USDA Natural Resources Conservation Service

Ecological site R030XD226CA
Alkaline Meadow

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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): 030X–Mojave Basin and Range

The Mojave Desert Major Land Resource Area (MLRA 30) is found in southern California, southern Nevada, the extreme southwest corner of Utah and northwestern Arizona within the Basin and Range Province of the Intermontane Plateaus. The Mojave Desert is a transitional area between hot deserts and cold deserts where close proximity of these desert types exert enough influence on each other to distinguish these desert types from the hot and cold deserts beyond the Mojave. Kottek et. al 2006 defines hot deserts as areas where mean annual air temperatures are above 64 F (18 C) and cold deserts as areas where mean annual air temperatures are below 64 F (18 C). Steep elevation gradients within the Mojave create islands of low elevation hot desert areas surrounded by islands of high elevation cold desert areas.

The Mojave Desert receives less than 10 inches of mean annual precipitation. Mojave Desert low elevation areas are often hyper-arid while high elevation cold deserts are often semi-arid with the majority of the Mojave being an arid climate. Hyper-arid areas receive less than 4 inches of mean annual precipitation and semi-arid areas receive more than 8 inches of precipitation (Salem 1989). The western Mojave receives very little precipitation during the summer months while the eastern Mojave experiences some summer monsoonal activity.

In summary, the Mojave is a land of extremes. Elevation gradients contribute to extremely hot and dry summers and cold moist winters where temperature highs and lows can fluctuate greatly between day and night, from day to day and from winter to summer. Precipitation falls more consistently at higher elevations while lower elevations can experience long intervals without any precipitation. Lower elevations also experience a low frequency of precipitation events so that the majority of annual precipitation may come in only a couple precipitation events during the whole year. Hot desert areas influence cold desert areas by increasing the extreme highs and shortening the length of below freezing events. Cold desert areas influence hot desert areas by increasing the extreme lows and increasing the length of below freezing events. Average precipitation and temperature values contribute little understanding to the extremes which govern wildland plant communities across the Mojave.

Hyper-Arid Mojave Land Resource Unit (XD)

LRU notes

The Mojave Desert is currently divided into 4 Land Resource Units (LRUs). This ecological site is within the Hyper-Arid Mojave LRU, extremely hot and dry low elevation troughs within the Mojave Desert. The Hyper-Arid Mojave LRU is designated by the 'XD' symbol within the ecological site ID. This LRU is found within the Death Valley/Mojave Central Trough, as well as portions of the Mojave exposed to the Salton Sea Trough and the Colorado River Valley. This LRU is essentially equivalent to the Death Valley/Mojave Central Trough, Arid Valleys and Canyonlands, and associated Mojave Sand Dunes and Mojave Playas of EPA Level IV Ecoregions.

Elevations range from -280 to 1650 feet with precipitation is less than 4 inches per year. This LRU is distinguished by its extremely aridity where a nearly barren landscape is occupied by widely spaced shrubs. Vegetation includes creosote bush, burrobush, big galleta grass with many annual species able to take advantage of infrequent precipitation events which occur in this LRU. Playa species such as Mojave seablite and saltbush species are also common in this LRU.

Classification relationships

Distichlis spicata intermittently flooded herbaceous alliance (Reid et al. 2000) is found within this ecological site.

Distichlis spicata herbaceous alliance Salt grass flats (Sawyer et al. 2009) is found within this ecological site.

Ecological site concept

Frequent ponding of long duration, a shallow water table, and salic soils in an extremely arid and warm climate on the edges of soft playa margins are the dominant features driving this ecological site. These harsh conditions prevent most plants from surviving. Saltgrass (*Distichlis spicata*) is the dominant, and generally the only, vascular plant species present. Seasonal and annual fluctuation in playa surface inundation and accompanying fluctuations in soil surface salinity are the primary drivers influencing vegetation dynamics of this site, with the extent and productivity of the plant community declining with ponding and excess salinity.

The central concept for this ecological site in the initial Soil Survey of the Mojave National Preserve Area, California (CA795) on the Typic Aquisalids components of the 412 - Typic Aquisalids complex, 0 to 1 percent slopes map unit.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Distichlis spicata*

Physiographic features

This ecological site occurs on flat, frequently ponded playa margins where the water table is shallow to the soil surface. Elevations range from 920 to 960 feet (elevation range is based on the Soda Lake Playa; this range may be expanded if this site is found at other locations within MLRA30). Runoff class is negligible. This site experiences occasional ponding of long duration which may occur from December through March and from July through September.

Table 2. Representative physiographic features

Landforms	(1) Playa
Ponding duration	Long (7 to 30 days)
Ponding frequency	Occasional
Elevation	280–293 m
Slope	0–1%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this ecological site is characterized by hot temperatures, aridity, and a bimodal precipitation pattern. Precipitation falls as rain, with 30 percent falling in summer between July and October, and 65 percent falling in winter between November and March. The mean annual precipitation is 2 to 5 inches and mean annual air temperature is 70 degrees F. The frost free period is 270 to 295 days. The freeze free period 295 to 320 degrees F.

Maximum and minimum monthly climate data for this ESD were generated by the Climate Summarizer (http://www.nm.nrcs.usda.gov/technical/handbooks/nrph/Climate_Summarizer.xls) using data from the following climate stations (results are weighted averages):

040436-7, Baker, CA (Period of record = 1971 to 2013) [1]

45122, Mojave River Sink, CA (Period of record = 1988 to 2011) [2]

The data from multiple weather stations were combined to most accurately reflect the climatic conditions of this ecological site.

Table 3. Representative climatic features

Frost-free period (average)	295 days
Freeze-free period (average)	320 days
Precipitation total (average)	127 mm

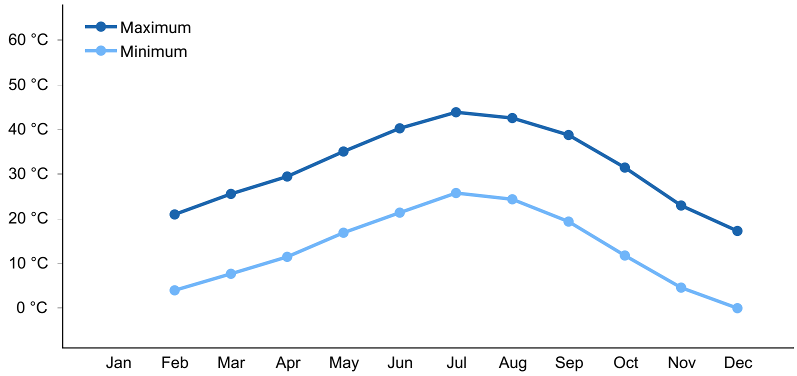


Figure 1. Monthly average minimum and maximum temperature

Influencing water features

Portions of desert playas are considered wetland habitat (e.g. Brostoff et al. 2001, Lichvar et al. 2006). Playas, or the "flat-floored bottom of an undrained desert basin that becomes at times a shallow lake which on evaporation may leave a deposit of salt or gypsum” [Brostoff et al. 2001, p.1], are lacustrine wetland systems. This site occurs on the lowest zone of the playa margin where plant growth is possible, on Typic aquisalid soils that at least part of the time meet the definition of hydric soils (NRCS, 2003). Saltgrass is considered a facultative wetland species, that is, one that usually occurs in wetlands but may also occur in upland habitats (Lichvar and Dixon, 2007).

Soil features

The soils associated with this ecological site are very deep, very poorly drained soils that formed in lacustrine deposits and alluvium from granitoid sources. Surface textures are fine sand with fine sand, loamy fine sand and loamy very fine sand subsurface textures. These soils are very poorly drained. A salic horizon is present to depths of approximately 59 inches, and aquic conditions are present between 23-59 inches. Redox features indicate a high water table of approximately 3 inches, which may fluctuate to depths of more than 5 feet. There are no rock fragments present on the soil surface or within the soil profile.

Table 4. Representative soil features

Parent material	(1) Lacustrine deposits–granite
Surface texture	(1) Fine sand
Family particle size	(1) Sandy
Drainage class	Very poorly drained
Permeability class	Rapid

Soil depth	152 cm
Available water capacity (0-101.6cm)	4.32–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Electrical conductivity (0-101.6cm)	45–255 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	140–1,136
Soil reaction (1:1 water) (0-101.6cm)	8.5–10

Ecological dynamics

Abiotic Factors

Occasional ponding that may be of long duration, a shallow water table, and salic soils in an extremely arid and warm climate on the edges of soft playa margins are the dominant features driving this ecological site. These harsh conditions prevent most plants from surviving. Saltgrass (*Distichlis spicata*) is the dominant, and generally the only, vascular plant species present. This ecological site is known from the western shore of Soda Lake, California, a discharge playa where water is at or near the surface due to a surficial spring. To the east are barren playa surfaces where the groundwater declines, and evaporation causes heavy accumulations of salts to form on the playa surface, conditions that are restrictive to plant growth. Towards the ephemeral river fan delta, sand deposits cover the playa surface, creating less saline and less anoxic conditions that may be colonized by deeper-rooted species.

Saltgrass is a warm-season, rhizomatous, native perennial grass (Baldwin et al. 2002, Hauser 2006). In the desert southwest and Great Basin, it is considered a facultative wetland species (Lichvar and Dixon 2007), and is most often found in saline habitats where the water table is shallow to the surface (Cluff et al. 1983, Groeneveld and Or 1994, Elmore et al. 2006, Hauser 2006, Lichvar and Dixon 2007, Mata-Gonzalez et al. 2012). With adaptations for high salinity, tolerance of anoxic soil conditions, drought and flooding, and the ability to colonize heavy soils, saltgrass can form very dense meadow communities in habitats where few other species can survive (Cluff et al. 1983). Lacunae tissue allow for gas exchange in inundated, anoxic soils and partial inundation (Hansen et al. 1976, Dahlgren et al. 1997). Salt glands excrete excess salt (Hansen et al. 1976). Saltgrass may also exist where the depth to water table (DTW) is deep; however it does not form monocultural meadows in these situations, and occurs with a mixture of more xeric and less salt tolerant species.

Disturbance dynamics

Seasonal and annual fluctuation in playa surface inundation and accompanying fluctuations in soil surface salinity are the primary drivers influencing vegetation dynamics of this site, with the extent and productivity of the plant community declining with both long duration, deep ponding or excess salinity. Infrequent flooding of ephemeral rivers may cause more extensive flooding on a roughly decadal basis (Enzel 1992). Off-road vehicle (OHV) use and historic cattle grazing are anthropogenic disturbances that may impact this site. Declines in groundwater have the potential to cause this site to cross a threshold to an alternative state, but this has not been observed within the geographic reference of this site.

Saltgrass is tolerant of at least 24 days of inundation (Aldon 1977), most often occurring in habitats subject to intermittent flooding, such as playa margins and tidal marshes (Hauser 2006, Sawyer et al. 2009). Inundation will reduce cover and vigor, and long duration, deep inundation will kill saltgrass. Following inundation, surviving rhizomes are repositories of sediments as floodwaters recede; these incipient hummocks provide sites for new growth and re-colonization of the playa surface (Hansen et al. 1976). Sharp silica coated rhizome tips are especially suited for colonizing heavy playa soils (Hansen et al. 1976). Recently inundated surfaces are characterized by fresh mud deposits, moist soils, and low density saltgrass, with large patches of bare ground between rhizomes. With time, infilling and leaf growth will lead to dense saltgrass meadows.

Soil surface salinity may cause reductions in saltgrass productivity and cover (Warren and Brockelman 1989, Hauser 2006). Surface salinity fluctuates with soil moisture and depth to water table; it is diluted when the soil is wet, i.e. with precipitation or ponding, but as the soil dries capillary action concentrates salts at the surface (Waisel 1972, Rosen 1994, Reid et al. 2000, Brostoff et al. 2001). Patterns of ponding and salinization may be highly dynamic and spatially variable across the playa surface (Rosen 1994), consequently temporal and spatial fluctuations in plant community phases are common in this ecological site. Salt will be drawn to the soil surface only when groundwater remains within the capillary range; if groundwater declines below 3 meters (9.8 feet), surface salinization due to evaporation no longer occurs (Waisel 1972).

Patches occupied by saltgrass may accumulate sands, with deposition leading to hummocks that are higher than the playa surface (Hansen et al. 1976, Cluff et al. 1983). These areas have lower salinity, and are more hospitable for saltgrass growth. Reductions in surface salinity also make these patches more favorable for colonization by more xeric and less salt tolerant species, and when these hummocks occur closer to the sand source at higher elevation on the playa margin, they are likely to be transitional to different plant communities, including R030XY229CA, which is composed of alkali goldenbush (*Isocoma acradenia*) and saltgrass.

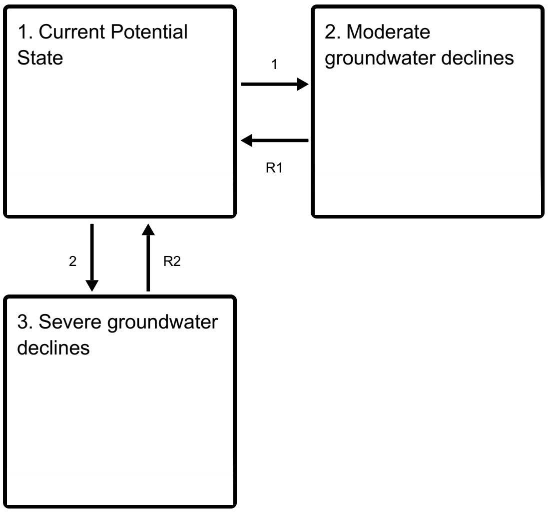
Historic cattle grazing has impacted this ecological site. Saltgrass is tolerant of grazing and trampling (Cluff et al. 1983, Reid et al. 2000); however excessive grazing will lead to declines in cover (Reid et al. 2000). Grazing was removed in 2003 and since baseline conditions are not available, it is unknown what the extent of grazing impacts has been. Recreational OHV use has also impacted this ecological site. OHVs are most disruptive in sand accumulation phases, as they destabilize soils and increase vulnerability to erosion, which can lead to saltgrass mortality.

Significant declines in the water table will alter the community composition of this ecological site, transitioning this site to an altered state where a monoculture of saltgrass is not supported. The severity of the decline would lead to different scenarios. Moderate declines with a lack of ponding state would lead to a state dominated by a barren playa surface with heavy salt accumulations. Unvegetated playa surfaces are more prone to wind erosion, and the resulting dust is a major source of air pollution (e.g. Gill 1996, Lancaster and Baas 1998, Pelletier 2006, Reynolds et al. 2007, Groeneveld and Barz 2013). There is a lack of data demonstrating declines in DTW at Soda Lake. However, groundwater drawdown and diversions of the Mojave River, which contributes intermittent flow to Soda Lake, have had profound ecological effects in lower reaches of the hydrological system, causing mortality in riparian vegetation and reactivating eolian surfaces (Laity 2003). Widespread mortality in phreatophytic trees in the delta feeding the playa, and erosion of sand accumulation patches on the playa, probably previously occupied by saltgrass is currently occurring (NRCS observations), and it is likely that reduced flow reaching the playa has reduced groundwater recharge and ponding, increasing the occurrence of a barren salt-crusted surface state. Any anthropogenic modifications that alter the hydrology of the playa system, including groundwater pumping, drainage ditches, roads, or runoff diversion should be considered a management action adverse to the resiliency of this ecological site.

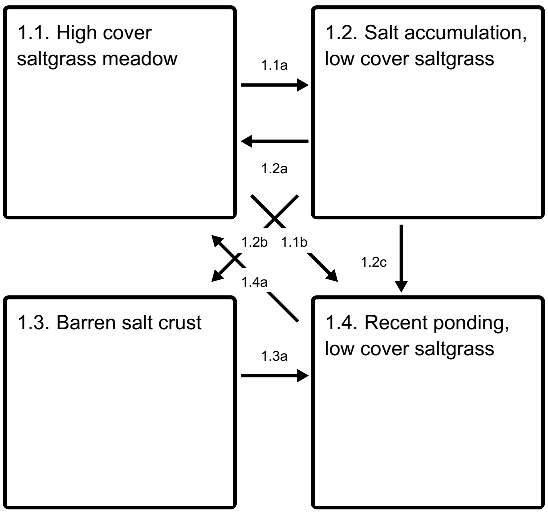
If the water table drops below three meters and surface salinization no longer occurs, invasion by less salt-tolerant deeper-rooted shrubs such as alkalki goldenbush and cattle saltbush (*Atriplex polycarpa*) could occur. Further declines in the water table will lead to colonization by upland species such as creosote bush (*Larrea tridentata*), burrobush (*Ambrosia dumosa*), and big galleta (*Pleuraphis rigida*). Multiple studies from a Mojave Desert-Great Basin system and from other playa environments have demonstrated shrub invasion into groundwater dominated saline meadows with declines in groundwater. For example, in Colorado playa communities, saltgrass and rush (*Juncus arcticus*) meadows existed where DTW was 36 inches (0.9m), and a decline in DTW to 8.2 feet (2.5m) over a 19-year period allowed for phreatophytic shrub invasion (greasewood [*Sarcobatus vermiculatus*] and rabbitbrush [*Ericameria nauseosa*]) (Cooper et al. 2006). In the Owen’s Valley, groundwater pumping and a 16 foot (5m) drop in DTW led to phreatophytic and xeric shrub invasion (Torrey’s saltbush [*Atriplex torreyi*], rabbitbrush, and big sagebrush [*Artemisia tridentata*]) and grass cover decline in alkali meadows (Pritchett and Manning 2012).

State and transition model

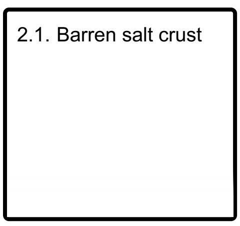
Ecosystem states



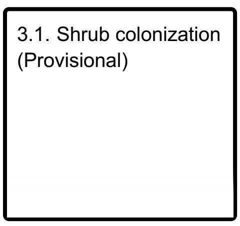
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Current Potential State

The current potential state exists with a shallow water table that remains within less than one meter of the soil surface, and regular intermittent ponding that dilutes soil surface salinity. Saltgrass monocultures dominate this state, with production and cover varying with ponding, DTW, and soil surface salinity. Invasive species are negligible in this site due to the harsh conditions present.

Community 1.1
High cover saltgrass meadow

Figure 2. Community Phase 1.1

Figure 3. Sand accumulation hummocks, phase 1.1

This community phase occurs when the water table remains within one meter of the surface, and flooding is intermittent and of relatively short duration. Saltgrass cover is high, between 45 and 85 percent, and production is between 130 and 325 pounds per acre. This phase may accumulate sands, creating hummocks which elevate the community above the playa surface.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	146	258	364
Total	**146**	**258**	**364**

Table 6. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	45-80%
Forb basal cover	0.0-0.1%
Non-vascular plants	0%
Biological crusts	0%
Litter	8-10%
Surface fragments >0.25" and <=3"	0%

Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	28-45%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	10-20%	–
>0.15 <= 0.3	–	–	30-55%	–
>0.3 <= 0.6	–	–	0-5%	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Salt accumulation, low cover saltgrass

This community develops due to increased salinization of the soil surface with soil drying and declines in groundwater. Increased salinity lowers the vigor of saltgrass, leading to lower cover and production in this community phase. The soil surface is covered with a salt crust.

Community 1.3
Barren salt crust

Figure 5. Community Phase 1.3

This community phase occurs with continued dry periods and/or declines in the water table, which further increases surface salinity so that it is no longer hospitable for saltgrass. Barren soil surfaces covered in thick salt crust dominate.

Community 1.4
Recent ponding, low cover saltgrass

Figure 6. Community Phase 1.4

This community phase occurs during re-colonization or new colonization of recently inundated playa surfaces. Saltgrass cover is low, less than 20 percent, and rhizomes are apparent crossing the playa surface. Soils are moist, and the soil surface is covered by freshly deposited mud and silt.

Pathway 1.1a
Community 1.1 to 1.2

Occurs with soil drying, and declines in DTW leading to increased soil salinity at the soil surface.

Pathway 1.1b
Community 1.1 to 1.4

High cover saltgrass meadow

Recent ponding, low cover saltgrass

Occurs with ponding from seasonal precipitation, or less frequently from flooding from ephemeral river sources.

Pathway 1.2a
Community 1.2 to 1.1

Occurs with groundwater recharge, or precipitation heavy enough to wash away surface salts.

Pathway 1.2b
Community 1.2 to 1.3

Occurs with continued drying and/or declines in DTW, and/or lack of precipitation or ponding.

Pathway 1.2c
Community 1.2 to 1.4

Occurs with ponding from seasonal precipitation, or less frequently from flooding from ephemeral river sources.

Pathway 1.3a
Community 1.3 to 1.4

Barren salt crust

Recent ponding, low cover saltgrass

Occurs with ponding from seasonal precipitation, or less frequently from flooding from ephemeral river sources.

Pathway 1.4a
Community 1.4 to 1.1

Recent ponding, low cover saltgrass

High cover saltgrass meadow

Occurs with time without inundation, and infilling of saltgrass patches.

State 2
Moderate groundwater declines

This state is dominated by a barren playa surface with heavy salt accumulations. Unvegetated playa surfaces are more prone to wind erosion, and the resulting dust is a major source of air pollution (e.g. Gill 1996, Lancaster and Baas 1998, Pelletier 2006, Reynolds et al. 2007, Groeneveld and Barz 2013).

Community 2.1
Barren salt crust

A barren salt crust dominates this ecological state. Surface salinity exceeds salt grass tolerance.

State 3
Severe groundwater declines

This state is provisional, and is based on evidence from other playa systems. Declines in groundwater below the capillary zone decreases soil surface salinity, allowing colonization by less salt-tolerant deeper-rooted shrubs such as alkalki goldenbush, cattle saltbush (*Atriplex polycarpa*), fourwing saltbush (*Atriplex canescens*), and honey mesquite (*Prosopis glandulosa*). Further declines in the water table will lead to colonization by upland species such as creosote bush (*Larrea tridentata*), burrobush (*Ambrosia dumosa*), and big galleta (*Pleuraphis rigida*).

Community 3.1
Shrub colonization (Provisional)

Deep rooted, less salt tolerant shrubs colonize playa surfaces.

Transition 1
State 1 to 2

This transition occurs with persistent moderate declines in groundwater, where capillary action still draws water to the soil surface, but shallow surface horizons are dry relative to State 1, causing increased salt concentrations on the surface. Generally groundwater depth below 3 meters does not contribute to salt concentrations on the soil surface (Waisel 1972), although this may vary with horizon textures.

Transition 2
State 1 to 3

This transition occurs with persistent severe declines in groundwater, where capillary action no longer draws salt to the soil surface (approximately more than 3 meters below the soil surface).

Restoration pathway R1
State 2 to 1

Groundwater is recharged either through reduction in use, following above average precipitation years or both.

Restoration pathway R2
State 3 to 1

Groundwater is recharged either through reduction in use, following above average precipitation years or both.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial Grasses**			146–364	
	saltgrass	DISP	*Distichlis spicata*	146–364	45–85
Forb					
2	**Annual forb**			–	
	Mojave cleomella	CLOB	*Cleomella obtusifolia*	–	0

Animal community

Saltgrass provides valuable cover for birds, small mammals and insects, and an important source of food for wildlife and livestock (Hauser, 2006).

The seeds and rhizomes of saltgrass are an important food source for waterfowl (Hauser, 2006). Migratory waterfowl species that may use this ecological site include greater white-fronted goose, snow goose, Canada goose, tundra swan, wood duck, mallard, gadwall, green-winged teal, American wigeon, northern pintail, northern shoveler, blue-winged teal, cinnamon teal, canvasback, redhead, ring-necked duck, and lesser scaup (Desert Studies Center Bird List, http://biology.fullerton.edu/dsc/biology/birds.html).

Ground squirrels also use saltgrass seeds as a food source (Hauser, 2006).

Saltgrass is a valuable forage species in the harsh, saline environment that it occurs in, because it is often the only palatable food source available (Cluff et al. 1983; Nielson, 1956). Although tough and avoided by livestock if other food sources are available (Hauser, 2006), saltgrass is relatively high in protein (Hansen et al. 1976).

Hydrological functions

Indicate changes in hydrology functions that may occur with shifts in community phases within states. For each community phase, describe the changes in infiltration and runoff characteristics expected because of changes in plant species composition and soil surface characteristics.

Community phase 1.1 is characterized by moist soils with a water table close to the soil surface, which dilutes soil salinity. Community phase 1.2 is characterized by soil drying, which is accompanied by increased evaporation rates and the accumulation of salts at the soil surface. Community phase 1.3 has water ponded on the soil surface. Flooding washes away accumulated surface salts, leaves behind a cap of silty sediments, and replenishes soil moisture.

Recreational uses

The saltgrass meadows of this ecological site provide an aesthetic vista on the otherwise barren playa surfaces that they occur on.

Other products

Native Americans used saltgrass for a variety of medicinal purposes, as a food, beverage and condiment source, and used the fiber for scouring (www.maquah.net/BritBrn/ethnobotanical/Distichlis.htm).

Inventory data references

Community Phase 1.1
2012CA795056
2013CA7952054

Community Phase 1.4
2012CA795129

Community Phase 1.5
2012CA795032

Type locality

Location 1: San Bernardino County, CA	
Township/Range/Section	T12N R12E S8
UTM zone	N
UTM northing	3887342
UTM easting	581678
General legal description	The type location is located on the Soda Lake Playa within the Mojave National Preserve. It is adjacent to the Old Government Road, approximately 1.1 mile at 177 degrees from the California State University Desert Studies Center at Zzyzx.

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Approval

Sarah Quistberg, 2/25/2025

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)	Dustin Detweiler
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Date	12/16/2014
Approved by	Sarah Quistberg
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

2. **Presence of water flow patterns:** Generally none, however being on a playa, water flow patterns may exist after flash flood events or around areas where water enters the playa.

3. **Number and height of erosional pedestals or terracettes:** None.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Vegetation at this site can be patchy and sparse. Healthy stands of salt grass can have as little as 25% bare ground or as much as 50% bare ground. Areas between healthy stands of salt grass may have as much as 100% bare ground.

5. **Number of gullies and erosion associated with gullies:** None.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Sand is deposited among salt grass at the playa/dune interface. Salt crusts and dense salt grass cover prevent wind scoured areas and blowouts.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter that is not removed by wind and water is usually imbedded in salt crystal crust.

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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):** Soil surface stability values range from 0 to 6 but the majority of the soil surface at this site has soil surface stability values between 1 and 3. Salt crusts tend to be much stronger under salt grass. Areas with weak salt crusts can be single grained with a thin crust. Only some areas under saltgrass is strongly cemented.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface structure is single grained to granular. Color can vary from white, when salt crusts develop, to brown, after salt crusts have dissolved. Surface horizons can be from 1 to 5 cm thick with very little to no organic matter.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Saltgrass traps eolian material which may remain free from the salt crusting processes and increase infiltration rates. Saltgrass may also slow water movement across the playa surface to increase infiltration. Despite the above, saltgrass also excretes excess salt and according to soil surface stability tests for this site, saltgrass has the potential to also decrease infiltration by creating a very strongly crusted soil surface.

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

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

    Dominant: Saltgrass

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Saltgrass is a warm-season, rhizomatous, native perennial grass. Mortality and decadence is not obvious. Saltgrass and its litter cover may inversely fluctuate in response to climatic conditions.

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14. **Average percent litter cover (%) and depth (in):** The percent litter cover can range from 1-10%. Litter is often moved by wind and water and trapped by plants. Litter at this site does not accumulate and is often a single piece of plant material.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production can be from 130 to 325 lbs/acre. Vegetation at this site can be sparse and patchy and production is based on areas where a consistent patch of vegetation exists.

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:** None.

17. **Perennial plant reproductive capability:** Due to the harsh environment of this site, reproduction is likely dependent on clonal reproduction rather than seedling establishment. No inflorescence production has been observed at this site over the last several years.