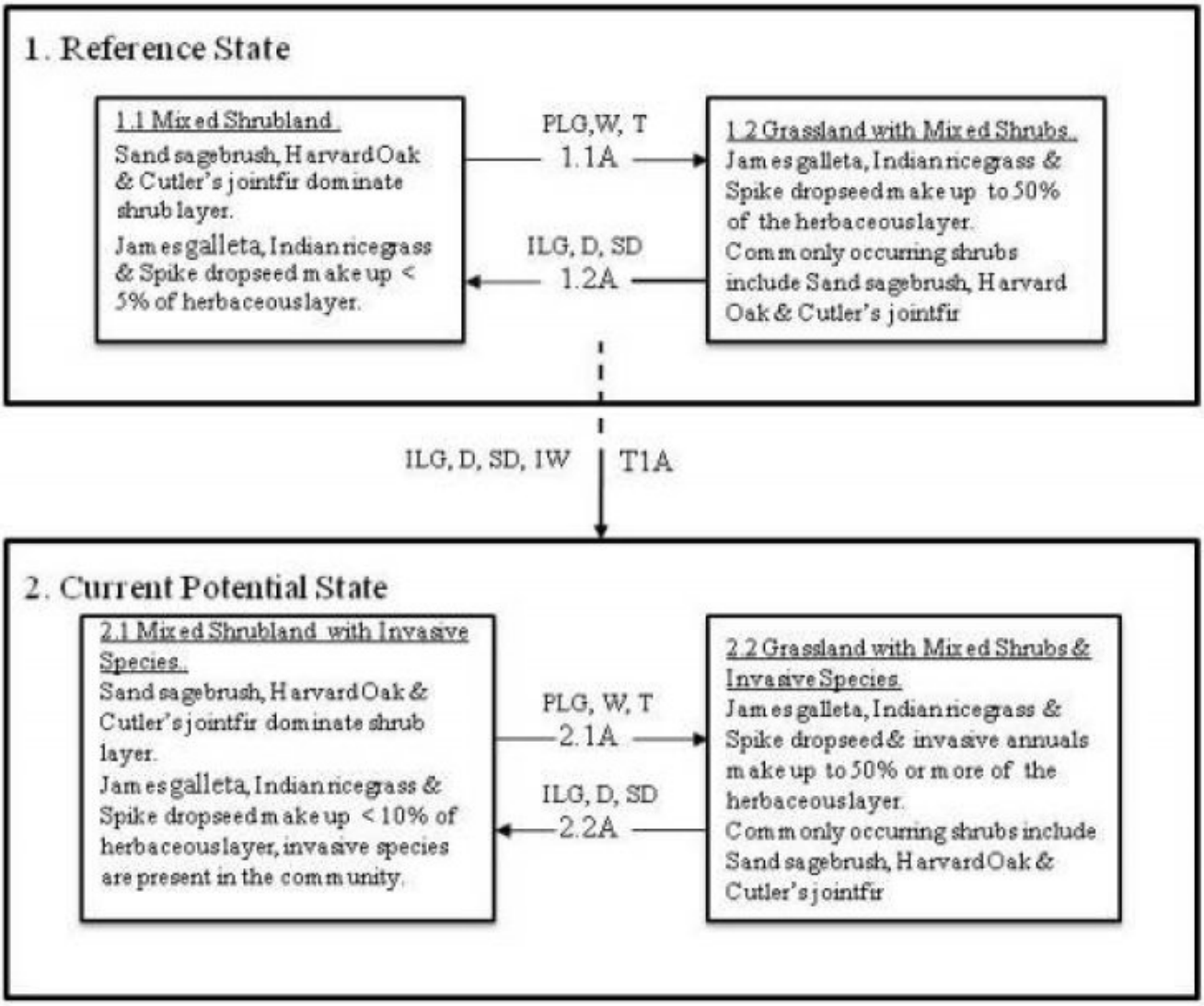
Suitability for rangeland seeding is very poor. It is not practical to revegetate large areas of this ecological site because of sandy soil textures, low annual precipitation, and very low available water capacity. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded.

As vegetation communities respond to changes in management or natural influences that move them to different ecological states, a return to previous states may not be possible without major energy inputs. The amount of energy needed to affect vegetative shifts depends on present biotic and abiotic features and the desired results.

The following State and Transition diagram shows some of the most commonly occurring plant communities found on this ecological site. These plant communities may not represent every possibility, but they are the most prevalent and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. This model was developed using range data collected over the last 40 years in MLRA D35 in southeastern Utah. Both ocular and

State and transition model

State and Transition Model
State: Utah
Site Type: Rangeland
MLRA: D-35- Colorado Plateau
R035XY211UT – Semi-desert Sand (Dune).



Legend:
D = Drought.
W = Wet weather periods.
T = Time
ILG = Improper Livestock Grazing.
PLG = Proper Livestock Grazing.
SD = Surface Disturbance.
IW = Invasive Weed Source.

State 1
Reference State

The reference state represents the plant community and ecological dynamics of the Semidesert Sand Dune site. This state includes the biotic communities that become established on the ecological site if all successional

sequences are completed under the natural disturbance regimes. The reference state is generally dominated by a shrub species. Primary disturbance mechanisms include climate fluctuations and events that result in soil stability changes. The process of changing from the dune phase to the stabilized phase is driven by plant succession. Typically, shrubs such as sand sagebrush and Cutler's jointfir establish on a site and begin to stabilize the soil. Then, more grasses begin to become established until the soil is stabilized and the site is no longer actively eroding and depositing in the form of dunes. Changing from a stabilized phase to a dune phase occurs as plant cover is reduced and wind erosion causes active dunes to form. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. Once invasive plants establish, return to the reference state may not be possible. Both community phases 1.1 ans 1.2 occur naturally and are a reflection of natural environmental variation. Reference State: Plant community resistant to fluctuations in climate. Indicators: A community dominated by shrub species where native perennial grasses and forbs may or may not be present. Feedbacks: Natural fluctuations in climate that allow for a self sustaining shrub and grass community. Any disturbance that allows for the establishment of invasive species. At-risk Community Phase: This community is at risk when plants are stressed and nutrients become available for invasive plants to establish. Trigger: The establishment of invasive plant species.

Community 1.1
Mixed Shrubland

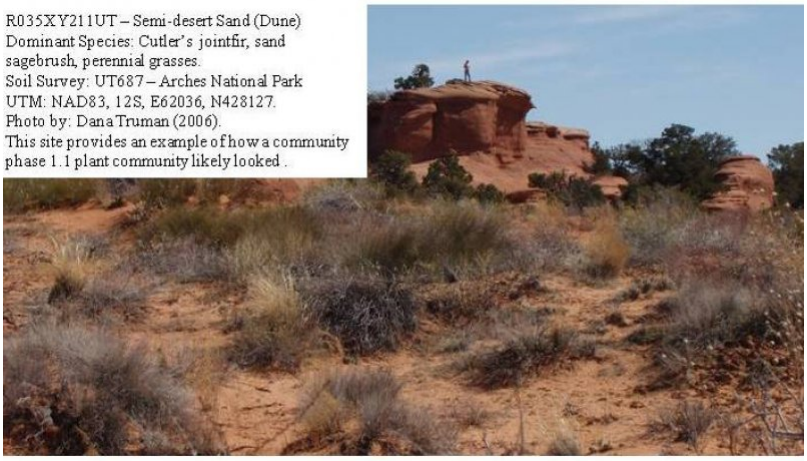


Figure 4. Mixed Shrubland.

This community phase is typically comprised of a variety of shrub species including resinbush, Havard oak, Cutler's jointfir, sand sagebrush, and frosted mint, where perennial grasses may or may not be present. Commonly seen grasses include Indian ricegrass, galleta, and spike dropseed. As grass cover increases, shrub interspaces are filled. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. The composition by air dry weight is approximately 10 percent forbs, 15 percent grasses, and 75 percent shrubs. However, some locations have up to 40% grass and only 30 percent shrub. Bare ground is variable (0-60%) depending on biological crust cover, which is also variable (0-59%). The following tables provide an example the the typical vegetative floristics of a community phase 1.1 plant community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	150	190	270
Grass/Grasslike	15	60	75
Forb	25	40	70
Tree	0	0	20
Total	**190**	**290**	**435**

Table 6. Ground cover

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	0-25%
Grass/grasslike foliar cover	0-35%
Forb foliar cover	0-20%
Non-vascular plants	0%
Biological crusts	0-60%
Litter	0-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	35-60%

Table 7. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-10%	0-15%	0-10%
>0.5 <= 1	–	0-10%	0-10%	0-6%
>1 <= 2	–	0-15%	0-5%	0-5%
>2 <= 4.5	0-5%	0-15%	–	–
>4.5 <= 13	0-5%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 1.2
Grassland with Mixed Shrubs

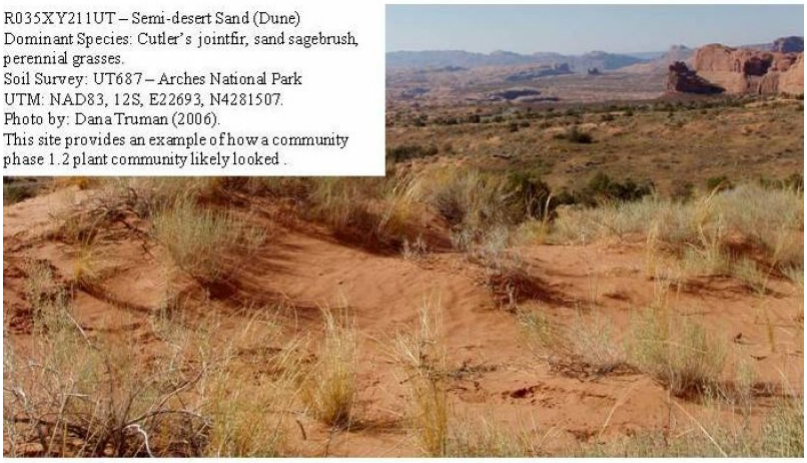


Figure 6. Grassland with Mixed Shrubs

This community phase is typically comprised of a mixture of native perennial grasses and shrubs. Commonly occurring grasses include Indian ricegrass, James galleta, and spike dropseed. Commonly occurring shrubs include resinbush, Havard oak, Cutler's jointfir, sand sagebrush, and frosted mint. Other perennial grasses, shrubs, and forbs may also be present and cover is variable. As grass cover increases, shrub interspaces are filled.The composition by air dry weight is approximately 15 percent forbs, 50 percent grasses, and 35 percent shrubs. Bare ground is variable (0-60%) depending on biological crust cover, which is also variable (1-35%). The following tables provide an example the the typical vegetative floristics of a community phase 1.2 plant community.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	110	250	330
Forb	20	60	153
Shrub/Vine	80	100	140
Tree	0	0	20
Total	**210**	**410**	**643**

Table 9. Ground cover

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	8-17%
Grass/grasslike foliar cover	13-33%
Forb foliar cover	2-19%
Non-vascular plants	0%
Biological crusts	1-35%
Litter	3-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-60%

Table 10. Canopy structure (% cover)

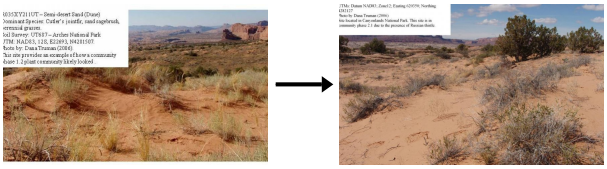
Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-10%	0-15%	0-10%
>0.5 <= 1	–	0-10%	0-10%	0-6%
>1 <= 2	–	0-15%	0-5%	0-5%
>2 <= 4.5	0-5%	0-15%	–	–
>4.5 <= 13	0-5%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2

Mixed Shrubland **Grassland with Mixed Shrubs**

This pathway occurs when any combination of proper livestock grazing, wet weather periods and time produce a stabilizing effect the sandy soils, resulting in an increase or establishment of perennial grasses.

Pathway 1.2A
Community 1.2 to 1.1



Grassland with Mixed Shrubs **Mixed Shrubland**

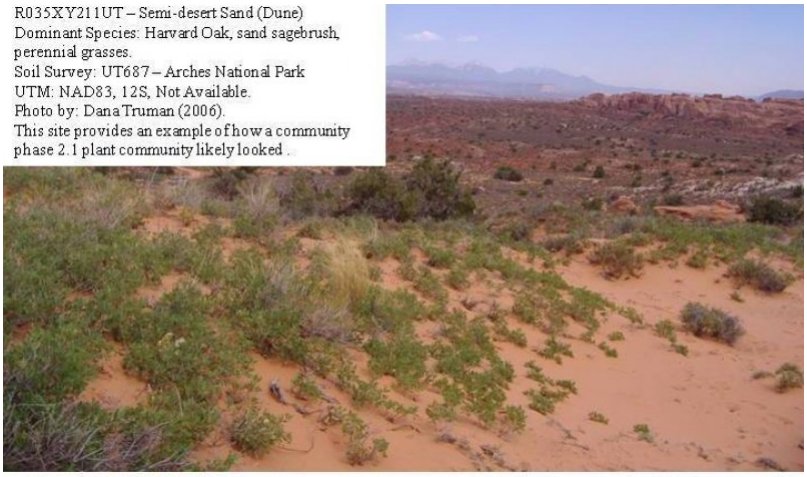
This pathway occurs when any combination of drought, improper livestock grazing and surface disturbance that result in soil surfaces becoming less stable, often forming active dunes.

State 2
Current Potential State

The current potential state is similar to the reference state, however invasive species are present. This state is generally dominated by shrub species. Disturbance mechanisms that may occur include climate fluctuations and events that result in soil stability changes. The process of changing from the dune phase to the stabilized phase is driven by plant succession. Typically shrubs such as sand sagebrush establish on a site and begin to stabilize the soil. Then more grasses begin to establish until the soil is stabilized and no longer actively eroding and depositing in the form of dunes. Changing from a stabilized phase to a dune phase occurs as plant cover is reduced and wind erosion causes active dunes to form. Other disturbances include domestic livestock grazing, and surface disturbances such as road and pipeline development and off road vehicle (OHV) use. Due to lack of disturbed areas, the community responses to such disturbances are not well understood, and are not currently included in the state and transition model. The current potential state is still self sustaining; but is losing resistance to change due to lower resistance to disturbances and lower resilience following disturbances, and new drastic disturbances such as fire being more likely to occur. Current Potential State: Plant communities resistant to climate fluctuations, herbivore grazing, and surface disturbance. Indicators: A community dominated by shrub species where native perennial grasses and forbs may or may not be present. Invasive grasses and forbs are present. Feedbacks: Natural fluctuations in climate that allow for a self sustaining shrub and grass community.

Community 2.1
Mixed Shrubland with Invasive Species

Figure 8. Mixed Shrubland with Invasive Species.



This community phase is typically comprised of a variety of shrub species including resinbush, Havard oak, mormon tea, sand sagebrush, and frosted mint, where perennial grasses may also be present. Where present, commonly occurring grasses include Indian ricegrass, James galleta, and spike dropseed. As grass cover increases, shrub interspaces are filled. Other perennial grasses, shrubs, and forbs may also be present. Invasive species are present in th ecommunity. The composition by air dry weight is approximately 10 percent forbs, 15 percent grasses, and 75 percent shrubs. However, some locations have up to 40% grass and only 30 percent shrub. Bare ground is variable (0-60%) depending on biological crust cover, which is also variable (0-59%). The following tables provide an example the the typical vegetative floristics of a community phase 2.1 plant community.

Table 11. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	150	190	270
Grass/Grasslike	15	60	75
Forb	25	40	70
Tree	0	0	20
Total	**190**	**290**	**435**

Table 12. Ground cover

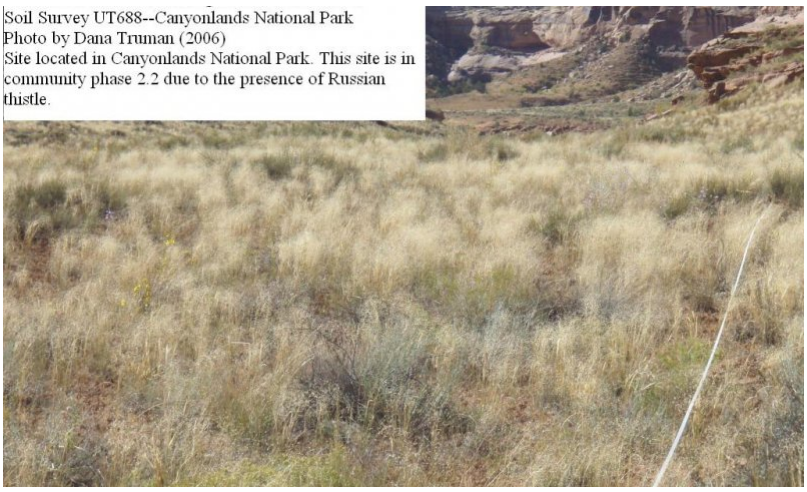
Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	0-27%

Grass/grasslike foliar cover	0-33%
Forb foliar cover	0-19%
Non-vascular plants	0%
Biological crusts	0-60%
Litter	0-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	30-60%

Table 13. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-10%	0-15%	0-10%
>0.5 <= 1	–	0-10%	0-10%	0-5%
>1 <= 2	–	0-15%	0-5%	0-5%
>2 <= 4.5	0-5%	0-15%	–	–
>4.5 <= 13	0-5%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Community 2.2
Grassland with Mixed Shrubs & Invasive Species


Soil Survey UT688--Canyonlands National Park
Photo by Dana Truman (2006)
Site located in Canyonlands National Park. This site is in community phase 2.2 due to the presence of Russian thistle.

This community phase is typically comprised of perennial grasses such as Indian ricegrass and Jame’s galleta. Commonly seen shrubs include a variety of shrub species including resinbush, Havard oak, Cutler's jointfir, sand sagebrush, and frosted mint. Commonly occurring grasses include Indian ricegrass, James galleta, and spike dropseed. As grass cover increases, shrub interspaces are filled. Other perennial grasses, shrubs, and forbs may or may not be present. Invasive species such as cheatgrass are present and mat dominate the herbaceous layer. The composition by air dry weight is approximately 15 percent forbs, 50 percent grasses, and 35 percent shrubs. Bare ground is variable (0-60%) depending on biological crust cover, which is also variable (1-35%). The following tables provide an example the the typical vegetative floristics of a community phase 2.2 plant community.

Table 14. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	110	250	330
Forb	20	60	153
Shrub/Vine	80	100	140
Tree	0	0	20
Total	**210**	**410**	**643**

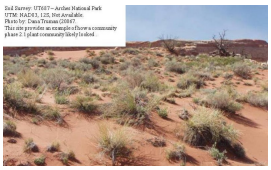
Table 15. Ground cover

Tree foliar cover	0-5%
Shrub/vine/liana foliar cover	8-17%
Grass/grasslike foliar cover	13-33%
Forb foliar cover	2-19%
Non-vascular plants	0%
Biological crusts	1-35%
Litter	3-10%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0-60%

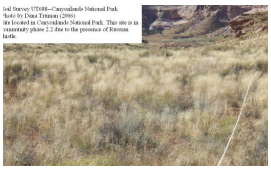
Table 16. Canopy structure (% cover)

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	0-10%	0-15%	0-10%
>0.5 <= 1	–	0-10%	0-10%	0-6%
>1 <= 2	–	0-15%	0-5%	0-5%
>2 <= 4.5	0-5%	0-15%	–	–
>4.5 <= 13	0-5%	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Pathway 2.1A
Community 2.1 to 2.2



Mixed Shrubland with Invasive Species

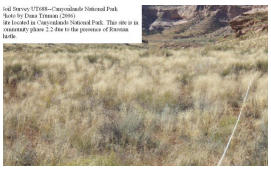


Grassland with Mixed Shrubs & Invasive Species

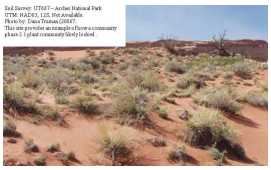
This pathway occurs when any combination of proper livestock grazing, wet weather periods and time produce a

stabilizing effect the sandy soils, resulting in an increase or establishment of perennial grasses. Invasive annuals such as cheatgrass may also increase during these periods.

Pathway 2.2a
Community 2.2 to 2.1



Grassland with Mixed Shrubs & Invasive Species



Mixed Shrubland with Invasive Species

This pathway occurs when any combination of drought, improper livestock grazing and surface disturbance that result in soil surfaces becoming less stable, often forming active dunes.

Transition T1A
State 1 to 2

Transition from Reference State (State 1) to Current Potential State (State 2). This transition is from the perennial grass understory in the reference state to a state that contains invasive species. Events include any combination of improper livestock, prolonged drought, and surface disturbances resulting in an increase in wind scoured blowouts, where an invasive species seed source is present. Invasive species, however, such as cheatgrass have been known to invade intact perennial plant communities with little to no disturbances. Once invasive plants are found in the plant community a threshold has been crossed.

Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrub**			90–190	
	Havard oak	QUHA3	*Quercus havardii*	0–120	–
	pillar false gumweed	VAST3	*Vanclevea stylosa*	20–100	–
	frosted mint	POIN3	*Poliomintha incana*	0–100	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	3–60	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	20–55	–
3	**Sub-Dominant Shrubs**			35–80	
	tarragon	ARDR4	*Artemisia dracunculus*	0–30	–
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	0–28	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–28	–
	desert princesplume	STPI	*Stanleya pinnata*	0–20	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–18	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–16	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–16	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–12	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–10	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–9	–
	common dunebroom	PAFI4	*Parryella filifolia*	0–4	–

	spiny hopsage	GRSP	*Grayia spinosa*	0–3	–
Grass/Grasslike					
0	**Dominant Grass**			11–63	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	8–65	–
	spike dropseed	SPCO4	*Sporobolus contractus*	4–8	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–5	–
1	**Sub-Dominant Grass**			4–22	
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–4	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–2	–
	giant dropseed	SPGI	*Sporobolus giganteus*	0–1	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–1	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–1	–
	beautiful rockcress	ARPU2	*Arabis pulchra*	0–1	–
Forb					
2				25–70	
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	10–70	–
	woolly bluestar	AMTO2	*Amsonia tomentosa*	0–68	–
	ragweed	AMBRO	*Ambrosia*	0–60	–
	dock	RUMEX	*Rumex*	4–40	–
	cryptantha	CRYPT	*Cryptantha*	0–30	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–20	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–20	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	5–20	–
	Utah juniper	JUOS	*Juniperus osteosperma*	0–20	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–18	–
	ragwort	SENEC	*Senecio*	0–16	–
	blazingstar	MENTZ	*Mentzelia*	0–12	–
	stickseed	LAPPU	*Lappula*	0–12	–
	Newberry's twinpod	PHNE5	*Physaria newberryi*	0–8	–
	pale evening primrose	OEPA	*Oenothera pallida*	0–8	–
	onion	ALLIU	*Allium*	0–8	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–8	–
	western sunflower	HEAN4	*Helianthus anomalus*	0–5	–
	globemallow	SPHAE	*Sphaeralcea*	0–5	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–5	–
	mustard	BRASS2	*Brassica*	0–4	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–4	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–2	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–2	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var.*	0–2	–

			armerioides		
	Townsend daisy	TOWNS	*Townsendia*	0–2	–
	beardtongue	PENST	*Penstemon*	0–2	–
	cleftleaf wildheliotrope	PHCRC	*Phacelia crenulata var. corrugata*	0–2	–

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			30–60	
	frosted mint	POIN3	*Poliomintha incana*	9–60	–
	Havard oak	QUHA3	*Quercus havardii*	0–54	–
	pillar false gumweed	VAST3	*Vanclevea stylosa*	0–18	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–9	–
3	**Sub-Dominant Shrubs**			35–80	
	tarragon	ARDR4	*Artemisia dracunculus*	0–63	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–15	–
	desert princesplume	STPI	*Stanleya pinnata*	0–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–10	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–10	–
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	0–10	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–9	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–5	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–3	–
	spiny hopsage	GRSP	*Grayia spinosa*	0–3	–
	common dunebroom	PAFI4	*Parryella filifolia*	0–2	–
Grass/Grasslike					
0	**Dominant Grass**			94–200	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–300	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–135	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–36	–
1	**Sub-Dominant Grass**			8–135	
	beautiful rockcress	ARPU2	*Arabis pulchra*	2–135	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–18	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–13	–
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	giant dropseed	SPGI	*Sporobolus giganteus*	0–9	–
	spike dropseed	SPCO4	*Sporobolus contractus*	4–8	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–1	–
Forb					
2				20–153	
	hoary tansyaster	MACA2	*Machaeranthera canescens*	5–153	–
	woolly bluestar	AMTO2	*Amsonia tomentosa*	0–10	–

	gilia	GILIA	*Gilia*	0–8	–
	pale evening primrose	OEPA	*Oenothera pallida*	0–8	–
	cryptantha	CRYPT	*Cryptantha*	4–6	–
	western sunflower	HEAN4	*Helianthus anomalus*	0–5	–
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	0–4	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–3	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–3	–
	ragweed	AMBRO	*Ambrosia*	0–3	–
	blazingstar	MENTZ	*Mentzelia*	0–3	–
	stickseed	LAPPU	*Lappula*	0–3	–
	dock	RUMEX	*Rumex*	0–3	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–3	–
	Townsend daisy	TOWNS	*Townsendia*	0–2	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–2	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–2	–
	cleftleaf wildheliotrope	PHCRC	*Phacelia crenulata var. corrugata*	0–2	–
	Newberry's twinpod	PHNE5	*Physaria newberryi*	0–2	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–2	–
	mustard	BRASS2	*Brassica*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–2	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–2	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–1	–
	onion	ALLIU	*Allium*	0–1	–
	beardtongue	PENST	*Penstemon*	0–1	–
	ragwort	SENEC	*Senecio*	0–1	–
	globemallow	SPHAE	*Sphaeralcea*	0–1	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–1	–
Tree					
4	**Trees**			0–20	
	Utah juniper	JUOS	*Juniperus osteosperma*	0–20	–

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			90–190	
	Havard oak	QUHA3	*Quercus havardii*	0–120	–
	pillar false gumweed	VAST3	*Vanclevea stylosa*	20–100	–
	frosted mint	POIN3	*Poliomintha incana*	0–100	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	3–60	–

	sand sagebrush	ARFI2	*Artemisia filifolia*	20–55	–
3	**Sub-Dominant Shrubs**			35–80	
	tarragon	ARDR4	*Artemisia dracunculus*	0–30	–
	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	0–28	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–28	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	8–22	–
	desert princesplume	STPI	*Stanleya pinnata*	0–20	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–18	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–16	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–16	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–12	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–10	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–9	–
	common dunebroom	PAFI4	*Parryella filifolia*	0–4	–
	spiny hopsage	GRSP	*Grayia spinosa*	0–3	–
Grass/Grasslike					
0	**Dominant Grass**			15–63	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	8–63	–
	cheatgrass	BRTE	*Bromus tectorum*	3–12	–
	spike dropseed	SPCO4	*Sporobolus contractus*	4–8	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–5	–
1	**Sub-Dominant Grass**			4–22	
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–4	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–2	–
	giant dropseed	SPGI	*Sporobolus giganteus*	0–1	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–1	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–1	–
	beautiful rockcress	ARPU2	*Arabis pulchra*	0–1	–
Forb					
2				25–75	
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	10–70	–
	woolly bluestar	AMTO2	*Amsonia tomentosa*	0–68	–
	ragweed	AMBRO	*Ambrosia*	0–60	–
	dock	RUMEX	*Rumex*	4–40	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–32	–
	cryptantha	CRYPT	*Cryptantha*	0–30	–
	prickly Russian thistle	SATR12	*Salsola tragus*	4–30	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	5–20	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–20	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–20	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–18	–

	ragwort	SENEC	*Senecio*	0–16	–
	blazingstar	MENTZ	*Mentzelia*	0–12	–
	stickseed	LAPPU	*Lappula*	0–12	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–12	–
	gilia	GILIA	*Gilia*	0–8	–
	Newberry's twinpod	PHNE5	*Physaria newberryi*	0–8	–
	pale evening primrose	OEPA	*Oenothera pallida*	0–8	–
	onion	ALLIU	*Allium*	0–8	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–8	–
	western sunflower	HEAN4	*Helianthus anomalus*	0–5	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–5	–
	globemallow	SPHAE	*Sphaeralcea*	0–5	–
	mustard	BRASS2	*Brassica*	0–4	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–4	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–2	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–2	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	Townsend daisy	TOWNS	*Townsendia*	0–2	–
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–2	–
	beardtongue	PENST	*Penstemon*	0–2	–
	cleftleaf wildheliotrope	PHCRC	*Phacelia crenulata var. corrugata*	0–2	–
Tree					
4	**Trees**			0–20	
	Utah juniper	JUOS	*Juniperus osteosperma*	0–20	–

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			30–60	
	frosted mint	POIN3	*Poliomintha incana*	9–60	–
	Havard oak	QUHA3	*Quercus havardii*	0–54	–
	pillar false gumweed	VAST3	*Vanclevea stylosa*	0–18	–
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0–9	–
3	**Sub-Dominant Shrubs**			35–80	
	tarragon	ARDR4	*Artemisia dracunculus*	0–63	–
	alderleaf mountain mahogany	CEMO2	*Cercocarpus montanus*	0–15	–
	desert princesplume	STPI	*Stanleya pinnata*	0–15	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–10	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–10	–

	curl-leaf mountain mahogany	CELE3	*Cercocarpus ledifolius*	0–10	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–9	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–8	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–5	–
	spiny hopsage	GRSP	*Grayia spinosa*	0–3	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–3	–
	common dunebroom	PAFI4	*Parryella filifolia*	0–2	–
Grass/Grasslike					
0	**Dominant Grass**			94–300	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–300	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–135	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–36	–
	cheatgrass	BRTE	*Bromus tectorum*	1–5	–
1	**Sub-Dominant Grass**			8–135	
	purple threeawn	ARPU9	*Aristida purpurea*	2–135	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–18	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–13	–
	Grass, perennial	2GP	*Grass, perennial*	0–10	–
	giant dropseed	SPGI	*Sporobolus giganteus*	0–9	–
	spike dropseed	SPCO4	*Sporobolus contractus*	4–8	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–1	–
Forb					
2				20–153	
	hoary tansyaster	MACA2	*Machaeranthera canescens*	5–153	–
	prickly Russian thistle	SATR12	*Salsola tragus*	0–14	–
	woolly bluestar	AMTO2	*Amsonia tomentosa*	0–10	–
	gilia	GILIA	*Gilia*	0–8	–
	pale evening primrose	OEPA	*Oenothera pallida*	0–8	–
	cryptantha	CRYPT	*Cryptantha*	4–6	–
	western sunflower	HEAN4	*Helianthus anomalus*	0–5	–
	globemallow	SPHAE	*Sphaeralcea*	0–5	–
	dock	RUMEX	*Rumex*	3–4	–
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	0–4	–
	ragweed	AMBRO	*Ambrosia*	0–3	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–3	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	0–3	–
	desert snowberry	SYLO	*Symphoricarpos longiflorus*	0–3	–
	blazingstar	MENTZ	*Mentzelia*	0–3	–
	stickseed	LAPPU	*Lappula*	0–3	–
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–2	–
	cleftleaf wildheliotrope	PHCRC	*Phacelia crenulata var. corrugata*	0–2	–
	Newberry's twinpod	PHNE5	*Physaria newberryi*	0–2	–
	Townsend daisy	TOWNS	*Townsendia*	0–2	–

	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–2	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–2	–
	mustard	BRASS2	*Brassica*	0–2	–
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–2	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–2	–
	onion	ALLIU	*Allium*	0–1	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–1	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–1	–
	yellow salsify	TRDU	*Tragopogon dubius*	0–1	–
	ragwort	SENEC	*Senecio*	0–1	–
	beardtongue	PENST	*Penstemon*	0–1	–
Tree					
4	**Trees**			0–20	
	Utah juniper	JUOS	*Juniperus osteosperma*	0–20	–

Animal community

--Threatened, Endangered and Sensitive Species-

This site provides foraging opportunities for Eagles, Peregrine Falcons and Ferruginous Hawks. Roosting opportunities are scarce due to the small amount of trees. This site can occur away from cliffs, so available nests sites are scarce. Desert bighorn sheep will use this site for foraging mostly during the winter and spring. And Fringed Myotis could potential use this site for foraging.

--Livestock and Wildlife Grazing--

This site provides very limited grazing opportunities for livestock and wildlife due to sparse vegetative cover and poor availability of nutritional plant species. It may lack natural perennial water sources which can also influence the suitability for livestock and wildlife grazing.

The plant community is composed primarily of shrubs, including Harvard oak, Cutler's jointfir, fourwing saltbush and sand sagebrush. These shrubs, if in abundance can provide fair browse year round for cattle, sheep, goats, mule deer, elk, bighorn sheep and pronghorn antelope. Cutler's jointfir is typically only browsed by livestock in the fall and winter due to it's poor nutritional value in the spring and summer. The sparse presence of grasses including Indian ricegrass and sand dropseed provide some grazing for all classes of livestock and wildlife. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging for use in making livestock grazing management decisions. Forb composition should be monitored, however, 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.

This sites suitability for re-seeding and/or restoration is poor due to a severe wind erosion potential, extreme temperatures and wide variability in time and amount of precipitation, therefore care should be taken to maintain the natural plant communities.

This site may occur in desert bighorn sheep, mule deer, elk, and pronghorn antelope ranges. However, in many places their populations will be small and have little grazing impact on the site.

Hydrological functions

The soil on this site is in hydrologic group A (NRCS National Engineering Handbook). These soils are well to excessively drained. Hydrological groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. Improper livestock grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but its affect is variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff (National Range and Pasture Handbook, 2003).

Recreational uses

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

Wood products

Utah juniper can occasionally be found growing on this site. Where growth is sufficient, firewood or fence posts may be harvested.

Other information

--Poisonous/Toxic Plant Communities--

Toxic plants associated with this site include sand sagebrush, Harvard oak and Russian thistle.

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.

Harvared oak is thought to contain tannins that can be detrimental to cattle, sheep, and occasionally horses if grazed as more than 50% of their diet. Oak is highly toxic during the budding and leafing stages, and when acorns are available. Symptoms include lack of appetite, weakness, excessive thirst, edema, reluctance to follow the herd, and emaciation.

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 an extented drought, during periods with cool/cloudy days, and on soils high in nitrogen and low in sulfur and phosphorus. 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.

Potentially toxic plants associated with this site include fourwing saltbush and some buckwheat species, which may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering.

--Invasive Plant Communities--

As this sites ecological condition deteriorates and perennial vegetation decreases due to disturbance (i.e., fire, improper livestock grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses are more

likely to become established. Of particular concern in semi-arid environments are cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The potential invasion of these species will depend on a sites soil properties, moisture availability and an available seed source. These invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may possible.

The severe wind erosion can occur on this site which may prevent invasive annual species from becoming established; however if growing conditions are favorable, these species can create dense mono cultures that can alter the sites nutrient cycling, erosion rates and the fire regime.

--Fire Ecology--

Any ecological sites ability to carry fire depends primarily on it's present fuel load and fine fuel moisture content. Due to this sites sparse vegetative cover, fire does not typically carry well. When this site is degraded due to the presence of invasive annuals, however, it's ability to burn may increase and it's fire interval shorten, preventing native species from re-establishing themselves.

Inventory data references

This model was developed using range data collected over the last thirty years in MLRA D35 in southeastern Utah. Both ocular and measured data was collected and utilized.

Type locality

Location 1: Wayne County, UT	
UTM zone	N
UTM northing	4281507
UTM easting	622693

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Relative Forage Preference of Plants for Grazing Use by Season: Plants commonly found in Major Land Resource Area D35 --The Colorado Plateau. 2007

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Contributors

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Rangeland health reference sheet

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

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Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Some. Due to the duning nature of this site, rills are expected to refill with sand in areas that are not stabilized by the establishment of grass. Rills increase immediately following episodic storm events.

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2. **Presence of water flow patterns:** Frequent and often continuous. Occur throughout the site, but are often masked by wind blown sand. Interspaces between vegetation serve as water flow patterns across during episodic precipitation events. Evidence of flow will increase somewhat with slope.

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3. **Number and height of erosional pedestals or terracettes:** Herbaceous plants may show little pedestalling. Pedestals may be up to 4 inches for shrubs. Terracettes should be absent or few. Pedestals that occur are usually associated with natural wind erosion.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 35 – 60%. Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Any well developed biological crusts present should not be recorded as bare ground. 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.

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5. **Number of gullies and erosion associated with gullies:** None. Some gullies may be present in landscape settings where increased runoff may accumulate. Such gully development is expected to be limited to slopes exceeding 15% and adjacent to sites where runoff accumulation occurs.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind generated soil movement is common. Wind

caused blowouts and depositions are somewhat stable or have healed over. Coppice mounding around perennial vegetation is common.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter accumulates under or adjacent to plant bases. Litter ¼" in diameter moves 3' or less from origin. Some litter (leaves, small stems) may accumulate in soil depressions located near plants. Woody stems are usually not expected to be moved from the base of shrubs. Minor litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. Fine litter may be removed from the site by wind action.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 3 or 4 under the plant canopies, and a rating of 1 to 3 in the interspaces. The average should be a 2-3. Vegetation cover, litter, biological and soil crusts help reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface varies from 0 to 2 inches. Color is reddish brown (5YR5/4). The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces. 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:** Distribution of vascular plants and/or biological soil crusts (where present) intercept raindrops preventing splash erosion. Plants and biological soil crusts (where present) are usually distributed in sufficient density to slow runoff allowing time for infiltration. When perennial grasses and shrubs decrease, reducing ground cover and increasing bare ground, runoff can increase and infiltration would be reduced.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None

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

    Dominant: Sprouting and non-sprouting shrubs >> Cool season perennial grasses > Warm season perennial grasses > forbs. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Crested wheatgrass and Russian wildrye etc.)

    Sub-dominant:

    Other: Biological soil crust is variable in it's expression where present on this site and is measured as a component of ground cover.

    Additional: When soils are stabilized perennial grasses and forbs(herbaceous species) may dominate the community. These conditions would reflect a functional community phase within the reference state.
    Dominants — sand sagebrush, mormon tea, Havard oak, resinbush, Indian ricegrass, and Galleta. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present under average growing conditions with age class expression likely subdued during below average years, or on sites with high (usually greater than 65%) similarity index (late seral to historic climax). Reference state includes mix of plants of various ages with some plants being dead or showing characteristics of decadence.

14. **Average percent litter cover (%) and depth (in):** Variability may occur due to weather.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 200-430 #/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:** Cheatgrass, Russian thistle, and other introduced annual forbs are most likely to invade this site.

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