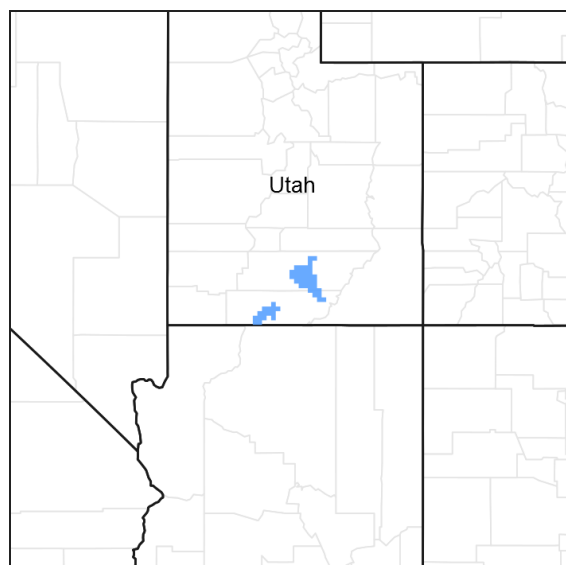


# **Ecological site R035XY225UT** **Semidesert Shallow Sand (Cutler's Jointfir)**

Accessed: 05/11/2025

## **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 High Plateaus of Utah section within that MLRA. This area has been structurally 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. In most areas elevation is 4,250 to 4,950 feet.

## **Classification relationships**

Modal Soil: Batterson — sandy, mixed, mesic Lithic Ustic Torriorthents

Type Location: Egypt, South of Escalante, Utah

## **Associated sites**

R035XY212UT	<b>Semidesert Sand (Fourwing Saltbush)</b>
R035XY215UT	<b>Semidesert Sandy Loam (4-Wing Saltbush)</b>
R035XY216UT	<b>Semidesert Sandy Loam (Wyoming Big Sagebrush)</b>

## Similar sites

**Table 1. Dominant plant species**

Tree	(1) <i>Pinus edulis</i> (2) <i>Juniperus osteosperma</i>
Shrub	(1) <i>Ephedra cutleri</i> (2) <i>Purshia mexicana</i>
Herbaceous	(1) <i>Achnatherum hymenoides</i> (2) <i>Muhlenbergia pungens</i>

## Physiographic features

This site is found principally on shallow sand sheets and low dunes associated with structural benches, buttes and mesas. Runoff is typically very high. Slopes range from 2-30%. Elevations are generally 4800-7500 feet.

**Table 2. Representative physiographic features**

Landforms	(1) Sand sheet (2) Structural bench (3) Mesa
Flooding frequency	None
Ponding frequency	None
Elevation	4,800–7,500 ft
Slope	2–30%
Aspect	Aspect is not a significant factor

## Climatic features

The climate is characterized by hot summers and cool to warm winters. Large fluctuations in daily temperatures are common. Mean annual high temperatures are 64 degrees Fahrenheit and mean annual low temperatures are 34 degrees Fahrenheit. Approximately 70-75% of precipitation occurs as rain from March through October. On the average, February, May, and June are the driest months and July through October are the wettest months. Precipitation is extremely variable from month to month and from year to year but averages between 9 and 13 inches per year. Much of the summer precipitation occurs as convection thunderstorms.

**Table 3. Representative climatic features**

Frost-free period (average)	170 days
Freeze-free period (average)	143 days
Precipitation total (average)	11 in

## Influencing water features

There are no influencing water features on this ecological site.

## Soil features

The characteristic soils in this site are 4 to 20 inches deep over Navajo sandstone and somewhat excessively drained. They occur on eolian deposits derived from sandstone parent material. The soils are deposited and

stabilized in the form of sand sheets or low dunes mixed with exposed bedrock and can contain some alluvium and residuum. Soil surfaces typically support biological crusts, but areas of bare sand or surface gravels are common. Plants are concentrated where the soil and available moisture are most conducive to plant growth. The soils are typically psamments. There are no distinguishing soil development characteristics; they are often composed of unconsolidated sand of various depths. The sand accumulates and is stabilized by vegetation or crust. Water often runs onto the soil from adjacent rock outcrop and may pool. When there is a large erosion event, soils will sometimes move and redeposit in nearby areas. Soil color is typically yellowish brown (10YR 5/6), and textures range from sand and loamy sand to fine sand and may contain small amounts of gravel. Available water holding capacity is 0.3 to 1.2 inches.

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

UT686 - Escalante Grand Staircase - Nalcas;  
 UT636 – Panguitch Area – Nalcas.

Typical Profile (Nalcas):

C1 – 0-4 inches; fine sand; pale brown (10YR 7/4); non-effervescent; neutral.

C2 – 4-8 inches; fine sand; yellowish brown (10YR 7/3); non-effervescent; neutral.

R - 8 inches; Navajo sandstone.

**Table 4. Representative soil features**

Parent material	(1) Eolian sands–sandstone
Surface texture	(1) Sand (2) Fine sand (3) Loamy sand
Drainage class	Somewhat excessively drained
Permeability class	Rapid
Soil depth	4–20 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	0.3–1.2 in
Calcium carbonate equivalent (0-40in)	0–2%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–8%
Subsurface fragment volume >3" (Depth not specified)	0%

## Ecological dynamics

This ecological site occurs on shallow sand sheets and low dunes interspersed in Navajo sandstone bedrock found in Major Land Resource Area (MLRA) D35—The Colorado Plateau. This site typically receives extra moisture in the form of run-on from the surrounding bedrock and outcroppings. The amount of this extra moisture, (i.e., size of the

surrounding rock outcrop watershed) allows for the presence of a wide variety of shrubs with smaller amounts of forbs and grasses also present. Widespread fire is not an influencing factor in this community due to natural fire barriers in the form of bedrock and outcrops. Significant fire impact has been observed, however, from lightning caused spot fires which are small in nature but that can cause the understory to shift from one dominated by shrubs to one with a more herbaceous aspect. Cheatgrass and other invasive species rarely invade this site.

Two distinct phases of this reference community have been characterized in this report, one dominated by various shrub species in the understory and few grasses and one with significant perennial grasses present. This variation appears to be a natural part of this ecological site.

The following diagram describes some of the most commonly occurring communities found on this ecological site. It does not necessarily depict all the vegetative states, phases, pathways and transitions associated with it. 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 30 years in MLRA D35 in southeastern Utah. Both ocular and measured data was collected and utilized.

## **State and transition model**

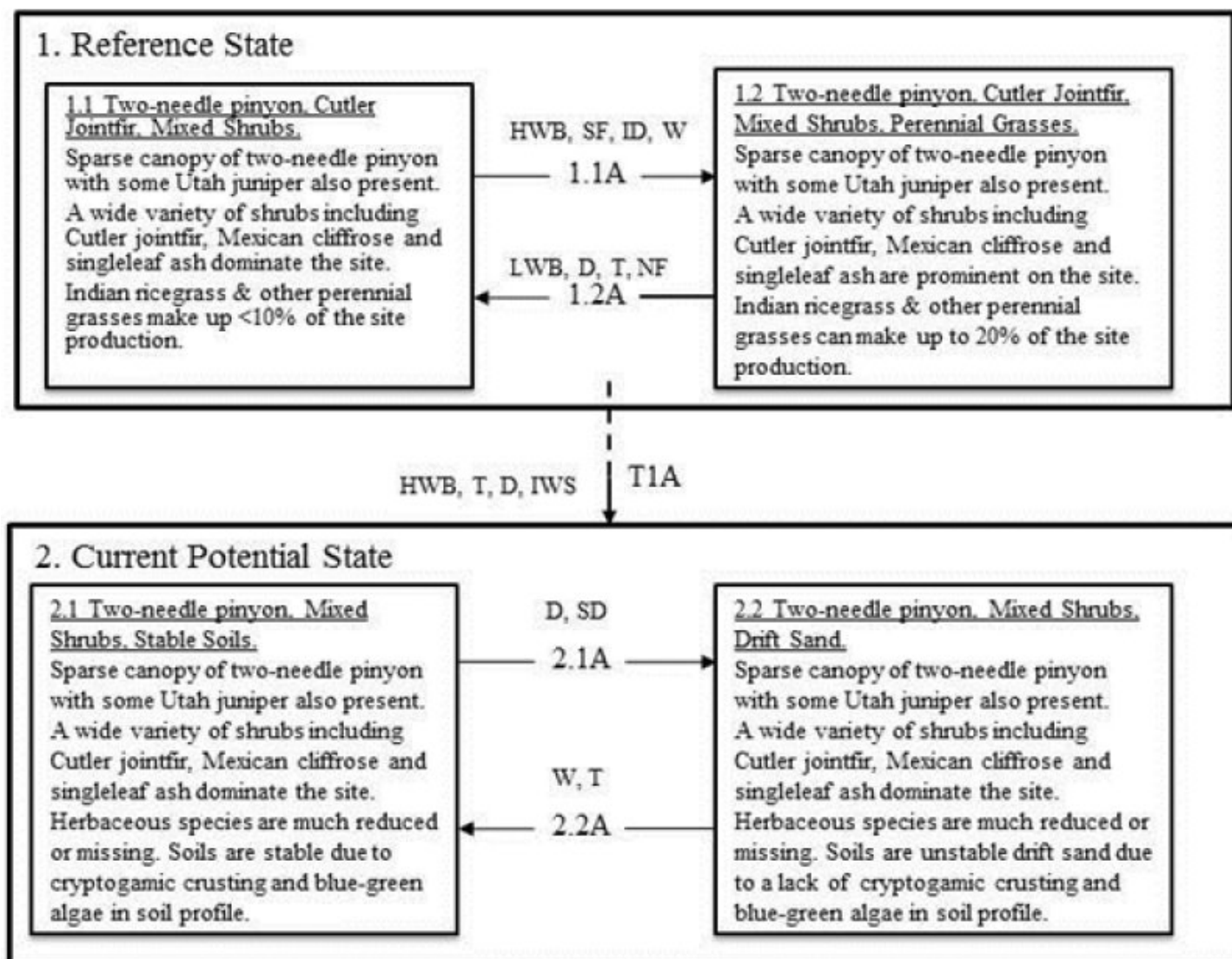
## State and Transition Model

State: Utah

Site Type: Rangeland

MLRA: D-35- Colorado Plateau

R035XY225UT – Semidesert Shallow Sand (Two-needle pinyon, Cutler Jointfir).



### Legend:

D = Drought.

W = Wet weather periods/increased run-in.

T = Time.

SD= Surface Damage.

HWB= Heavy Wildlife Browsing.

LWB= Light Wildlife Browsing.

ID = Insect Damage.

IWS = Invasive Weed Source.

SF = Natural Spot Fire.

NF = No Spot Fire.

Figure 6. R035XY225UT

## State 1

### Reference State

This Reference State describes the historic plant communities and natural ecological dynamics of the Semidesert Shallow Sand, Cutler jointfir site. It includes those biotic communities that became established on this ecological

site when all successional sequences are completed under natural climatic conditions; natural disturbances are inherent in its development. This state is dominated by an overstory of two-needle pinyon with some Utah juniper, and a mixture of shrubs with Cutler jointfir, Mexican cliffrose and singleleaf ash occurring most commonly. A wide variety of other shrubs are also found in both community phases on this site. Perennial grasses including Indian ricegrass and Sandhill muhly, may or may not be present depending on spot-fire occurrence, soil development and available moisture. The primary disturbance mechanisms are weather fluctuations, runoff moisture and spot fires. Two distinct phases of this reference community have been characterized in this report, the first and most prominent, is the Shrub Phase. This phase of the ecological site is characterized by an overstory of old two-needle pinyon with some Utah juniper also present. A shrub layer dominates the understory with Cutler jointfir, Mexican cliffrose, singleleaf ash and a wide variety of other shrubs commonly found. Herbaceous species make up less than 10 percent of the understory. The Herbaceous Phase is characterized somewhat less shrub production in the understory while the perennial grasses and other herbaceous species are more prominent in appearance. Terminology: Reference State: Community phases disturbed by spot-fire occurrence, soil depth, run-on moisture and climate fluctuations. Indicators: A site dominated by Cutler jointfir and various other shrub species. Indian ricegrass, Sandhill muhly and other herbaceous species may also be present. Feedbacks: Extended drought resulting in a reduction of native perennial plant vigor. Normal fluctuations in weather allowing for the maintenance of both shrubs and perennial grasses. At-risk Community Phase: All communities are at risk when nutrients are available for invasive plants to establish. Plant community 1.1 is especially at risk due to limited production and cover of understory grasses. Trigger: Introduction of invasive plants to fill available niches.

## Community 1.1

### Two-needle Pinyon, Cutler Jointfir, Mixed Shrubs.



Figure 7. Community Phase 1.1

This phase of the ecological site is characterized by an overstory of old Two-needle pinyon with some Utah juniper also present. A shrub layer dominates the site with Cutler jointfir, Mexican cliffrose and singleleaf ash occurring most often. A wide array of other shrubs are also commonly present. Herbaceous species make up less than 10 percent of the understory. Important understory grass species include Indian ricegrass and sandhill muhly. The appearance of most forbs is episodic in nature and is closely tied to precipitation events. Other commonly occurring herbaceous species include James galleta and blue grama. Air dry weight is approximately 10 percent trees, 75 percent shrubs,

5 percent forbs, and 10 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the 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	80	170	265
Tree	40	100	150
Grass/Grasslike	40	80	120
Forb	15	25	40
<b>Total</b>	<b>175</b>	<b>375</b>	<b>575</b>

**Table 6. Ground cover**

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

**Table 7. Canopy structure (% cover)**

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	—	—	—	—
>0.5 <= 1	—	—	—	—
>1 <= 2	—	—	24-26%	4-6%
>2 <= 4.5	—	9-11%	—	—
>4.5 <= 13	2-4%	—	—	—
>13 <= 40	—	—	—	—
>40 <= 80	—	—	—	—
>80 <= 120	—	—	—	—
>120	—	—	—	—

## Community 1.2

**Two-needle Pinyon, Cutler Jointfir, Mixed Shrubs, Perennial Grasses.**



**Figure 9. Community Phase 1.2**

This phase of the ecological site is characterized by an overstory of old two-needle pinyon with some Utah juniper also present. A shrub layer is still present on the site with Cutler jointfir, Mexican cliffrose and singleleaf ash occurring most often. Herbaceous species are prominent in areas associated with spot fires or run-on moisture and can make up more than 20% of the sites production. Important understory grass species include Indian ricegrass and sandhill muhly. Other commonly occurring herbaceous the species include James galleta and blue grama. The appearance of most forbs is episodic in nature and is closely tied to precipitation events. Air dry weight is approximately 10 percent trees, 75 percent shrubs, 5 percent forbs, and 10 percent grasses. Bare ground is variable (2-55%) depending on biological crust cover, which is also variable (0-64%). The following tables present a typical example of the 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)
Shrub/Vine	40	130	225
Grass/Grasslike	80	120	160
Tree	40	100	150
Forb	15	25	40
<b>Total</b>	<b>175</b>	<b>375</b>	<b>575</b>

**Table 9. Ground cover**

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

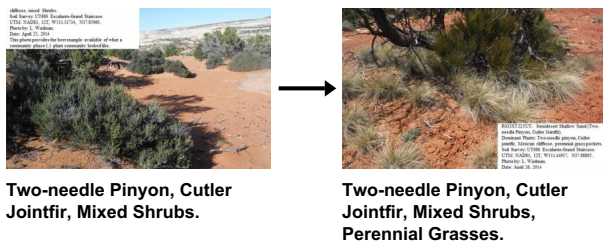


Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

**Table 10. Canopy structure (% cover)**

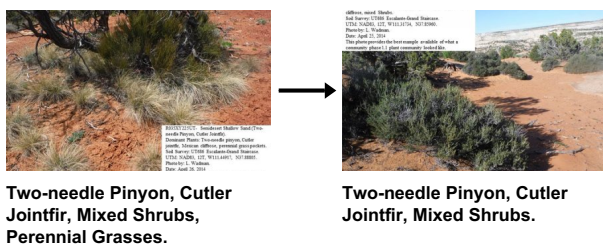
Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	—	—	—	—
>0.5 <= 1	—	—	—	—
>1 <= 2	—	—	24-26%	4-6%
>2 <= 4.5	—	9-11%	—	—
>4.5 <= 13	2-4%	—	—	—
>13 <= 40	—	—	—	—
>40 <= 80	—	—	—	—
>80 <= 120	—	—	—	—
>120	—	—	—	—

## Pathway 1.1A Community 1.1 to 1.2



This pathway describes the affects of any combination of surface spot fire activity, wet weather periods or increased run-on moisture amounts, and/or insects or pathogens that kill the woody species that allow herbaceous species to be more prominent in the understory. Heavy wildlife browsing can also weaken palatable woody species, allowing more available moisture for herbaceous species.

## Pathway 1.2A Community 1.2 to 1.1



This pathway describes the affects of a long term drought that does not allow for sufficient precipitation or run-on moisture to support herbaceous species and/or long periods without spot fires. Light wildlife browsing can allow for shrub recovery, reducing available moisture for herbaceous species.

## State 2

### Current Potential State

This Current Potential State is dominated by an overstory of two-needle pinyon with some Utah juniper, and a mixture of shrubs with Cutler jointfir, Mexican cliffrose and singleleaf ash occurring most commonly. A wide variety of other shrubs are also found in both community phases on this site. Perennial grasses and forbs may not be present on the site. Invasive annuals such as cheatgrass, Russian thistle and redstemmed storksbill may be present in small amounts where a seed source is available. Bare ground percent can range as high as 85 percent and may be stable or loose sand grains depending on cryptogamic crusting percent. Primary disturbance mechanisms are weather fluctuations, runoff moisture and spot fire occurrence. Terminology: Reference State: Community phases disturbed by spot-fire occurrence, soil depth, run-on moisture and precipitation fluctuations. Indicators: A site dominated by Cutler jointfir and various other shrub species. Indian ricegrass, sandhill muhly and other herbaceous species are not typically present. Feedbacks: Extended drought resulting in a reduction of native perennial plant vigor. Normal fluctuations in weather allowing for the maintenance of both shrubs and perennial grasses. At-risk Community Phase: All communities are at risk when nutrients are available for invasive plants to establish. Trigger: Introduction of invasive plants to fill available niches.

### Community 2.1

#### Two-needle Pinyon, Cutler Jointfir, Stable Soils.



Figure 11. Community Phase 2.1

This phase of the ecological site is characterized by an overstory of old Two-needle pinyon with some Utah juniper also present. A shrub layer dominates the site with Cutler jointfir, Mexican cliffrose and singleleaf ash occurring most often. A wide array of other shrubs are also commonly present. Herbaceous species are typically absent but may be present in small amounts under certain conditions. Invasive species such as cheatgrass, Russian thistle and redstem storksbill may be present where growing conditions allow for them to become established. Soils are being stabilized by significant amounts of cryptogamic crusting and bluegreen algae found within their soil profiles. Air dry weight is approximately 10 percent trees, 85 percent shrubs, 2 percent forbs, and 3 percent grasses. Bare ground is variable (50-85%) depending on biological crust cover, which is also variable (30-60%). The following tables present a typical example of the 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	120	240	345
Tree	40	100	175
Grass/Grasslike	10	25	40
Forb	5	10	15
<b>Total</b>	<b>175</b>	<b>375</b>	<b>575</b>

**Table 12. Ground cover**

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

**Table 13. Canopy structure (% cover)**

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	—	—	—	—
>0.5 <= 1	—	—	—	—
>1 <= 2	—	—	24-26%	4-6%
>2 <= 4.5	—	9-11%	—	—
>4.5 <= 13	2-4%	—	—	—
>13 <= 40	—	—	—	—
>40 <= 80	—	—	—	—
>80 <= 120	—	—	—	—
>120	—	—	—	—

## Community 2.2

**Two-needle Pinyon, Cutler Jointfir, Drift Sand.**



**Figure 13. Community Phase 2.2**

This phase of the ecological site is characterized by an overstory of old Two-needle pinyon with some Utah juniper also present. A shrub layer dominates the site with Cutler jointfir, Mexican cliffrose and singleleaf ash occurring most often. A wide array of other shrubs are also commonly present. Herbaceous species are typically absent but may be present in small amounts under certain conditions. Invasive species such as cheatgrass, Russian thistle and redstem storksbill may also be present where growing conditions allow for them to become established. Soils are typically composed of unstable single grains of sand with little or no soil structure in their soil profiles. Air dry weight is approximately 10 percent trees, 85 percent shrubs, 2 percent forbs, and 3 percent grasses. Bare ground is variable (50-85%) depending on biological crust cover, which is also variable (30-60%). The following tables present a typical example of the vegetative floristics of a community phase 2.1 plant community.

**Table 14. Annual production by plant type**

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	120	240	345
Tree	40	100	175
Grass/Grasslike	10	25	40
Forb	5	10	15
<b>Total</b>	<b>175</b>	<b>375</b>	<b>575</b>

**Table 15. Ground cover**

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

Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

**Table 16. Canopy structure (% cover)**

Height Above Ground (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	—	—	—	—
>0.5 <= 1	—	—	—	—
>1 <= 2	—	—	24-26%	4-6%
>2 <= 4.5	—	9-11%	—	—
>4.5 <= 13	2-4%	—	—	—
>13 <= 40	—	—	—	—
>40 <= 80	—	—	—	—
>80 <= 120	—	—	—	—
>120	—	—	—	—

## Pathway 2.1A Community 2.1 to 2.2



**Two-needle Pinyon, Cutler Jointfir, Stable Soils.**



**Two-needle Pinyon, Cutler Jointfir, Drift Sand.**

This community pathway describes the affects of long term drought and soil surface actions such as blowing sand on cryptogamic crusting and the destruction of beneficial soil algae.

## Pathway 2.2A Community 2.2 to 2.1



**Two-needle Pinyon, Cutler Jointfir, Drift Sand.**



**Two-needle Pinyon, Cutler Jointfir, Stable Soils.**

This community pathway describes the affects of improved soil moisture over time allowing for the reduction of soil surface actions such as blowing sand which may allow cryptogamic crusting and beneficial soil algae to increase.

## Transition T1A State 1 to 2

This transitional pathway describes the affects of long term drought, continued heavy wildlife browsing and the

establishment of invasive species such as cheatgrass or Russian thistle. A threshold is crossed when invasive and/or non-native species become established.

## Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Dominant Grasses</b>			50–80	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	30–60	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	15–30	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	15–30	–
2	<b>Sub-Dominant Grasses</b>			20–40	
	Grass, annual	2GA	<i>Grass, annual</i>	10–20	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	10–20	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	10–20	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	10–20	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	10–20	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	10–20	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	10–20	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	10–20	–
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	10–20	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	10–20	–
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	10–20	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	10–20	–
<b>Forb</b>					
3	<b>Forbs</b>			25–50	
	Forb, annual	2FA	<i>Forb, annual</i>	15–40	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	15–40	–
	tapertip onion	ALAC4	<i>Allium acuminatum</i>	5–10	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	5–10	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	5–10	–
	splitleaf Indian paintbrush	CARH4	<i>Castilleja rhexiifolia</i>	5–10	–
	Wright's bird's beak	COWR2	<i>Cordylanthus wrightii</i>	5–10	–
	basin yellow cryptantha	CRCO12	<i>Cryptantha confertiflora</i>	5–10	–
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	5–10	–
	shy gilia	GIIN2	<i>Gilia inconspicua</i>	5–10	–
	manybranched ipomopsis	IPPO2	<i>Ipomopsis polycladon</i>	5–10	–
	Gray's biscuitroot	LOGR	<i>Lomatium grayi</i>	5–10	–
	oblongleaf bluebells	MEOB	<i>Mertensia oblongifolia</i>	5–10	–
	Colorado beeblossom	OECO	<i>Oenothera coloradensis</i>	5–10	–
	lobeleaf groundsel	PAMU11	<i>Packera multilobata</i>	5–10	–
	Wasatch beardtongue	PECY2	<i>Penstemon cyananthus</i>	5–10	–
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	5–10	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	5–10	–

	spiny cholla	PLPA2	<i>Plantago patagonica</i>	5–10	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	5–10	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	5–10	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	5–10	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	5–10	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	5–10	–
	stemless four-nerve daisy	TEACA2	<i>Tetranneuris acaulis</i> var. <i>acaulis</i>	5–10	–
<b>Shrub/Vine</b>					
4	<b>Primary Shrubs</b>			100–200	
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	50–80	–
	singleleaf ash	FRAN2	<i>Fraxinus anomala</i>	20–30	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–30	–
5	<b>Sub-Dominant Shrubs</b>			50–100	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	10–20	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	10–20	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	10–20	–
	Havard oak	QUHAT	<i>Quercus havardii</i> var. <i>tuckeri</i>	10–20	–
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	10–20	–
	Great Basin fishhook cactus	SCPU6	<i>Sclerocactus pubispinus</i>	5–10	–
	roundleaf buffaloberry	SHRO	<i>Shepherdia rotundifolia</i>	5–10	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	5–10	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	5–10	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	5–10	–
	littleleaf mountain mahogany	CEIN7	<i>Cercocarpus intricatus</i>	5–10	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–10	–
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	5–10	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	5–10	–
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	5–10	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	5–10	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	5–10	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	5–10	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	5–10	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	5–10	–
<b>Tree</b>					
6	<b>Dominant Trees</b>			50–100	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	40–80	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	10–20	–

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					

1	<b>Dominant Grasses</b>			80–120	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	60–90	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	25–45	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	25–45	–
2	<b>Sub-Dominant Grasses</b>			20–40	
	Grass, annual	2GA	<i>Grass, annual</i>	10–20	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	10–20	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	10–20	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	10–20	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	10–20	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	10–20	–
	squirreldropseed	ELEL5	<i>Elymus elymoides</i>	10–20	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	10–20	–
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	10–20	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	10–20	–
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	10–20	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	10–20	–
<b>Forb</b>					
3	<b>Forbs</b>			25–50	
	Forb, annual	2FA	<i>Forb, annual</i>	15–40	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	15–40	–
	tapertip onion	ALAC4	<i>Allium acuminatum</i>	5–10	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	5–10	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	5–10	–
	splitleaf Indian paintbrush	CARH4	<i>Castilleja rhexiifolia</i>	5–10	–
	Wright's bird's beak	COWR2	<i>Cordylanthus wrightii</i>	5–10	–
	basin yellow cryptantha	CRCO12	<i>Cryptantha confertiflora</i>	5–10	–
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	5–10	–
	shy gilia	GIIN2	<i>Gilia inconspicua</i>	5–10	–
	manybranched ipomopsis	IPPO2	<i>Ipomopsis polycladon</i>	5–10	–
	Gray's biscuitroot	LOGR	<i>Lomatium grayi</i>	5–10	–
	oblongleaf bluebells	MEOB	<i>Mertensia oblongifolia</i>	5–10	–
	Colorado beeblossom	OECO	<i>Oenothera coloradensis</i>	5–10	–
	lobeleaf groundsel	PAMU11	<i>Packera multilobata</i>	5–10	–
	Wasatch beardtongue	PECY2	<i>Penstemon cyananthus</i>	5–10	–
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	5–10	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	5–10	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	5–10	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	5–10	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	5–10	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	5–10	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	5–10	–
	stemless four-nerve daisy	TEACA2	<i>Tetraneuris acaulis</i> var. <i>acaulis</i>	5–10	–



Shrub/vine					
4	<b>Primary Shrubs</b>			75–150	
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	30–50	–
	singleleaf ash	FRAN2	<i>Fraxinus anomala</i>	20–30	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–30	–
5	<b>Sub-Dominant Shrubs</b>			50–100	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	10–20	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	10–20	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	10–20	–
	Havard oak	QUHAT	<i>Quercus havardii</i> var. <i>tuckeri</i>	10–20	–
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	10–20	–
	Great Basin fishhook cactus	SCPU6	<i>Sclerocactus pubispinus</i>	5–10	–
	roundleaf buffaloberry	SHRO	<i>Shepherdia rotundifolia</i>	5–10	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	5–10	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	5–10	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	5–10	–
	littleleaf mountain mahogany	CEIN7	<i>Cercocarpus intricatus</i>	5–10	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–10	–
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	5–10	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	5–10	–
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	5–10	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	5–10	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	5–10	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	5–10	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	5–10	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	5–10	–
<b>Tree</b>					
6	<b>Dominant Trees</b>			50–100	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	40–80	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	10–20	–

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Dominant Grasses</b>			50–80	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	20–40	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	10–20	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	10–20	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	10–20	–
2	<b>Sub-Dominant Grasses</b>			20–40	
	Grass, annual	2GA	<i>Grass, annual</i>	10–20	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	10–20	–

	purple threeawn	ARPU9	<i>Aristida purpurea</i>	10–20	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	10–20	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	10–20	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	10–20	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	10–20	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	10–20	–
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	10–20	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	10–20	–
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	10–20	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	10–20	–

## Forb

3	<b>Forbs</b>			25–50	
	Forb, annual	2FA	<i>Forb, annual</i>	15–40	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	15–40	–
	redstem stork's bill	ERC16	<i>Erodium cicutarium</i>	20–40	–
	Russian thistle	SAKA	<i>Salsola kali</i>	20–40	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	5–10	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	5–10	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	5–10	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	5–10	–
	stemless four-nerve daisy	TEACA2	<i>Tetraneuris acaulis</i> var. <i>acaulis</i>	5–10	–
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	5–10	–
	shy gilia	GIIN2	<i>Gilia inconspicua</i>	5–10	–
	manybranched ipomopsis	IPPO2	<i>Ipomopsis polycladon</i>	5–10	–
	Gray's biscuitroot	LOGR	<i>Lomatium grayi</i>	5–10	–
	oblongleaf bluebells	MEOB	<i>Mertensia oblongifolia</i>	5–10	–
	Colorado beeblossom	OECO	<i>Oenothera coloradensis</i>	5–10	–
	lobeleaf groundsel	PAMU11	<i>Packera multilobata</i>	5–10	–
	Wasatch beardtongue	PECY2	<i>Penstemon cyananthus</i>	5–10	–
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	5–10	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	5–10	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	5–10	–
	tapertip onion	ALAC4	<i>Allium acuminatum</i>	5–10	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	5–10	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	5–10	–
	splitleaf Indian paintbrush	CARH4	<i>Castilleja rhexiifolia</i>	5–10	–
	Wright's bird's beak	COWR2	<i>Cordylanthus wrightii</i>	5–10	–
	basin yellow cryptantha	CRCO12	<i>Cryptantha confertiflora</i>	5–10	–

## Shrub/Vine

4	<b>Dominant Shrubs</b>			100–200	
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	50–80	–
	singleleaf ash	FRAN2	<i>Fraxinus anomala</i>	20–30	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–30	–

5	<b>Sub-Dominant Shrubs</b>			50–100	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	10–20	–
	Havard oak	QUHAT	<i>Quercus havardii</i> var. <i>tuckeri</i>	10–20	–
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	10–20	–
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	10–20	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	10–20	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	5–10	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	5–10	–
	littleleaf mountain mahogany	CEIN7	<i>Cercocarpus intricatus</i>	5–10	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–10	–
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	5–10	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	5–10	–
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	5–10	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	5–10	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	5–10	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	5–10	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	5–10	–
	Great Basin fishhook cactus	SCPU6	<i>Sclerocactus pubispinus</i>	5–10	–
	roundleaf buffaloberry	SHRO	<i>Shepherdia rotundifolia</i>	5–10	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	5–10	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	5–10	–
<b>Tree</b>					
6	<b>Dominant Trees</b>			50–100	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	40–80	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	10–20	–

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Dominant Grasses</b>			50–80	
	cheatgrass	BRTE	<i>Bromus tectorum</i>	20–40	–
	sandhill muhly	MUPU2	<i>Muhlenbergia pungens</i>	10–20	–
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	10–20	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	10–20	–
2	<b>Sub-Dominant Grasses</b>			20–40	
	Grass, annual	2GA	<i>Grass, annual</i>	10–20	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	10–20	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	10–20	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	10–20	–
	black grama	BOER4	<i>Bouteloua eriopoda</i>	10–20	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	10–20	–

	squirreltail	ELEL5	<i>Elymus elymoides</i>	10–20	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	10–20	–
	spike dropseed	SPCO4	<i>Sporobolus contractus</i>	10–20	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	10–20	–
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	10–20	–
	sixweeks fescue	VUOC	<i>Vulpia octoflora</i>	10–20	–
<b>Forb</b>					
3	<b>Forbs</b>			25–50	
	Forb, annual	2FA	<i>Forb, annual</i>	15–40	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	15–40	–
	redstem stork's bill	ERIC6	<i>Erodium cicutarium</i>	20–40	–
	Russian thistle	SAKA	<i>Salsola kali</i>	20–40	–
	old-man-in-the-Spring	SEVU	<i>Senecio vulgaris</i>	5–10	–
	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	5–10	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	5–10	–
	desert princesplume	STPI	<i>Stanleya pinnata</i>	5–10	–
	stemless four-nerve daisy	TEACA2	<i>Tetranneuris acaulis</i> var. <i>acaulis</i>	5–10	–
	James' buckwheat	ERJA	<i>Eriogonum jamesii</i>	5–10	–
	shy gilia	GIIN2	<i>Gilia inconspicua</i>	5–10	–
	manybranched ipomopsis	IPPO2	<i>Ipomopsis polycladon</i>	5–10	–
	Gray's biscuitroot	LOGR	<i>Lomatium grayi</i>	5–10	–
	oblongleaf bluebells	MEOB	<i>Mertensia oblongifolia</i>	5–10	–
	Colorado beeblossom	OECO	<i>Oenothera coloradensis</i>	5–10	–
	lobeleaf groundsel	PAMU11	<i>Packera multilobata</i>	5–10	–
	Wasatch beardtongue	PECY2	<i>Penstemon cyananthus</i>	5–10	–
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	5–10	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	5–10	–
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	5–10	–
	tapertip onion	ALAC4	<i>Allium acuminatum</i>	5–10	–
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	5–10	–
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	5–10	–
	splitleaf Indian paintbrush	CARH4	<i>Castilleja rhexiifolia</i>	5–10	–
	Wright's bird's beak	COWR2	<i>Cordylanthus wrightii</i>	5–10	–
	basin yellow cryptantha	CRCO12	<i>Cryptantha confertiflora</i>	5–10	–
<b>Shrub/Vine</b>					
4	<b>Dominant Shrubs</b>			100–200	
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	50–80	–
	singleleaf ash	FRAN2	<i>Fraxinus anomala</i>	20–30	–
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	20–30	–
5	<b>Sub-Dominant Shrubs</b>			50–100	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	10–20	–
	Havard oak	QUHAT	<i>Quercus havardii</i> var. <i>tuckeri</i>	10–20	–
	Sonoran scrub oak	QUTU2	<i>Quercus turbinella</i>	10–20	–

	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	10–20	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	10–20	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata</i> ssp. <i>tridentata</i>	5–10	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	5–10	–
	littleleaf mountain mahogany	CEIN7	<i>Cercocarpus intricatus</i>	5–10	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	5–10	–
	blackbrush	CORA	<i>Coleogyne ramosissima</i>	5–10	–
	mormon tea	EPVI	<i>Ephedra viridis</i>	5–10	–
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	5–10	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	5–10	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	5–10	–
	brittle pricklypear	OPFR	<i>Opuntia fragilis</i>	5–10	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	5–10	–
	Great Basin fishhook cactus	SCPU6	<i>Sclerocactus pubispinus</i>	5–10	–
	roundleaf buffaloberry	SHRO	<i>Shepherdia rotundifolia</i>	5–10	–
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	5–10	–
	Utah serviceberry	AMUT	<i>Amelanchier utahensis</i>	5–10	–
<b>Tree</b>					
6	<b>Dominant Trees</b>			50–100	
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	40–80	–
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	10–20	–

## Animal community

### --Threatened and Endangered Species--

This site may provide foraging and resting opportunities for peregrine Falcons.

### --Wildlife Interpretation--

Small herds of mule deer and pronghorn antelope may graze/browse on these sites, especially when located near water sources and in the winter. The hot summers and lack of water often favors small mammals, which may have an easier time finding shelter, food, and water. Several species of rats, mice, squirrels, bats, and chipmunks may be observed using the site, along with coyotes and foxes. Lizards can often be observed during the day. Common lizard species include the northern whiptail, desert spiny, and the colorful western collard lizard. (NPS.gov, 2008)

### --Grazing Interpretations--

This site has limited potential for livestock grazing due to a lack of perennial grasses and the large amounts of rock outcrop that dissect this site. This site often lacks natural water sources, which can influence its suitability for livestock grazing.

The plant community is typically composed of Utah juniper, two-needle pinyon, and a variety of shrubs. Several shrub species can serve as browse forage for livestock on winter range. When present, perennial grasses, primarily Indian ricegrass and James galleta, can also provide good forage for horses, cattle, and sheep. Grazing must be carefully planned and managed to prevent damage to the site. An onsite evaluation should be conducted as part of a science based grazing management plan.

## Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group D due to their shallow depth

(NRCS National Engineering Handbook). These soils become saturated quickly due to their high infiltration rates and shallow depths; once these soils are saturated run off potential is high. (National Range and Pasture Handbook, 2003)

## **Recreational uses**

Recreation activities include aesthetic value and good opportunities for hiking and off-road vehicle use.

## **Wood products**

Utah juniper and Two-needle pinyon may provide firewood and possibly fence post where growth is sufficient and regulations allow such use.

## **Other information**

### **--Poisonous/Toxic Plant Communities--**

Toxic plants associated with this site include woolly locoweed, sand sagebrush, and oakbrush. Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed is palatable and had similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is available. Locoweed contains swainsonine (indolizidine alkaloid) and is poisonous at all stages of growth. Poisoning will become evident after 2-3 weeks of continuous grazing and is associated with 4 major symptoms: 1) neurological damage, 2) emaciation, 3) reproductive failure and abortion, and 4) congestive heart failure linked with "high mountain disease". 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. Oakbrush is thought to contain tannins that can be detrimental to cattle, sheep, and occasionally horses if grazed as more than 50% of the diet. Oak is highly toxic during the budding stage, leafing stage, and when acorns are available. Symptoms include lack of appetite, weakness, excessive thirst, edema, reluctance to follow the herd, and emaciation.

Potentially toxic plants associated with this site include four-wing saltbush, 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, souging of the hoof, hair loss, blindness, and aimless wondering. Horses tend to develop what is called a "bob" tail or "roached" main due to breakage of the long hairs.

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur.

### **--Invasive Plant Communities--**

Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the non-native annual invaders including cheatgrass, Russian thistle, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible. Due to Cutler jointfir's slow growth rate it does not compete well with invading plants after a disturbance and thus restoration efforts could be hindered.

## --Fire Ecology--

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Many semi-desert plant communities in the Colorado Plateau may have evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

Fires on cutler jointfir ecological sites are relatively uncommon due to sparse vegetation and insufficient fuels. Its fire regime depends on the adjacent plant communities and has been to have a wide range of return intervals. This plant generally sprouts from the roots or woody rood crown after a fire, but also has the capability of reestablishing through seed. While it establishes quickly after fire, its slow growth rate inhibits vigorous competition with invading annuals, which could change the fire regime due to an increase in fine fuels.

## Other references

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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	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
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## Indicators

1. **Number and extent of rills:** Rills are not present in the reference state on the gentler slopes. Few rills present on slopes exceeding 10% are likely to form below adjacent exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion. Rills present should be small, less than 6 feet in length. The number of rills can increase immediately following large storm events but should not persist more than one or two seasons due to coarse soil textures and frost-heave recovery.
2. **Presence of water flow patterns:** The occurrence of water flow patterns is rare (0-3% cover) on all slopes in the reference state, and are typically less than 3 feet long. As slopes increase (>10%) water flow pattern occurrence (3-8% cover) and length (3-5ft) also increases. An increase in water flow patterns is also expected after disturbance events such as precipitation events and increased wildlife use, which increases the percent of bare ground and erosion potential.
3. **Number and height of erosional pedestals or terracettes:** The occurrence of pedestalling or terracetting in the reference state is rare; however 1 inch pedestalling of shrubs is acceptable, but there should be no exposed roots.
4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** In the reference state bare ground is variable (20-60%) throughout all plant community phases. Bare ground is associated with water flow patterns, rodent activity, and plant interspaces. Areas with poorly developed biological soils crust that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground. This site can have up to 5% surface rock cover.
5. **Number of gullies and erosion associated with gullies:** Active gullies are generally nonexistent; however, stable gullies may occur in landscape settings where increased runoff may have accumulated (such as areas below exposed bedrock). Any gully development is expected to be limited to steeper slopes, show little sign of accelerated erosion, and be stabilized with perennial vegetation.
6. **Extent of wind scoured, blowouts and/or depositional areas:** Some wind generated soil movement is normal. Wind caused blowouts and depositions are mostly small, stable and have healed over. Some coppice mounding around Cutler mormontea, when present is common. Increased wind generated soil movement can occur after severe (multi-year) drought or severe wind events.
7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement and wind. Fine litter (<¼ inch in diameter) may be moved up to 2-3 ft and usually occurs in water flow patterns and rills, with deposition occurring at obstruction. The majority of litter accumulates at the base of plants or in soil depressions adjacent to the plant. Woody stems (those greater than .25 inch in diameter) are not likely to move under normal conditions.



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 3-4 throughout the site. Surface texture varies from sand to loamy fine sand. As sites depart from the reference state to a state dominated by invasive annuals soil surfaces textures are expected to have less structure.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Nalcase) Soil surface 0-4 inches deep and structure is single grain. The A-horizon color ranges from a very pale brown (10YR 7/4) to a yellowish brown (10YR 5/6) when moist. Surface textures are typically sands to fine sands. The A-horizon typically exhibits none to very little development. 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:** The presence of overstory trees, shrubs, and perennial grasses break raindrop impact and splash erosion. The spatial distribution of vascular plants, non-vascular communities (when present), and interspaces provide detention storage and surface roughness that slows down runoff, allowing time for infiltration. When shrubs and perennial grasses 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. Soils typically reach bedrock at 8 inches.
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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: Overstory trees (Two-needle pinyon/Utah juniper) > sprouting shrubs (Cutler jointfir > non-sprouting shrubs (Mexican cliffrose/ single-leaf ash) > Perennial grasses (Indian ricegrass/Sandhill muhly/James galleta).
- Sub-dominant: Sprouting shrubs (Rabbitbrush/ Sand sage) = forbs (globemallow, milkvetch) > Biological soil crust.
- Other: Biological soil crust is variable in its occurrence on this site and when present, is measured as a component of ground cover.
- Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.
- Additional: Temporal variability is caused by drought, insects, large precipitation events, and infrequent spot fire. Spatial variability is caused by soil textures, proximity to runoff producing sites, etc.
- Following a major disturbance such as drought or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may increase in the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase, competing with the perennial herbaceous understory species. In either case, these conditions reflect a community phase within the reference state.
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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be very little mortality or decadence apparent in either shrubs or grasses. Many plants may die during a multi-year drought. Some (up to 20%) perennial bunch grass mortality is expected during severe drought

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14. **Average percent litter cover (%) and depth ( in):** Litter cover (including under plants) ranges from 10-20%, nearly all of which should be fine litter. Variability is due to the herbaceous production differences from one year to the next. Depth is generally 1 leaf thickness in the interspaces and up to .25 inch under plant canopies. Litter can increase up to 20% immediately following leaf drop or after favorable conditions increase native annual forb production.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 350 - 400 lbs./acre on an average year, but could range from 150 to 600 lbs./acre during periods of prolonged drought or above average precipitation.
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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Known invasive species include cheatgrass, Russian thistle and redstem storksbill.
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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except during drought.
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18. **Supporting Data::** NRCS (Dana Truman/Ashley Garrelts) 2006/2007 ESD data from Arches and Canyonlands National Parks.
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