

Ecological site R028AY011ID

ALKALI FLATS 8-12 ATCO/ELEL5

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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): 028A–Ancient Lake Bonneville

MLRA 28A occurs in Utah (82 percent), Nevada (16 percent), and Idaho (2 percent). It encompasses approximately 36,775 square miles (95,246 square kilometers). A large area west and southwest of Great Salt Lake is a salty playa. This area is the farthest eastern extent of the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. It is an area of nearly level basins between widely separated mountain ranges trending north to south. The basins are bordered by long, gently sloping alluvial fans. The mountains are uplifted fault blocks with steep side slopes. Most of the valleys are closed basins containing sinks or playa lakes. Elevation ranges from 3,950 to 6,560 feet (1,204 to 2000 meters) in the basins and from 6,560 to 11,150 feet (1996 to 3398 meters) in the mountains. Much of the MLRA has alluvial valley fill and playa lakebed deposits at the surface from pluvial Lake Bonneville, which dominated this MLRA 13,000 years ago. A level line of remnant lake terraces on some mountain slopes indicates the former extent of this glacial lake. The Great Salt Lake is what remains of the pluvial lake. Mountains in the interior of this MLRA consist of tilted blocks of marine sediments from Cambrian to Mississippian age with scattered outcrops of Tertiary continental sediments and volcanic rocks. The average annual precipitation is 5 to 12 inches (13 to 30 cm) in the valleys and ranges up to 49 inches (124 cm) in the mountains. Most of the rainfall in the southern LRU occurs as high-intensity, convective thunderstorms during the growing season (April through September). The driest period is from midsummer to early autumn in the northern LRU. Precipitation in winter typically occurs as snow. The average annual temperature is 39 to 53 °F (4 to 12 °C). The freeze-free period averages 165 days and ranges from 110 to 215 days, decreasing in length with increasing elevation. The dominant soil orders in this MLRA are Aridisols, Entisols, and Mollisols. Soils are dominantly in the mesic or frigid soil temperature regime, aridic or xeric soil moisture regime, and mixed mineralogy. The soils are generally well drained, loamy or loamy-skeletal, and very deep.

LRU notes

The Basin and Range North LRU exhibits dry summer with stronger xeric patterns than the Basin and Range South LRU. Ranges in the north LRU are about 50 percent Paleozoic sedimentary/metasedimentary (limestone/quartzite dominant) and about 10 percent Tertiary volcanics. The basin floors are between 4,200 and 5,100 feet (1280 to 1554 meters) in elevation. Pinyon and juniper sites have a greater percentage of Utah juniper (*Juniperus osteosperma*) in the plant community than pinyon pine (*Pinus edulis* or *monophylla*). The Basin and Range North have few semidesert ecological sites with Utah juniper. Cool season grasses, such as bluebunch wheatgrass (*Pseudoroegneria spicata*), are dominant in the plant community, while warm season grasses are largely absent or a small component of the plant community.

Ecological site concept

The Alkali Flats 8-12 ATCO/ELEL5 site is found on fan remnants on shallow slopes. The soil surface texture is silt loam with up to 15 percent rock fragments on the soil surface. The Alkali Flats 8-12 ATCO/ELEL5 site is influenced by salts and is dominated by salt and alkali tolerant vegetation.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Atriplex confertifolia</i>

Herbaceous	(1) <i>Elymus elymoides</i>
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Physiographic features

The Alkali Flats 8-12 ATCO/ELEL5 site occurs on gently sloping stream, lake and fan terraces. Slopes range from 0 to 3 percent on all aspects. Elevation ranges from 4,200 to 5,600 feet (1280 to 1706 meters).

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Strath terrace (3) Lake terrace
Elevation	1,280 – 1,710 m
Slope	0 %

Climatic features

The Great Salt Lake Area has elevations in the basins ranging from 3,950 to 6,560 feet above sea level with mountains ranging up to 11,150 feet. The average annual precipitation is 14 inches based on data collected from 5 long term climate stations located throughout the MLRA. The average annual low is 11.32 inches and the average annual high is 16 inches. The average annual temperature is 45.7 degrees Fahrenheit. The average annual low is 31.7 and the average annual high is 59.7 degrees F. The frost free period ranges from 100 to 125 days and the freeze free period ranges from 131 to 156 days.

Table 3 Representative climatic features

Frost-free period (characteristic range)	60-60 days
Freeze-free period (characteristic range)	90-110 days
Precipitation total (characteristic range)	280-330 mm
Frost-free period (actual range)	60-60 days
Freeze-free period (actual range)	90-110 days
Precipitation total (actual range)	280-330 mm
Frost-free period (average)	60 days
Freeze-free period (average)	100 days

Precipitation total (average)	310 mm
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- (1) MALTA 4 ESE [USC00105563], Malta, ID
- (2) SNOWVILLE [USC00427931], Snowville, UT

Influencing water features

Soil features

The soils are very deep, somewhat poorly to well drained, silt loams and loams. Root penetration is limited by low moisture and high sodium and/or salt. The pH is usually slightly alkaline to strongly alkaline. Light surface color is due to lower organic matter. Coarse fragments may occur in the soil profile but do not significantly affect the kind or amount of vegetation. Permeability is very slow to moderate, while runoff is generally low to medium. The available water holding capacity (AWC) ranges from low to moderate. The soils are characterized by a xeric or an aridic bordering on xeric soil moisture regime and either a mesic or frigid soil temperature regime.

Table 4. Representative soil features

Parent material	(1) Alluvium – limestone and sandstone (2) Lacustrine deposits – limestone and sandstone
Surface texture	(1) Gravelly silt loam (2) Gravelly loam
Drainage class	Poorly drained to well drained
Permeability class	Very slow to moderate
Soil depth	150 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (Depth not specified)	2.29 – 18.54 cm
Calcium carbonate equivalent (Depth not specified)	0 – 30 %
Electrical conductivity (Depth not specified)	0 – 40 mmhos/cm

Sodium adsorption ratio (Depth not specified)	0 – 40
Soil reaction (1:1 water) (Depth not specified)	7.9 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 50 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

The dominant visual aspect of the Alkali Flats 8-12 ATCO/ELEL5 site is salt and alkali tolerant vegetation. Composition by weight is approximately 40 to 50 percent grass, 3 to 8 percent forbs, and 45 to 55 percent shrubs.

In the last few thousand years, the Alkali Flats 8-12 ATCO/ELEL5 site has evolved in a semi-arid climate characterized by hot, dry summers and cold winters. Herbivory has historically occurred on this site at low levels of utilization. Herbivores include pronghorn antelope, mule deer and lagomorphs.

Fire has historically occurred on the site at intervals of more than 100 years. Fire only occurs in favorable years.

The Historic Climax Plant Community (HCPC), the Reference State (State 1), moves through many phases depending on the natural and human caused forces that impact the community over time. State 1, described later, indicates some of these phases. The Reference Plant Community Phase is Phase 1.1. This plant community is dominated by bottlebrush squirreltail, Sandberg bluegrass, western wheatgrass, Indian ricegrass, scarlet globemallow, black greasewood, and shadscale saltbush. Subdominants include sand dropseed, basin wildrye, needle and thread, Gardner saltbush, bud sage, and winterfat. The plant species composition of Phase 1.1 is listed later under "Reference Plant Community Phase Plant Species Composition".

Total annual production is 400 pounds per acre (444 Kg/ha) in a normal year. Production in a favorable year is 600 pounds per acre (666 Kg/ha). Production in an unfavorable year is 200 pounds per acre (222 Kg/ha). Structurally, medium height shrubs are dominant followed by cool season grasses being more dominant than perennial forbs while shallow rooted bunchgrasses are subdominant.

Function.

The Alkali Flats 8-12 ATCO/ELEL5 site is suited for spring, fall and winter grazing by domestic livestock. Natural water supplies over much of the site are short or absent. Livestock water may have to be piped, hauled or otherwise made available.

Mule deer and pronghorn use the site in the winter and spring. Rabbits, mourning doves, songbirds and some small mammals use the site part of the year.

The soils on this site are in hydrologic groups C and D and have low to high runoff potential.

Because of the relatively flat slopes and non-stony surface, this site is easily degraded by improper grazing management.

The site is open space with smooth terrain and low growing vegetation providing an unobstructed view of the adjacent mountains.

Impacts on the Plant Community.

Influence of fire:

The Alkali Flats 8-12 ATCO/ELEL5 site historically had a very low fire frequency, approximately every 100 or more years. Most of the shrubs evolved in the absence of fire, therefore many of them can be severely damaged or killed when burned. Winterfat will re-sprout after a low intensity fire. However, black greasewood and Gardner saltbush will re-sprout after fire, regardless of intensity. Cheatgrass

can be a troublesome invader on this site after fire, preventing perennial grass and shrub re-establishment and increasing the fire frequency.

Influence of improper grazing management:

Gardner saltbush, bud sagebrush, shadscale saltbush, winterfat, along with Indian ricegrass can all be impacted by improper grazing management. Black greasewood will normally increase with improper grazing management. Relatively low levels of utilization by cattle and sheep are needed to maintain the shrub component.

Weather influences:

Extended periods of drought reduces vigor of the perennial grasses and palatable shrubs. Extreme drought may cause plant mortality.

Influence of insects and disease:

Mormon crickets and grasshopper outbreaks occur occasionally. Since defoliation usually occurs only once during the growing season, little mortality occurs. Shadscale saltbush can be heavily impacted by the scale insect, *Orthezia annae*. It is also called "mealy bug". This insect is moved by ants from one plant to another and feeds on the roots of shadscale saltbush. It can cause stand mortality, especially following a series of drought years.

Influence of noxious and invasive weeds:

Annual and perennial weeds compete with desirable plants for moisture and nutrients. The result is reduced production and change in composition of the understory. Cheatgrass can be an invasive weed, especially after fire. Once it becomes established the fire frequency increases, however, the fire frequency is still relatively long. As a result, the shrub component can be lost or severely reduced.

Influence of wildlife:

Relatively low numbers of wildlife use this site and impact it little. Pronghorn antelope is the dominant large herbivore using the site. They use the site yearlong but prefer it in the spring, fall and early winter. Winter and spring use by mule deer occasionally occurs.

Watershed:

Decreased infiltration and increased runoff occurs when Gardner saltbush, bud sagebrush, and winterfat is removed with frequent fires, particularly following the fire event. With improper grazing management, black greasewood will increase along with an increase in bare ground in the interspaces. The increased runoff also increases sheet and rill erosion. The long-term effect is a transition to a different state.

Plant Community and Sequence:

Transition pathways between common vegetation states and phases:

State 1.
Phase A to B. Develops under improper grazing management.
Phase A to C. Develops with fire (approximately every 100+ years) and improper grazing management. Fire only occurs in above normal precipitation (favorable) years.
Phase C to A. Develops under a good prescribed grazing management program and no fire.
Phase B to A. Develops from prescribed grazing and no fire.
State 1, Phase B to State 2. Develops with fire and improper grazing management.

State 1 to 2.
Develops from Phase B with frequent fire or from Phase C with improper grazing management and fire.

State 2 to 3.
The site has deteriorated further and soil loss has occurred resulting in a loss of site potential. This has resulted from improper grazing management and frequent fires.

Practice Limitations.

The Alkali Flats 8-12 ATCO/ELEL5 site is not well suited to seeding due to the low precipitation and salts in the profile. Brush management is normally not needed or useful on this site.

Plant Community Narrative:

State 1, Reference State

State 1, Phase A, Reference Plant Community Phase. This plant community is dominated by bottlebrush squirreltail, Sandberg bluegrass,

Western wheatgrass, Indian ricegrass, black greasewood, and shadscale saltbush. Subdominants include sand dropseed, basin wildrye, needle and thread, Gardner saltbush, bud sage and winterfat. Natural fire frequency is 100+ years.

State 1, Plant community B. This plant community is dominated by bottlebrush squirreltail with small amounts of shadscale saltbush remaining. Black greasewood may be increasing. This phase has developed due to improper grazing management and lack of fire. There are remnants of Indian ricegrass, winterfat and bud sage. These deep-rooted bunchgrasses and shrubs are typically in low vigor. Palatable shrubs are hedged.

State 1, Plant community C. This plant community is dominated by Indian ricegrass and bottlebrush squirreltail. Forbs remain about in the same proportion as Plant Community A. Gardner saltbush and black greasewood have re-sprouted. This phase is a result of wildfire.

State 2. This plant community is dominated by cheatgrass, peppergrass, halogeton and other annuals. Root sprouting shrubs such as rabbitbrush and black greasewood can be present. Plains pricklypear is increasing. This site has crossed the threshold. It is economically impractical to return this plant community to State 1 with accelerating practices. This state has developed due to frequent fires and improper grazing management.

Unknown new site. This plant community has gone over the threshold to a new site. Site potential has been reduced. Significant soil loss has occurred. Infiltration has been reduced and run-off has become more rapid. This state has developed due to continued improper grazing management and/or frequent fires.

State and transition model

Additional community tables

Approval

Kendra Moseley, 6/12/2025

Rangeland health reference sheet

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

Author(s)/participant(s)	
Contact for lead author	
Date	09/17/2026
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. Number and extent of rills:

2. Presence of water flow patterns:

3. Number and height of erosional pedestals or terracettes:

4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):

5. Number of gullies and erosion associated with gullies:

6. Extent of wind scoured, blowouts and/or depositional areas:

7. Amount of litter movement (describe size and distance expected to travel):

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:

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

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:

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):

14. Average percent litter cover (%) and depth (in):

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):

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:

17. Perennial plant reproductive capability:
