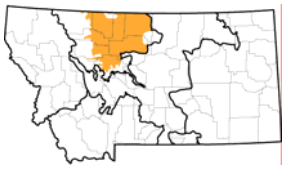
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION



ECOLOGICAL SITE CHARACTERISTICS

Site Type: Rangeland

Site Name: Saline Overflow 10-14 inch, p.z. (precipitation zone)
(formerly named Saline Lowland 10-14" p.z.)

Site ID: R052XN171MT

Major Land Resource Area: 52XN – Northern Glaciated Plains

Physiographic Features: This site occurs on overflow lands (topography that receives run-in moisture from upland areas) where salt and/or alkali accumulations are apparent. The site is found in small bands and patches associated with alkali basins, and at isolated alkali seeps. It is also found at the base of badlands erosional sideslopes (such as along the floodplain of the Missouri River—just southeast of the Fred Robinson bridge).

The site has a seasonal water table that is within 42" of the surface. Slopes usually vary from 0 to 2 percent. Elevations normally vary from 2000 to 3500 feet.

Land Forms:
(1) terrace
(2) fan
(3) swale

	Minimum	Maximum
Elevation (feet):	1900	4500
Slope (percent):	1	<5
Water Table Depth (inches):	42	72

Flooding:

Frequency: none to rare, depending on landform location.
Duration:

Ponding:

Depth (inches): none
Frequency: none
Duration: none

Runoff Class: medium

Aspect: no significant influence

Climatic Features

A semi-arid, temperate climate characterizes the Glaciated Plains. The predominance of cool season species has evolved to take advantage of the precipitation regime that peaks in late spring-early summer (June). Seventy-five percent of the annual precipitation usually falls as steady, soaking, frontal system rains. Summer rains usually come with thunderstorms. Precipitation is the most important factor influencing production (Heitschmidt et al 2005). Severe drought occurs on average in two out of every ten years (Cooper, et al., 2001).

	Minimum	Maximum
Frost-free period (days):	85	123
>32F, 90% probability = Minimum 50% probability = Maximum		
Freeze-free period (days):	116	142
>28F, 90% probability = Minimum 50% probability = Maximum		
Mean annual precipitation (inches):	10	14

Climate Stations:
(1) #241088 - Bredette
(2) #241692 - Chester
(3) #243558 - Glasgow AP
(4) #243996 - Havre WSO AP
(5) #245572 - Medicine Lake
(6) #247500 - Shelby

Influencing Water Features

This site receives additional "run in" moisture from adjacent upland sites during snowmelt or precipitation events. It is not influenced by water from wetlands or perennial streams.

Representative Soil Features

The soils on this site are moderately to strongly saline, medium- to fine-textured, moderately deep to deep, but poorly developed. This site has a seasonal high water table that is deeper than 48 inches. Soils tend to be saline or sodic. Soluble salt accumulations are often apparent at or near the surface. Most herbaceous roots extend less than 20 inches below the soil surface. Surface textures are mainly silty clay, silt loam, silty clay loam, clay loam and loam. Permeability varies with surface texture and the amount of salt and/or sodium present. Soil ph varies from 7.9 – 9.0.

Predominant Parent Materials:
Kind: alluvium
Origin: mixed sedimentary origin

Surface Texture: (1) clay loam
(2) loam
(3) silty clay loam
Surface Texture Modifier: (1) none
Subsurface Texture Group: clay loam
Surface Fragments < = 3" (% cover): 0

Surface Fragments >3" (% cover): 0
Subsurface Fragments < = 3" (% Volume): 0
Subsurface Fragments > 3" (% Volume): 0
Drainage Class: moderately well to well drained
Permeability Class: slow

	Minimum	Maximum
Depth (inches):	20	>72
Electrical Conductivity (mmhos/cm):	4	30
Sodium Adsorption Ratio:	8	30
Calcium Carbonate Equivalent (percent):	0	15
Soil Reaction (1:1 Water):	7.4	9.0
Soil Reaction (0.1M CaC12):	---	---
Available Water Capacity (inches):	3	6

Plant Communities

Ecological Dynamics Of the Site

This site developed through time under the influence of climate, herbivory, geological materials, fire, plants and animals. The plant communities associated with the site tend to have low species diversity.

The historic climax plant community (HCPC) is the basis for plant community interpretations. The HCPC has been determined by evaluating rangeland relic areas, and other areas protected from excessive disturbance.

Departures from the HCPC generally result from management actions, drought, and/or a change in the natural fire regime, or from hydrological changes. Because the site is influenced by the receipt of "overflow" (run-in) moisture and by saline or sodic conditions, the plant communities in State #1 are not highly resistant to disturbance. The site is considered fragile in the sense that vegetative vigor and composition will rapidly decline with continued adverse impacts. Once regression to a lower state occurs, salts and/or sodium are more likely to accumulate on the soil surface. This makes it unlikely that the use of prescribed grazing and/or favorable precipitation will induce and facilitate succession to the HCPC (State #1). In comparison to the other ecological sites that encompass large acreages in the Glaciated Plains, this Saline Overflow 10-14" p.z. site occupies rather small portions of the landscape. The limited acreage may explain why very little research has been published on the site.

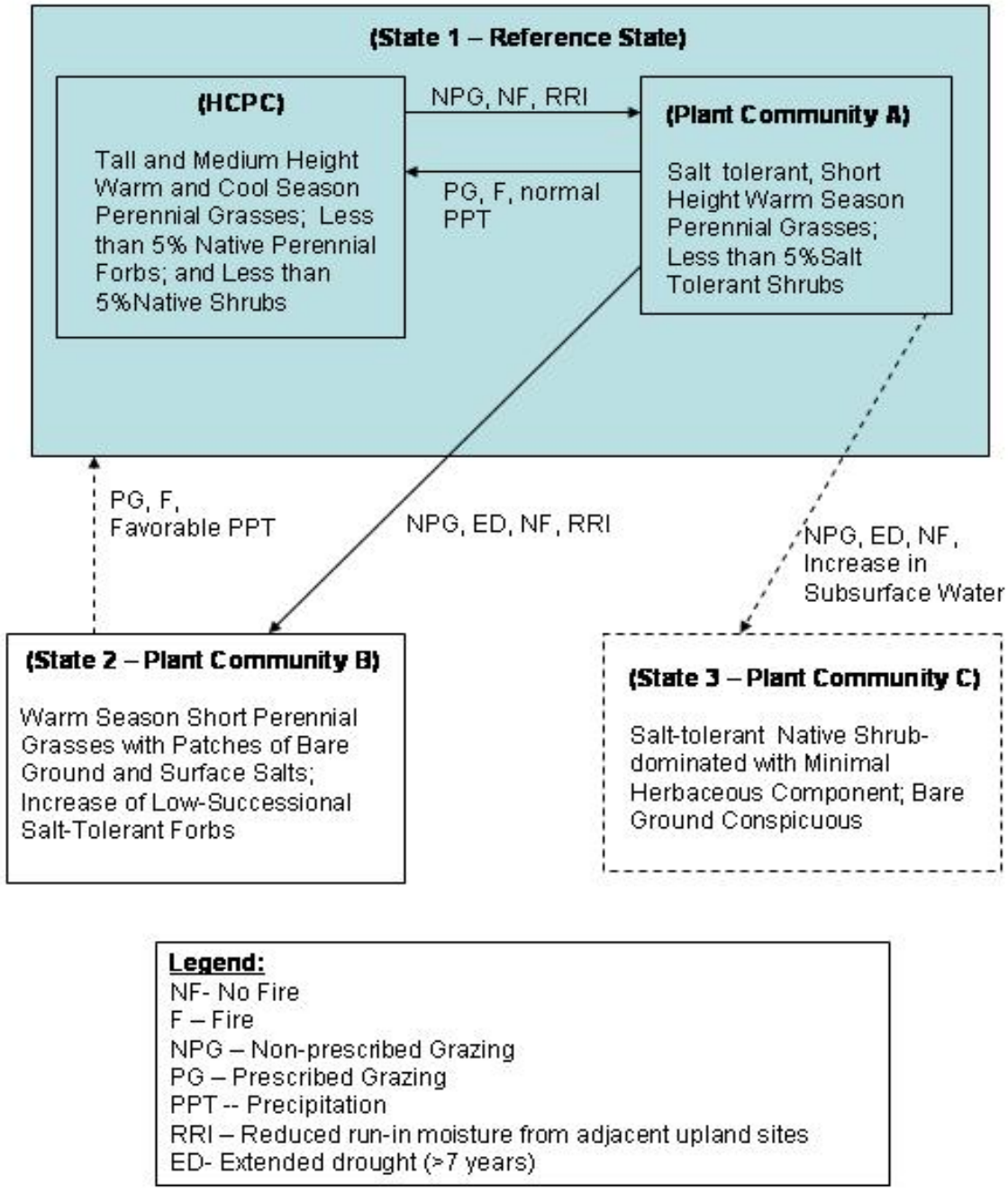
State and Transition Diagram

Successional pathways of the Saline Overflow 10-14" p.z. ecological site cannot be satisfactorily described using traditional theories of plant succession leading to a single climax community (Stringham et al. 2003). A threshold, lying somewhere between the mid and early seral stages is crossed as the HCPC regresses toward the early seral stage. The plant communities occurring below

this threshold are in a steady state. Succession back to the HCPC does not occur within a reasonable length of time, and/or without a large input of energy.

Two common plant communities within the reference state (State #1) with associated successional pathways, and transitions from State #1 to States #2 and #3 are illustrated below for this ecological site. Ecological processes are discussed further in the plant community descriptions following the diagram.

Saline Overflow 10-14" p.z. RRUs 52XC, 52XN and 53AE



Legend:
NF- No Fire
F – Fire
NPG – Non-prescribed Grazing
PG – Prescribed Grazing
PPT -- Precipitation
RRI – Reduced run-in moisture from adjacent upland sites
ED- Extended drought (>7 years)

State #1: Historic Climax Plant Community (HCPC):

The HCPC is comprised of a mixture of cool and warm season grasses, forbs and shrubs. About 90% of the annual production is from grasses and sedges, most of which is produced during the cool season. Forbs and shrubs each contribute about 5% to total annual production. Total vegetative production at HCPC averages 2500 lbs/ac in normal years, 3000 lbs/ac in favorable years, and 1750 lbs/ac in "unfavorable" years.

The Saline Overflow 10-14" p.z. ecological site is not characterized by a precise assemblage of species that remains constant from place to place or from year to year. Variability is apparent in productivity and occurrence of individual species. Western/thickspike wheatgrasses, alkali sacaton, alkali cordgrass, Nuttall alkaligrass, inland saltgrass and sedges are the most common grasses and grasslike plants in this community. They account for about 90% percent of the total production.

Prairie aster and slimleaf goosefoot are common forbs. Forbs usually make up about 5% of the total annual production.

Greasewood and Nuttall saltbush are the most common shrubs. They should be present in the HCPC. However, all shrubs only account for about 5% of the total annual production.

Plant basal cover is normally around 35%, while litter provides 65% cover. Therefore, plant cover and litter are adequate to efficiently utilize infiltration, minimize runoff and erosion, and provide good hydrologic conditions. Runoff and soil erosion normally increase as the HCPC regresses to earlier seral states.

The HCPC is believed to have evolved with periodic fires occurring at intervals of 5-7 years. Fires temporarily reduce litter, thus allowing more runoff. However, fire favors the succession of grasses and forbs at the expense of half-shrubs and shrubs.

The HCPC regresses to lower seral stages when subjected to grazing management strategies that do not allow adequate recovery periods between grazing events, drought, the disruption of the normal fire sequence, and or a change in the availability of run-in water. The above disturbances favor the replacement of alkali sacaton, alkali cordgrass, and western/thickspike wheatgrasses with blue grama, sandberg bluegrass, curlycup gumweed, western yarrow, and foxtail barley.

(Insert HCPC Plant Community photo)

The major plant species composition and production by dry weight are shown for the HCPC in the following table. Total annual production has been derived from

several sources, and has been adjusted to represent a typical annual precipitation cycle.

Historic Climax Plant Community Plant Species Composition:

GRASSES /GRASSLIKES **90% of Community**			Group Allowable		Annual Production in Pounds Per Acre	
Common Name	Scientific Name	Group	Pounds Per Acre		Low	High
			Low	High		
Nuttall's alkaligrass	*Puccinellia nuttalliana*				500	1000
Western wheatgrass	*Pascopyrum smithii*	1	250	500	125	250
Thickspike wheatgrass	*Elymus macrourus*	1			125	250
Alkali sacaton	*Sporobolus airoides*				500	1000
Alkali cordgrass	*Spartina gracilis*				250	500
Inland saltgrass	*Distichlis spicata*				125	250
Narrow-spiked reedgrass	*Calamagrostis stricta*				125	250
Other native grasses					125	250
Native sedges	*Carex spp.*				125	250
Spike-rush	*Eleocharis spp.*				125	250
Bulrush	*Scirpus spp.*				125	250

FORBS **5% of Community**			Group Allowable		Annual Production in Pounds Per Acre	
Common Name	Scientific Name	Group	Pounds Per Acre		Low	High
			Low	High		
Knotweed	*Polygonum spp.*				25	125
Western yarrow	*Achillea millefolium*				25	125
Pussytoes	*Antennaria spp.*		125 lbs/ac is		25	125
Seepweed	*Suaeda maritima*		maximum allowed		25	125
Poverty weed	*Iva axillaries*		for all forbs.		25	125
Prairie aster	*Symphyotrichum fulcatum*				25	125
Slimleaf goosefoot	*Chenopodium pallescens*				25	125
Arrowgrass	*Triglochin maritimum*				25	125
Other native forbs					No more than 25 lbs/ac for any one species.	

SHRUBS AND HALF-SHRUBS **5% of Community**			Group Allowable		Annual Production in Pounds Per Acre	
Common Name	Scientific Name	Group	Pounds Per Acre		Low	High
			Low	High		
Nuttall saltbush	*Atriplex nuttallii*				25	125
Buffaloberry	*Shepherdia argentea*				25	125
Greasewood	*Sarcobatus vermiculatus*				25	125
Rubber rabbitbrush	*Ericameria nauseosa*		125 lbs/ac is the max		25	125
Other native shrubs			allowed for all shrubs.		No more than 50 lbs/ac for any one species.	

Structure and Cover

Soil Surface Cover (%)

Basal Cover				Non-Vascular Plants	Biological Crust		Surface Fragments >1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
Grass/ Grasslike	Forb	Shrub/ Vine	Tree								
30	1-5	1-5	0							0	

Ground Cover (%)

Vegetative Cover						Non-Vegetative Cover					
Grass/ Grasslike	Forb	Shrub/ Vine	Tree	Non-Vascular Plants	Biological Crust	Litter	Surface Fragments >1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
				0-1	0-1	60-65	0-T	0-T	T	0	0-T

Structure of Canopy Cover (%)

	Grass/Grasslike	Forb	Shrub/Vine	Tree
<= 0.5 feet	30	30	T	0
>0.5 - <=1 feet	30	40	25	0
>1 - <=2 feet	30	20	50	0
>2 - <=4.5 feet	10	10	25	0
>4.5 - <=13 feet				0
>13 - <= 40 feet				0

Annual Production by Plant Type:

Plant	Annual Production (lbs/AC)		
Type	Low	RV*	High
Grasses /Grasslike	1530	2250	2700
Forb	85	125	150
Shrub/Vine	85	125	150
Tree	T	T	T
Total	1700	2500	3000

*RV means "representative value".

Successional Pathway to Plant Community A
Non-prescribed grazing and reduced run-in moisture from adjacent upland sites will cause regression from HCPC to Community A.

Plant Community A (State #1):

In contrast to the HCPC, total vegetation production may be 1000 lbs/ac lower in Community A. Selective grazing and increasing salinity adversely affect the competitiveness of alkali sacaton, alkali cordgrass, wheatgrasses and Nuttall's alkaligrass. Thus, these taller warm and cool season grasses are replaced by inland saltgrass and other low-growing grasses and grasslike palnts. The lower-stature plants tend to produce less forage than the mid- grasses that they

replaced, use less ground water for total vegetative production, and produce less litter to protect the surface of the soil. As the ground water rises to the surface during the summer and evaporates, salt crystals form on the surface. Thus the amount of bare ground increases, in comparison to the HCPC. Greasewood tends to increase and the total shrub production in Community A is >5%. Shrub composition also shifts, favoring chenopod species.

Plant Community A is considered the pre-threshold community. It can be recognized because annual production is reduced by about 40% from the HCPC. The percentage of short, warm season perennial grasses and forbs has increased at the expense of the taller warm and cool season perennial grasses. Litter amount is moderately reduced from site potential and amount of bare ground is moderately to much higher than expected. This community remains resilient and succession can move the plant community toward the HCPC. However, Plant Community A is only moderately resistant to disturbance. Without proper management it can readily regress to a lower state.

***Successional Pathway from Community A to HCPC:**
The implementation of prescribed grazing, or periodic fire will move Plant Community A to the HCPC. Under non-drought conditions, this succession can occur within a few years.

***Transition from State #1 to States #2 & #3:**
The reference state (State #1) will regress to States #2 and #3 under non-prescribed grazing, prolonged drought, and an extended period of no fire. The rate of regression varies with the kind, intensity, frequency and duration of the disturbances. The transition may end up as a warm season short grass dominated community (State #2) or as a salt-tolerant shrub-dominated community (State #3). The shrub dominated community is depicted within the dashed lines (in the state and transition diagram) because its ecological characteristics are not presently fully understood.

Plant Community B (State #2) – Shortgrass-dominated:

Inland saltgrass, sand dropseed, sandberg bluegrass, bottlebrush squirreltail, foxtail barley, and sedges dominate this community. In contrast to the HCPC, the mid and tall warm season perennial grasses (alkali sacaton, western/thickspike wheatgrasses, alkali cordgrass, etc.) are either significantly reduced or absent. Poverty weed, knotweed, seepweed, curlycup gumweed and other forbs account for about 10% of the annual production. Amount of bare ground is moderately higher than expected. Surface salts are quite extensive.

Most of the study sites examined on the Saline Overflow 10-14" p.z site during the range inventory of the Fort Peck and Fort Belknap Reservations (2001-2004) had similarity indices of 0-25%. A lack of species diversity also characterizes the data. In most plots, fewer than 8-9 species were recorded. Shrubs were recorded at 3 of the 15 sampling locations.

In these inventories, which took place during a prolonged drought, the annual production varied from 53 to 1043 lbs/ac, and averaged 600 lbs/ac. The amount of bare ground was much higher than expected for the site.

This plant community is resistant to change. The short warm season perennial grasses are well-adapted to the salinity. It is believed that the seeds of native HCPC species are scarce or absent in the seedbank. Succession is not expected to occur within a reasonable length of time.

Plant Community C (State #3) – Shrub-dominated:

Greasewood is the dominant plant is this community, which is less than fully understood at this time (dash lines mark its boundary in the S&T diagram). Other shrubs include Nuttall saltbush, rabbitbrush, fringed sagewort and silver sagebrush. Inland saltgrass, foxtail barley, Nuttall alkali grass, and other herbaceous species usually produce less than 50% of the total annual production. Poverty weed, curlycup gumweed, arrowgrass, knotweed and other weedy forbs are usually present in small amounts. Total annual production is usually less than 500 lbs/ac.

The amount of bare ground is much higher than expected for the site. In addition, litter cover averages about 30%, a significant reduction relative to site potential.

This plant community is resistant to change. Greasewood is well adapted to the salinity. This community may not be resilient. Succession is not expected to occur within a reasonable length of time.

***Transition from States #2 and #3 to the Reference state (State #1)**
The implementation of prescribed grazing is not expected to move these plant communities toward a higher successional state. In comparison to the HCPC, annual production is about 25% of the site potential. It is theorized that the salinity of the site increased during the regression from the "Reference state" to early seral states. Thus, the lower-successional plants occurring on the site may be better-adapted than some of the original climax species. Because of the soil limitations, mechanical treatments and range seeding are not normally recommended.

Ecological Site Interpretations

Animal Community

Livestock Management

The Saline Overflow 10-14" p.z. ecological site is suited for livestock grazing. The HCPC (or reference state) is highly productive and has a high carrying capacity. Livestock are often attracted to the site because of the level terrain and the high potential for livestock water developments within the adjacent areas. Species composition and soils are susceptible to heavy stocking and season long grazing. Therefore, prescribed grazing is needed to maintain the high seral state and/or to prevent further deterioration. This site may also be attractive to livestock and wildlife because of the increase salt accumulations in the plants.

It is important to understand site limitations. A site in an early seral state is not likely to successionally respond solely to the implementation of a prescribed grazing management system. Furthermore, seeding and/or mechanical treatment are usually not recommended on the Saline Overflow 10-14" p.z.

ecological site. Landowners may have to learn to live with a site that is in an early seral state.

Wildlife Interpretations

The HCPC associated with the Saline Overflow 10-14" p.z. ecological site provides diverse and valuable wildlife habitat. This site often occurs as a minor component of a large, dry landscape. The uniqueness of the site makes it extremely critical habit for many species of wildlife.

This ecological site becomes less valuable for wildlife when plant diversity is loss. For example, the disappearance of either the tall warm season grasses or cool season grasses reduces the amount of cover available for wildlife.

Plant Preferences by Animal Kind

Refer to NRCS Field Office Technical Guide, Section IIE, General Information, for tables displaying plant preferences by livestock and wildlife.

Hydrology Functions

Soils characterizing this ecological site have a moderately high runoff potential, with hydrologic runoff curves of 74 to 86. These soils fall into Hydrologic Group C. Field investigations are needed to adjust the runoff curves when plant communities deteriorate from the HCPC. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff.

Recreational Uses

This site is aesthetically appealing for its natural beauty. Recreational potential is somewhat limited by the relatively small areas.

Wood Products

This site has no significant value for wood products.

Other Products

Other Information

The Saline Overflow 10-14" p.z. ecological site is not highly resistant to disturbances in State #1. Species diversity is adversely affected by season long continuous grazing and by heavy stocking. Mid and tall cool season perennial grasses are replaced by short warm season perennial grasses, or by a shrub-dominated community in more extreme cases. The number of structural/ functional groups is reduced with retrogression, which adversely affects the amount of solar energy that is captured and converted to carbohydrates for plant growth. A reduction in total vegetative growth results in less potential vegetation

that can be transformed into litter. Less soil water use by plants combined with reduced ground cover may cause salinity or alkalinity to increase.

Supporting Information

Associated Sites The following sites may be found in association with the Saline Overflow 10-14" p.z. ecological site. The Site ID indicates in which Rangeland Resource Unit (RRU) this site occurs. For example, Site ID R052XN161MT occurs in RRU 52XN.

Site Name	Site ID	Site Narrative
Silty 10-14" p.z.	R052XN161MT	soils >20 inches in depth, and slopes < 15%, no salt tolerant plants.
Saline Upland 10-14" p.z.	R052XN170MT	soils with saline-sodic conditions limiting moisture for plant growth
Very Shallow 10-14" p.z.	R052XN085MT	<10 inches deep, or has a water holding capacity of 2 inches or less, salts not apparent.
Shallow Clay 10-14" p.z.	R052XN179MT	soils are clayey over clayey shale, different vegetation

Similar Sites

Site Name	Site ID	Site Narrative
Saline Overflow 10-14" p.z. (formerly "Saline Lowland 10-14" p.z.)	R052XC209MT R053AE072MT	
Saline Subirrigated 10-14" p.z.	R052XN177MT	not in flood plain, permanent water table within 42" of soil surface, salts are apparent

State Correlation
This site has been correlated with the following states: Montana

Inventory Data References

Data Source	Number of Records	Sample Period	State	County
SCS-Range-417 ECS-1 Modified Double Sampling	34	2001-2004	MT	Blaine, Phillips, Valley, Roosevelt, Daniels, Sheridan

USDA-SCS-MT 1981 Technical Range Site Description (for saline lowland)

Type Locality
State: MT

County:
Township:
Range:
Section:
UTM: Datum: NAD__ _____E ____N
General Description:
Sensitivity: Yes___ No___

Relationship to Other Classifications

Other References

Stringham, Tamzen K., William C. Krueger, and Patrick L. Shaver. (2003). State and transition modeling: an ecological process approach. J. Range Manage. 56:2(106-113).

Site Revisions

This site was formerly called Saline Lowland 10-14" p.z. It was split into two sites, Saline Subirrigated 10-14" p.z., and Saline Overflow 10-14" p.z. in 2004.

The 2005 Saline Overflow 10-14" p.z. ecological site description replaces earlier dated versions of Saline Lowland 10-14" p.z. descriptions in Rangeland Resource Unit 52XN.

This 2005 revision incorporates the State and Transition Model theory, additional data on site productivity, and an improved understanding of many rangeland health indicators.

Site Description Approval

This ecological site description is approved with the understanding that it is no more than another step in our continual effort to update the NRCS technical guide. In order to facilitate the process, NRCS field personnel are encouraged to forward existing information and/or new data that can be used to improve the utility of this site description. Please forward the information and data to the State Rangeland Management Specialist.

Authors	Date	Approval	Date
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