

# Ecological site R034BY012UT Sandy Bottom (Fourwing salbush)

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## General information

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

## MLRA notes

Major Land Resource Area (MLRA): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau. Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA. The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation. Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days. The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

## Ecological site concept

This site occurs on insert fans and drainageways without a permanent stream. Slopes are mostly 1 to 6 percent. Elevations range from 3,900 feet to 6,200 feet on all aspects. Characteristic soils in this site are deep to very deep and well drained with a moderately rapid to rapid permeability. They formed in alluvium derived mainly from sandstone parent materials. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. pH is moderately alkaline. Available water holding capacity is 2 to 4 inches in the upper 60 inches of soil. The soil moisture regime is typic aridic to ustic aridic and the soil temperature regime is mesic. Precipitation ranges from 5 to 12 inches annually.

**Table 1. Dominant plant species**

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

### Physiographic features

This site occurs on inset fans and drainageways without a permanent stream. Slopes are mostly 1 to 6 percent. Elevations range from 3,900 feet to 6,200 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Inset fan (2) Drainageway
Runoff class	Very low
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	None to very rare
Elevation	1,190 – 1,890 m
Slope	0 – 10 %
Ponding depth	Not specified
Water table depth	Not specified

### Climatic features

Average annual precipitation is 5 to 12 inches. Approximately 55 percent occurs as rain from March through May. On the average, November through February are the driest months and July through October are the wettest months. The mean annual air temperature is 8.4 celsius and the soil temperatures are in the mesic regime. The average freeze-free period is 115 to 125 days. This site receives run-in moisture from surrounding areas which supplies much of the plant's water needs. In average years, plants begin growth around March 10 and end growth around October 15.

Table 3 Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	130-310 mm

Frost-free period (average)	
Freeze-free period (average)	130 days
Precipitation total (average)	

### Influencing water features

Due to its landscape position, in bottoms and drainageways, it does receive run-in/extra water.

### Soil features

Characteristic soils in this site are deep to very deep and well drained with a moderately rapid to rapid permeability. They formed in alluvium derived mainly from sandstone parent materials. Rock fragments may be present on the soil surface and throughout the profile, but make up less than 35 percent of the soil volume. pH is moderately alkaline. Available water holding capacity is 2 to 4 inches in the upper 60 inches of soil. The soil moisture regime is typic aridic to ustic aridic and the soil temperature regime is mesic. Precipitation ranges from 5 to 12 inches annually.

**Table 4. Representative soil features**

Parent material	(1) Alluvium – sandstone
Surface texture	(1) Loamy fine sand
Family particle size	(1) Sandy
Drainage class	Well drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	150 cm
Soil depth	150 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	5.08 – 10.16 cm

Calcium carbonate equivalent (Depth not specified)	0 – 20 %
Electrical conductivity (Depth not specified)	0 – 10 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0 – 10
Soil reaction (1:1 water) (Depth not specified)	7.9 – 8.4
Subsurface fragment volume ≤3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

## Ecological dynamics

### State 1: Reference State

This reference state was determined by the study of rangeland relic areas, areas protected from excessive disturbance, as well as areas influenced by activities such as grazing and recreation. Literature reviews, trends in plant community dynamics, and historical accounts are also considered.

This reference state represents the plant communities and ecological dynamics of the desert sandy loam, four-wing saltbush site. This state includes the biotic communities that can become established on this ecological site if all successional sequences are completed under the natural disturbance regime. This state is dominated by perennial warm and cool season grasses, where four-wing saltbush and Torrey's jointfir make up the dominant shrub canopy. In this state, both warm and cool season grass species are present, including Indian ricegrass and James' galleta. Forb composition is variable.

Primary disturbance mechanisms include occasional fire caused by lightning strikes and Native American ignition sources, climate fluctuations, insect herbivory, and native herbivore grazing. Timing of these natural disturbances dictates the what ecological dynamics occur. The reference state is self sustaining and resistant to change due to its high resistance to natural disturbances and it's high resilience following natural disturbances. When natural disturbances occur, the rate of recovery is relatively rapid due to niches being filled with highly adapted native vegetation.

Reference State: Community phases influenced by infrequent fire, native herbivore grazing, insect herbivory, and weather.

Indicators: A well developed perennial cool and warm season grass understory with fourwing saltbush forming the dominant visual aspect.

Feedbacks: Extended drought and/or improper grazing that result in a reduction of native perennial plant vigor which may cause invasive species to become established in the understory, increased bare spaces, erosion, and soil loss. Infrequent but regular fires and/or properly managed grazing that maintain the perennial bunch grass understory and the establishment of shrubs.

At-risk Community Phase: All communities in this state are at risk when native plants are stressed and/or nutrients become available for invasive plants to establish; plant community 1.3 is most at risk due to its limited understory.

Trigger: Introduction and establishment of non-native invasive plants such as cheatgrass and Russian thistle.

#### Community Phase 1.1: Desert Grassland/Shrubland.

This plant community phase is characterized by a fourwing saltbush overstory with a perennial cool and warm season grass understory. The dominant cool season grass is Indian ricegrass and the dominant warm season grass is James galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground (40-50% cover) is common and biological crusts (1-10% cover) are characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy.

#### Community Phase Pathway 1.1a

This pathway occurs when events, such as fire or shrub insect herbivory, favor the establishment of perennial native grasses and a reduction in the shrub canopy.

#### Community Phase Pathway 1.1b

This pathway occurs when events favor the establishment of native shrubs and a reduction in the perennial grass understory. Events may include time without disturbances, or improper grazing. This is the natural successional pathway from community 1.1 to 1.3

#### Community Phase 1.2: Desert Grassland

This plant community phase is characterized by well developed perennial warm and cool season grassland with occasional scattered fourwing saltbush, depending on disturbance history. Dominant grasses include Indian ricegrass, needle-and-thread, James galleta, and sand dropseed. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground (30-45% cover) is common and biological crusts (1-10% cover) are characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy. This plant community typically is a result of a fire in either plant community 1.2 or 1.3 and thus shrubs may or may not be present depending on when the fire occurred.

#### Community Phase Pathway 1.2a

This pathway occurs when events favor the establishment of native shrubs with minimal loss of the perennial grass understory. Events may include time without disturbances or mild drought.

#### Community Phase 1.3: Desert Shrubland

This plant community phase is characterized by a well developed shrub overstory with a minimally developed native perennial grass understory. Dominant shrub species include four-wing saltbush and Torrey's jointfir. Dominant perennial cool and warm season grasses include Indian ricegrass and James galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground (40-50% cover) is common and biological crusts (1-10% cover) are characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy. Due to increased bare ground and decreased perennial grass understory this plant community is most at risk for erosion, soil loss, and invasion by introduced species such as cheatgrass, annual mustard, and/or Russian thistle, as well as invasive native species including broom snakeweed.

#### Community Phase Pathway 1.3a

This pathway occurs when events, such as a cool fire or insect herbivory, favor a minimal decrease in the shrub canopy and the increased establishment of native perennial grasses.

#### Community Phase Pathway 1.3b

This pathway occurs when events, such as a hot fire, favors the establishment of native perennial grasses with a major reduction or removal of the shrub canopy.

#### Transition T1a

This transition is from the native perennial grass understory in the reference state to a state that contains invasive plants such as cheatgrass, Russian thistle, and annual mustards. Events that may trigger this event include fire, improper domestic livestock grazing, and extended drought that stress the native plants and allow nutrients to become available for more tolerant invasive species. Non-native, invasive species such as cheatgrass, however, have been known to invade into intact perennial plant communities where little to no disturbances have occurred. So while this transition may occur from any state in the reference state it typically will occur from community 1.3. Once invasive species have established in the understory a threshold has been crossed.

#### State 2: Current Potential State

This state is similar to the reference state except there are now non-native invasive plants established in the understory. This state is dominated by perennial warm and cool season grasses, where fourwing saltbush and Torrey's jointfir make up the shrub canopy. Dominant grass species include Indian ricegrass and James galleta. Forb composition is variable. Primary disturbance mechanisms include fire, human induced fire suppression, weather fluctuations, domestic livestock grazing, insect herbivory, and native herbivore grazing. Timing and severity of these disturbances dictate the ecological dynamics that occur. Disturbances can lead to shifts in species composition that affect the nutrient cycling, soil-water relationships, hydrology, and soil stability. This state has lower resistance to disturbances and resilience after disturbance than the reference state due to the occurrence of invasive species and increased bare ground.

Current Potential State: Community phases influenced by fire, native herbivore grazing, domestic livestock grazing, insect herbivory

cycles, lack of disturbances, and weather.

Indicators: A well developed perennial cool and warm season grass understory with fourwing saltbush forming the dominant visual aspect. Invasive plants are present.

Feedbacks: Extended drought and/or improper grazing that result in a reduction of native perennial plant vigor which may cause invasive species to dominate the understory, increased bare spaces, erosion, and soil loss. Infrequent but regular fires and/or properly managed grazing that maintain the perennial bunch grass understory and the establishment of shrubs.

At-risk Community Phase: All communities are at risk when cheatgrass is present in the understory due to increased fine fuels, which may decrease the natural fire return interval that could eventually lead the site into an annual grass state (State 4). All community phases are also subject to possible transition into the disturbed state (state 3) due to increased bare ground, and increased opportunities for soil erosion especially when site is exposed to improper livestock grazing.

Trigger: Increase and/or establishment of broom snakeweed, and surface disturbances which increase soil erosion and loss; and/or increased establishment of invasive annuals such as cheatgrass and annual mustards which decrease the fire return interval.

Restoration Pathway: None

#### Community Phase 2.1: Desert Grassland/Shrubland

This plant community is characterized by a native perennial bunch grass understory with minimal occurrence of non-native invasive species. Fourwing saltbush forms the dominant shrub overstory. Commonly observed invasive plants include broom snakeweed, Russian thistle, cheatgrass, and annual mustards. Dominant perennial cool and warm season grasses include Indian ricegrass and James galleta. Other grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground (50-60% cover) is common and biological crusts (1-5% cover) are characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy.

#### Community Phase Pathway 2.1a

This pathway occurs when events favor the establishment of grasses with a complete removal of the shrub component. Events may include fire that allows for the reestablishment of the perennial grasses or grazing livestock in such a way that removes the shrub canopy.

#### Community Phase Pathway 2.1b

This pathway occurs when events favor the establishment of shrubs with a reduction in the grass understory. Events may include fire suppression, time, or grazing livestock in such a way that reduces the grass understory and allows for increased establishment of the shrub component.

#### Community Phase 2.2: Desert Grassland

This plant community phase is characterized by well developed perennial warm and cool season grassland with occasional scattered fourwing saltbush, depending on when the disturbance history. There is minimal occurrence of non-native invasive species. Grass species present include Indian ricegrass, James galleta, and cheatgrass. Commonly seen invasive forbs and shrubs include Russian thistle, broom snakeweed and annual mustards. Other grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground (50-60% cover) is common and biological crusts (1-5% cover) are characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy. This plant community typically is a result of a cool fire in either plant community 2.1 or 2.3 and thus shrubs may or may not be present depending on when the fire occurred.

#### Community Phase Pathway 2.2a

This pathway occurs when events favor the establishment of shrubs with minimal loss of the grass understory. Events may include time without disturbances, mild drought, or grazing livestock in such a way that allows for the increase of shrubs and decrease of grass species.

#### Community Phase 2.3: Desert Shrubland

This plant community phase is characterized by a well developed shrub overstory with a minimally developed native perennial grass understory. Non-native invasive plants are present. Shrub species include fourwing saltbush, broom snakeweed, and Torrey's jointfir. Grasses include Indian ricegrass, cheatgrass, and James galleta. Commonly occurring invasive forbs include annual mustards and Russian thistle. Other grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground (50-60% cover) is common and biological crusts (1-5% cover) are characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy.

The following tables provide an example of the typical vegetative floristics of a community phase 2.3 plant community.

#### Community Phase Pathway 2.3a

This pathway occurs when events favor the establishment of native perennial grasses with a removal of the shrub canopy. Events typically include a cool fire that will significantly reduce or remove the shrubs, but still allow for establishment of native perennial grasses.

#### Community Phase Pathway 2.3b

This pathway occurs when events, such as insect herbivory, favor a decrease in shrub canopy. A variety of insects including Orthoptera, Lepidoptera, and Hemiptera feed on fourwing saltbush.

#### Transition T2a

This transition from the Current Potential State (State 2) to the Disturbed State (State 3). This transition occurs when events favor broom snakeweed to dominate the site. Bare ground increases and perennial/annual grass production decreases. Events typically include improperly managed domestic livestock grazing for extended periods of time. This transition may occur from any community in the current potential state. Once broom snakeweed and bare ground dominate, and drive the ecological dynamics of a site, a threshold has been crossed.

#### Transition T2b

This transition from the Current Potential State (State 2) to the Annual Grass State (State 4). This transition occurs when events allow cheatgrass to dominate the site. Bare ground typically will decrease as cheatgrass increases. A hot, catastrophic fire occurring in any community in the current potential state can cause this transition to occur. This often causes an increase in the fire return interval. Once cheatgrass dominates and drives the ecological dynamics of a site, a threshold has been crossed.

#### State 3: Disturbed State

This state is characterized by a dominance of broom snakeweed, Russian thistle, and Torrey's jointfir, with minimal occurrence of the perennial warm and cool season grasses associated with this site. Fourwing saltbush may or may not be present. The primary disturbance mechanism is improperly managed domestic livestock grazing that maintains the broom snakeweed and bare ground. The shift in species composition, as well as the increased bare ground, affects the nutrient cycling, soil-water relationships, hydrology, and soil stability of this site. This state has lower resistance to disturbances and resilience after a disturbance than the previous two states.

Disturbed State: Community phase maintained by improperly managed domestic livestock grazing.

Indicators: A plant community dominated by broom snakeweed and Russian thistle, where bare ground is very common.

Feedbacks: Improper domestic livestock grazing that allows for the continued establishment and maintenance of broom snakeweed and bare ground. Time without disturbances that may aid in the reestablishment of native perennial grasses and shrubs.

At-risk Community Phase: All community phases are at risk when cheatgrass is present in the plant community and there are sufficient fine fuels to carry a fire.

Trigger: Increased cheatgrass and a resulting decrease in the sites fire return interval.

Restoration Pathway: Time with proper livestock grazing or other disturbance that allows native perennial vegetation to reclaim the site. This may take many years to accomplish.

#### Community Phase 3.1: Disturbed Grassland/Shrubland

This plant community phase is characterized by a dominance of broom snakeweed and Russian thistle. The perennial warm and cool season grasses may or may not be present. Fourwing saltbush and Torrey's jointfir also may be present. Cheatgrass is typically present and other invasive forbs are variable. Bare ground (60-80% cover) is very common and the biological crust (0-5%) cover when present is characterized by light cyanobacteria in the interspaces, with an occasional isolated lichen or moss pinnacle under the plant canopy. This plant community is most at risk when cheatgrass is present and fine fuel loads are sufficient to carry a fire, causing this community to be at risk of transitioning to an annual grass state (state 4).

#### Transition T3a

This transition is from the Disturbed State (State 3) to the Annual Grass state (State 4). This transition occurs when cheatgrass production is sufficient in the disturbed state for fire to be able to carry through the ecological site. Once cheatgrass drives the ecological dynamics of the site, a threshold has been crossed.

#### Restoration Pathway R3a

This restoration from the Disturbed State (State 3) to the Current Potential State (State 2). This restoration pathway occurs as native perennial shrubs and grasses are able to reclaim a site over time when improper livestock grazing and other disturbances are removed. For this to occur there must still be a seed source for native grasses and shrubs near or on the site. This restoration pathway may take many decades to complete and may not even be possible with the current knowledge.

#### State 4: Annual Grass State

This states ecological processes are driven by the dominance of cheatgrass production. Other invasive, and some native plant species may also be present. Cheatgrass dramatically affects the soil/plant/water relationships of a site. Research has shown that it has substantial effects on soil water content and temperature, as well as impacts on the frequency and intensity of disturbance. After a cheatgrass invasion, a sites fundamental nutrient cycling processes, root pores, mycorrhizal associations, microbial species, and soil organic material are changed (Chapin et al. 1997; Belnap and Phillips, 2001). These alterations may eventually create ecologically impoverished sites that are very difficult to restore to functionally. The competitiveness of cheatgrass and its ability to quickly establish after a disturbance make this state extremely resistance to change and resilient after a disturbance.

Annual Grass State: Community phases maintained, in a self-sustaining manner, by frequent fire.

Indicators: A site where ecological processes are driven by cheatgrass.

Feedbacks: A self sustaining disturbance regime of frequent fire.

#### Community Phase 4.1: Cheatgrass Dominated

This plant community is characterized by dominance of cheatgrass, other native species are present but no longer drive the ecological dynamics of the site. Bare ground is minimal (5-15% cover) due to the increase in litter and cheatgrass' dense establishment. Fire can carry through this community. Biological crusts (1-5% cover) are characterized by light cyanobacteria in the interspaces.

#### Community Phase Pathway 4.1a

This pathway is characterized by frequently occurring fires (every 5-10 years) that allows for establishment of a cheatgrass monoculture.

#### Community Phase 4.2: Cheatgrass Monoculture

This community is characterized by a complete monoculture of cheatgrass, where other grasses and shrubs do not occur. Invasive annual forbs may or may not be present, depending on current climatic conditions. This plant community is self-enhancing through frequent fire (every 5-10 years). Bare ground (5-15%) is minimal and biological crusts (1-5%) are characterized by light cyanobacteria in the interspaces.

## State and transition model

Figure 1. STM

## Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
<b>Shrub/Vine</b>					
0	<b>Dominant Shrub</b>			111-194	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	62-93	–
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	12-31	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	12-31	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	12-19	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	12-19	–
3	<b>Sub-Dominant Shrubs</b>			27-62	
	Shrub (>.5m)	2SHRUB	<i>Shrub (&gt;.5m)</i>	7-25	–
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	7-12	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	7-12	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	7-12	–
<b>Grass/Grasslike</b>					
0	<b>Dominant Grasses</b>			248-370	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	123-185	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	31-62	–
1	<b>Sub-Dominant Grasses</b>			65-139	
	Grass, annual	2GA	<i>Grass, annual</i>	19-31	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	19-31	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	7-19	–
	saltgrass	DISP	<i>Distichlis spicata</i>	7-19	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	7-19	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	7-19	–
<b>Forb</b>					
0	<b>Dominant Forb</b>			19-31	
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	19-31	–

2	<b>Sub-Dominant Forb</b>			105-253	
	Forb, annual	2FA	<i>Forb, annual</i>	19-31	-
	Forb, perennial	2FP	<i>Forb, perennial</i>	19-31	-
	annual ragweed	AMAR2	<i>Ambrosia artemisiifolia</i>	7-19	-
	woolly locoweed	ASMO7	<i>Astragalus mollissimus</i>	7-19	-
	roughseed cryptantha	CRFL6	<i>Cryptantha flavoculata</i>	7-19	-
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulle</i>	7-19	-
	desert trumpet	ERIN4	<i>Eriogonum inflatum</i>	7-19	-
	flatspine stickseed	LAOC3	<i>Lappula occidentalis</i>	7-19	-
	rusty lupine	LUPUP	<i>Lupinus pusillus ssp. pusillus</i>	7-19	-
	skyblue phacelia	PHCO	<i>Phacelia coerulea</i>	7-19	-
	woolly plantain	PLPA2	<i>Plantago patagonica</i>	7-19	-

### Animal community

This site provides proper grazing for cattle and sheep during fall, winter, and spring. This site provides food and cover for wildlife. Wildlife using this site include jackrabbit, coyote, kangaroo rat, snake, hawk and mule deer.

### Hydrological functions

The soil is in hydrologic group B. The runoff curve numbers are 61 through 29 depending upon the overall watershed condition.

### Recreational uses

Recreation activities are hiking and hunting.

### Wood products

None

### Other references

Modal Soil: Glenton SL – coarse-loamy, mixed (calcareous), mesic Typic Torrifuvents

Type Location: See the Uintah County Soil Survey

### Contributors

Jim Brown

### Approval

Kirt Walstad, 3/05/2022

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

## Indicators

1. **Number and extent of rills:** Rills are normally not present. Some very minor rill development may occur following large storm events, but they should heal within the next growing season due the sites sandy surface textures and weak soil structure. Any rills present should be less than 1/2 inch deep, widely spaced (15 to 20 feet), and not connected. They should average < 15 feet in length. Rill development may also increase where the site is adjacent to other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, etc.)

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2. **Presence of water flow patterns:** None to very few. Any flow patterns present should be sinuous and wind around perennial plant bases. They may be long (15 to 25 feet), < 1 foot wide, and spaced from 10 to 20 feet apart. They should be stable with only minor evidence of deposition. This site is periodically inundated with runoff water from adjacent sites. It also acts as a filter and trap sediment from adjacent channels during significant flooding events.

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3. **Number and height of erosional pedestals or terracettes:** Plants may show very minor pedestalling where they are adjacent to water flow patterns, but there should be no exposed roots. A few terracettes may be present. Where they are present, they should be stable and occur behind litter blocking water flow patterns.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25 to 35% bare ground. Bare ground openings should not be greater that 1 to 2 feet in size and normally should not be connected. Poorly developed biological crusting that functions the same as bare ground, should be recorded as bare ground.

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5. **Number of gullies and erosion associated with gullies:** None at site level. Widely scattered landscape level gully channels, however, are a normal component of desert environments. Where landscape gullies are present, they should be stable, partially vegetated on their sides and bottoms, with little evidence of head-cutting. Some slight increase in disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Slight evidence of wind generated soil movement is present. Wind scoured (blowouts) and depositional areas may be present but are stable or healing. One to two inches of coppice mounding around four-wing saltbush and perennial grass clumps is normal for this site.

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7. **Amount of litter movement (describe size and distance expected to travel):** The majority of litter accumulates in place at the base of plant canopies. Slight movement of the finest material (< 1/8 inch) may move 1 to 2 feet in the direction of prevailing winds or downslope if being transported by water. Little accumulation is observed behind obstructions.
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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 4 to 5 under plant canopies and a rating of 2 to 4 in the interspaces. The average should be 3 or 4. Surface textures typically vary from fine sands, sandy loams to loams.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Beebe) Soil surface is typically 0 to 2 inches deep. Surface texture is a very fine sandy loam and structure is weak medium and thick platy. The A-horizon color is brown (10YR 6/3). Soils have an Ochric epipedon that extends 2 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies. 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:** Perennial vegetation breaks raindrop impact and reduces splash erosion. Good spatial distribution of plants slows runoff by obstructing surface flows, allowing time for increased infiltration. With the physiographic location of this site being in low lying areas, it often acts as a terminal accumulation site for runoff.
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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. This site will normally have textural changes within its' soil profile. These should not be mistaken for compaction layers.
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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 Shrubs (four-wing saltbush, Torrey jointfir ) >> Perennial bunchgrasses (Indian ricegrass, needle-and-thread) > Perennial Forbs (scarlet globemallow).
- Sub-dominant:** Sprouting Shrubs (winterfat, rubber rabbitbrush) > Rhizomatous Grasses (James galleta) >> Perennial Forbs (woolly milkvetch).
- Other:** Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state. Biological soil crust is variable in its' expression where present on this site and is measured as a component of ground cover. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.
- Additional:** Disturbance regimes include insects, infrequent fire, and flooding. Temporal variability can be caused by fires, droughts, insects, etc. Spatial variability can be caused by runoff, soil pH, and topography. Following a recent disturbance such as fire, drought, or insect damage that remove woody vegetation, forbs and perennial grasses may dominate the community for a time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase on the site, reducing herbaceous species. These conditions may reflect community phases 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):**  
There should be no mortality or decadence in either shrubs or grasses during years with average to above average precipitation. During severe (multi-year) droughts that affect groundwater levels, up to 10% of the perennial shrubs may die. Minor mortality of bunchgrasses may also occur during these drought periods. There may be partial mortality of individual bunchgrasses and shrubs during less severe droughts.
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- 14. Average percent litter cover (%) and depth ( in):** Litter cover ranges from 20 to 25%. Depth should be a 1 to 2 leaf thickness in the interspaces and from 1/2 to 1 inch under perennial plant canopies.
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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 500 to 550 pounds per acre on an average year. Production could vary from 300 to 700 pounds per acre during drought or above-average years.
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- 16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Russian thistle, halogeton, mustard species, filarie, other non-native annual forbs and cheatgrass.**
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- 17. Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years. During average or above average years, some recruitment of major species should be present. Good age class distribution should also be apparent.
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