

Ecological site R034BY002UT Alkali Bottom (Alkali sacaton)

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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 poorly drained alluvial bottom lands, floodplains and drainageways. Slopes are mostly 0 to 3 percent. Elevations range from 4,000 feet to 6,500 feet on all aspects. Characteristic soils in this site are deep and poorly to moderately well drained. They formed in alluvium derived mainly from sandstone, limestone, shale and quartzite. Soils are affected by salt and alkali and have a watertable that is below 20 inches throughout most of the plant growing period. Soil surface textures are loam, silt loam to silty clay loam. Permeability is slow to moderate and runoff is low. The water supplying capacity is 2.0 to 7.0 inches.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Sarcobatus vermiculatus</i>

Herbaceous	(1) <i>Sporobolus airoides</i> (2) <i>Deschampsia cespitosa</i>
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Physiographic features

This site occurs on poorly drained alluvial bottom lands, floodplains and drainageways. Slopes are mostly 0 to 3 percent. Elevations range from 4,000 feet to 6,500 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Drainageway (2) Flood plain
Runoff class	Low
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	None to occasional
Elevation	1,220 – 1,980 m
Slope	0 %
Water table depth	60 – 120 cm

Climatic features

Average annual precipitation is 6 to 8 inches. Approximately 60 percent occurs as rain from March through September. The soil temperatures are in the mesic regime. The average freeze- free period is 110 to 125 days. This site receives run-in moisture from the surrounding area and a fluctuating water table supplies most of the plant water needs. In average years, plants begin growth around April 1 and end growth around October 1.

Table 3 Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	150-200 mm

Influencing water features

This site receives run-in moisture from the surrounding upland sites.

Soil features

This site occurs on poorly drained alluvial bottom lands, floodplains and drainageways. Slopes are mostly 0 to 3 percent. Elevations range from 4,000 feet to 6,500 feet on all aspects. Characteristic soils in this site are deep and poorly to moderately well drained. They formed in alluvium derived mainly from sandstone, limestone, shale and quartzite. Soils are affected by salt and alkali and have a watertable that is below 20 inches throughout most of the plant growing period. Soil surface textures are loam, silt loam to silty clay loam. Permeability is slow to moderate and runoff is low. The water supplying capacity is 2.0 to 7.0 inches.

Table 4. Representative soil features

Parent material	(1) Alluvium – sedimentary rock
Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Family particle size	(1) Fine-silty
Drainage class	Poorly drained to moderately well drained
Permeability class	Slow to very slow
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 (50.8-101.6cm)	5.08 – 17.78 cm
Calcium carbonate equivalent (50.8-101.6cm)	10 – 20 %
Electrical conductivity (50.8-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (50.8-101.6cm)	0 – 10

Soil reaction (1:1 water) (50.8-101.6cm)	7.9 – 10
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 state includes the biotic communities that become established on the ecological site if all successional sequences are completed under the natural disturbance regime. The reference state is generally dominated by black greasewood and alkali sacaton. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. When natural disturbances occur, the rate of recovery is variable due to disturbance intensity. Once invasive plants establish, return to the reference state may not be possible.

Reference State: Black greasewood/alkali sacaton state with natural fluctuations that form either a shrubland or grassland aspect depending on the natural disturbance history.

Indicators: A community dominated by greasewood and and alkali sacaton.

Feedbacks: Improper livestock grazing of perennial grasses and/or other disturbances that may allow for the establishment of invasive species.

At-risk Community Phase: This state is at risk when native plants are stressed and nutrients become available for invasive plants to establish.

Trigger: The establishment of invasive plant species.

Community 1.1

Black greasewood/Alkali Sacaton Community Phase.

This community is characterized by an open black greasewood shrub canopy, small amounts of basin big sagebrush and shadscale may also present. The site however, has a grassland aspect with alkali sacaton, alkali bluegrass and basin wildrye dominating the herbaceous layer. Other perennial grasses, shrubs, and forbs are also present. The composition by air-dry weight is approximately 85 percent perennial grasses, 5 percent forbs, and 10 percent shrubs. Bare ground is variable (20-40%) depending on the amount of biological crust (0 to 15), and plant cover.

State 2

Current Potential State

The current potential state is similar to the reference state, however invasive grasses and/ or forbs are now present in all community phases. This state is still dominated by an open canopy of black greasewood, however depending on disturbance history, basin big sagebrush and rubber rabbitbrush may be prominent on the site. Alkali sacaton and basin wildrye are still the primary perennial grass species however, saltgrass, cheatgrass and other less palatable species make up a larger portion of the herbaceous layer.

Primary disturbance mechanisms include native herbivore grazing and proper domestic livestock grazing. Timing of these disturbances dictates the ecological dynamics that occur. The current potential state is still self sustaining; but is losing resistance to change due to lower resilience following disturbances. When disturbances occur, the rate of recovery is variable depending on severity.

Current Potential State: Black greasewood/ alkali sacaton state with variations within a basin big sagebrush and/or rubber rabbitbrush shrubland community. Invasive plants are present.

Indicators: A community dominated by greasewood and/or rubber rabbitbrush where native perennial grasses and forbs are also present. Invasive grasses and/or forbs are present.

Feedbacks: Frequent disturbances that may allow the dominance of annual invasive species such as cheatgrass to dominate.

At-risk Community Phase: As increased disturbance frequency allows for the dominance of annual grasses, such as cheatgrass, this community is at greater risk.

Trigger: Reoccurring disturbance that results in a dominance of annual grasses in the herbaceous layer.

Community 2.1

Black greasewood, Alkali Sacaton, Invasive Weed Community Phase.

This community phase is characterized by a black greasewood shrub canopy with alkali sacaton, alkali bluegrass and basin wildrye still dominating the herbaceous layer. Non-native species including cheatgrass, mustard species, and halogeton are present. The composition by air-dry weight is approximately 60 percent perennial grasses, 10 percent forbs, and 30 percent shrubs. Bare ground is variable (20-50%) depending on the amount of biological crust (0 to 15), and plant cover.

Community 2.2

Black greasewood, Invasive Weed Community Phase.

This community phase is characterized by a black greasewood and/or basin big sagebrush shrub canopy. Alkali sacaton, alkali bluegrass and basin wildrye are much reduced in the understory. Non-native species including cheatgrass, mustard species, alyssum, fivehorn smotherweed and halogeton often dominate the site. Other commonly occurring grasses and grasslikes include saltgrass, baltic rush may be increasing and preferred species are decreasing. The composition by air-dry weight is approximately

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 (%)
Shrub/Vine					
0	Dominant Shrub			140-399	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	100-200	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	20-100	–
	Gardner's saltbush	ATGA	<i>Atriplex gardneri</i>	20-100	–
3	Sub-Dominant Shrub			81-337	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	20-100	–
	basin big sagebrush	ARTRT	<i>Artemisia tridentata ssp. tridentata</i>	0-28	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0-17	–
Grass/Grasslike					
0	Dominant Grasses			998-1496	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	499-599	–
	tufted hairgrass	DECE	<i>Deschampsia cespitosa</i>	200-299	–
	saltgrass	DISP	<i>Distichlis spicata</i>	100-200	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	100-200	–
	basin wildrye	LECI4	<i>Leymus cinereus</i>	100-200	–
1	Sub-Dominant Grasses			299-898	
	Grass, annual	2GA	<i>Grass, annual</i>	100-200	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	100-200	–
	clustered field sedge	CAPR5	<i>Carex praegracilis</i>	20-100	–
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	20-100	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	20-100	–
Forb					
2	Sub-Dominant Forb			121-359	
	Forb, annual	2FA	<i>Forb, annual</i>	20-100	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	20-100	–

Animal community

This site provides proper grazing for cattle and sheep during any season of the year. This site provides food and limited cover for wildlife.

Hydrological functions

The soil is in hydrologic group c. The runoff curve numbers are 74 through 86 depending on the overall watershed condition.

Recreational uses

Recreation activities are hiking and hunting.

Wood products

None

Contributors

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Approval

Kirt Walstad, 3/04/2022

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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Date	05/21/2012
Approved by	
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 in sparsely vegetated areas. 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. A slight increase in rill development may also be observed following large storm events or spring runoff periods, but should heal within the next year. 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.)

- 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), < one 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.

- 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.

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20 to 25% bare ground. Bare ground openings should not be greater than 1 foot 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.

- 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.

- 6. Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind generated soil movement. Wind scoured (blowouts) and depositional areas are not present. One to two inches of depositional mounding around black greasewood and perennial grass clumps is normal for this site and is not caused by wind erosion.

- 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.

- 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 to 5 under plant canopies and a rating of 3 to 4 in the interspaces. The average should be 4. Surface textures typically vary from loams silty clay loams.

- 9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Green River) Soil surface is typically 0 to 11 inches deep. Surface texture is a loam and structure is weak medium platy. The A-horizon color is brown (10YR 5/3). Soils have an Ochric epipedon that extends 11 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.

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. The amount of sodium in the soil can reduce the infiltration and facilitate puddling on the surface.

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' profile. These should not be mistaken for compaction layers.

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

Dominant: Sprouting Shrub (black reasewood) > Perennial Grasses (Alkali sacaton, tufted hairgrass) > Perennial Forbs (fireweed).

Sub-dominant: Sprouting Shrubs (four-wing saltbush, Gardner saltbush > Rhizomatous Grasses (saltgrass) >> Perennial Forbs (shrubby seepweed).

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.

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 no mortality or decadence in either shrubs or grasses. During severe (multi-year) droughts that affect groundwater levels, up to 10% of the greasewood plants may die. Minor mortality of bunchgrass and other shrubs may also occur during these drought periods. There may be partial mortality of individual bunchgrasses and other shrubs during less severe droughts.

14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 25 to 30%. Depth should be 1/4 inch thickness in the interspaces and from 1 to 1.5 inches under perennial plant canopies.

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 1680 to 1780 pounds per acre on an average year. Production could vary from 900 to 2500 pounds per acre during drought or above-average years.

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.

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