

Ecological site R053AE071MT

Saline Upland (SU) (Legacy) RRU 53AE

Last updated: 6/14/2023

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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.

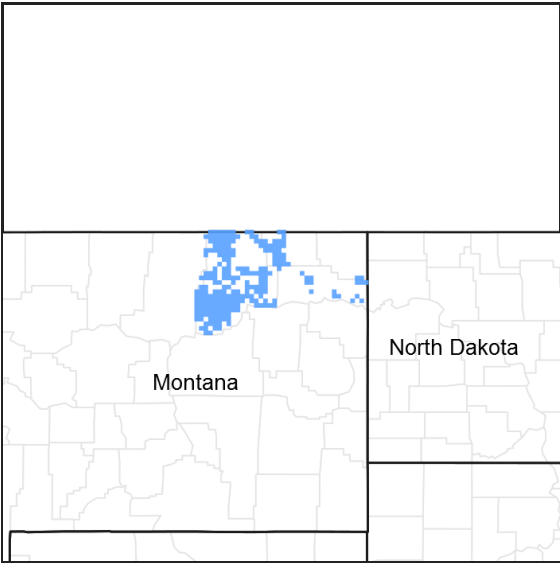


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on nearly level to moderately sloping fans and terraces in the uplands. It is associated with shale beds and soils have a clay loam to clay surface layer, subsoil, and underlying material. Soils contain salt and/or alkali accumulations and salt-tolerant species dominate the plant community. Slopes are usually less than 8%. Elevations normally vary from 2200 to 4000 feet.

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Fan (3) Fan apron
Flooding frequency	None
Ponding frequency	None

Elevation	572–1,372 m
Slope	0–8%
Aspect	Aspect is not a significant factor

## 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).

**Table 3. Representative climatic features**

Frost-free period (average)	123 days
Freeze-free period (average)	142 days
Precipitation total (average)	356 mm

## Influencing water features

### Soil features

These deep, well drained soils formed in alluvium and glacial till. The soils usually contain a 2-3-inch surface layer, a 2-3 inch clay subsoil, and a strongly saline underlying material to a depth of > 60 inches. The surface texture is clay loam or silty clay; subsoil textures are usually clay or silty clay. Permeability is very slow. Salt tolerant plants dominate the site. Soil ph varies from 6.6 – 9.6. This site is characterized by the following taxonomic units: Benz and Nobe.

**Table 4. Representative soil features**

Surface texture	(1) Clay loam (2) Silty clay (3) Loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow
Soil depth	51–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–10%
Electrical conductivity (0-101.6cm)	4–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10–70
Soil reaction (1:1 water) (0-101.6cm)	6.6–9.6

Subsurface fragment volume <=3" (Depth not specified)	0–1%
Subsurface fragment volume >3" (Depth not specified)	0–1%

## Ecological dynamics

This site developed through time under the influence of climate, geological materials, fire, plants and animals. Research on upland ecological sites consistently shows that precipitation is the principal factor altering productivity (Heitschmidt et al. 2005). The same authors concluded that grazing reduces herbage standing crop, whereas its effects on aboveground net primary production vary with timing of grazing and precipitation events, along with the functional and structural composition of the plant community. Some ecologists believe that these lands may have burned on a natural interval of 10-12 years (Frost 1998). However, environmental characteristics of this site limit herbage production and subsequent fuel accumulation. Therefore, in comparison to normal upland range sites, the role of natural fire is probably less significant in the development of this site. The resultant 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.

The HCPC is comprised of a mixture of cool and warm season grasses and shrubs. About 70% of the annual production is from grasses and sedges, most of which is produced during the cool season. Forbs and shrubs contribute 5% and 25%, respectively, to total annual production. Total vegetative production averages 500 lbs/ac in normal years, 350 lbs/ac in “unfavorable” years, and 600 lbs/ac in “favorable” years.

This site is moderately resilient to disturbance because soil characteristics limit plant growth. Departures from the HCPC generally result from management actions, drought, and/or a change in the natural fire regime. The site is considered fragile in the sense that vegetative vigor and composition will rapidly decline with continued adverse impacts. With favorable precipitation and/or prescribed grazing treatments, plant communities that are in the high seral state can return to the HCPC. In contrast, significant succession is unusual within early-seral communities.

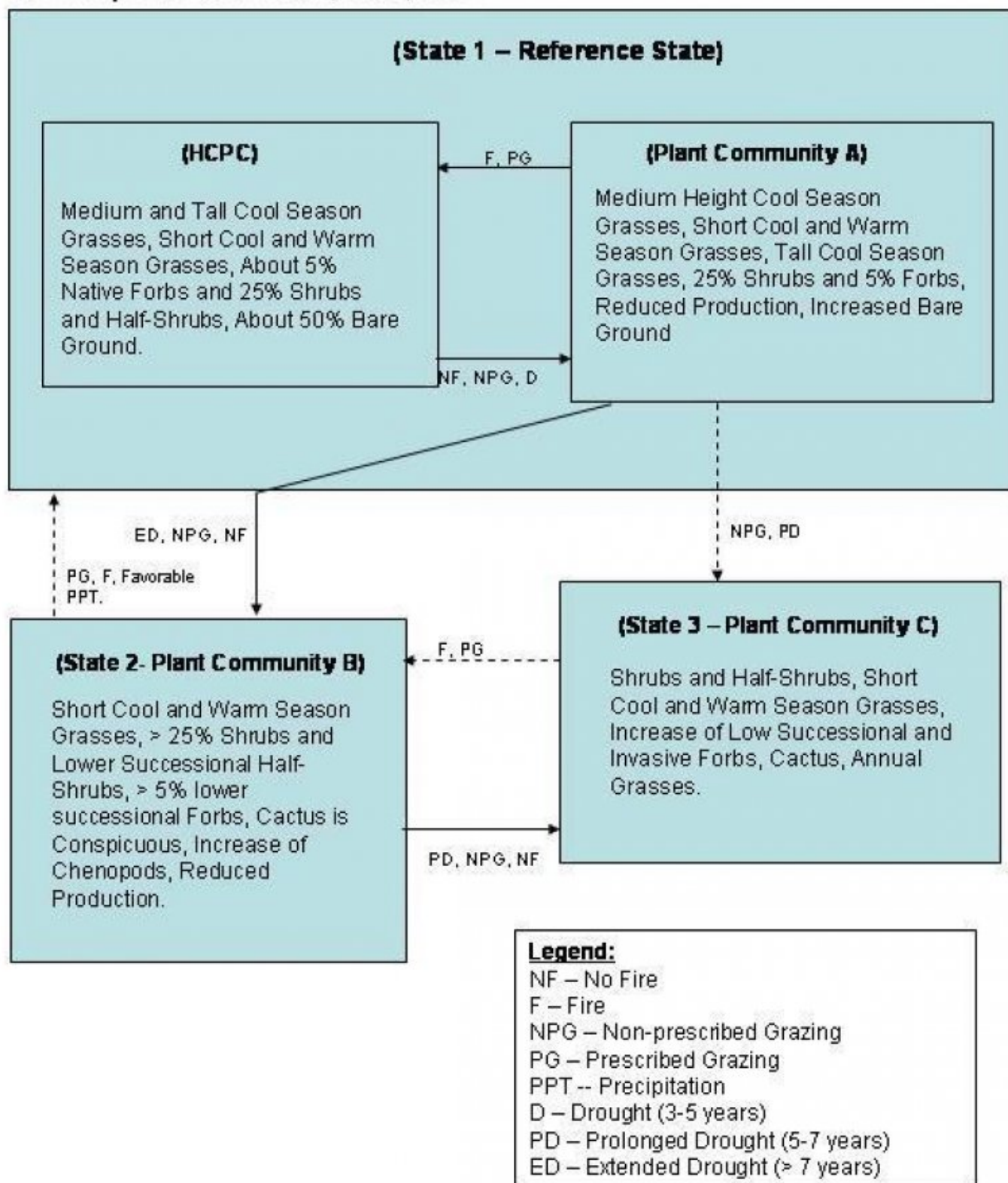
### State and Transition Diagram

Successional pathways of Saline Upland 10-14” p.z. ecological sites cannot be satisfactorily described using traditional theories of plant succession leading to a single climax community (Briske et al. 2005). As the HCPC regresses to an early seral state, it is theorized that a threshold is crossed somewhere within the mid-seral state. 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 plant communities and the successional pathways that commonly occur within the Reference State (State #1) are shown in the following diagram. The transitions from State #1 to State #2 (Plant Community B) and State #3 (Plant Community C) are also illustrated. Ecological processes are discussed in the plant community descriptions that follow the diagram.

## State and transition model

Saline Upland MLRU 52XA, 52XB, 53AY



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

## Community 1.1

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

The cool season western wheatgrass and warm season alkali sacaton are the dominant plants on this ecological site. They account for about 60% of the total annual production in the HCPC. Drought and non-prescribed grazing reduces the competitiveness of the dominant species, and allows lower successional grasses (Nuttall's alkali grass, inland saltgrass, plains reedgrass, blue grama and prairie junegrass) to increase on the site. About 10% of the total production is composed of a mix of warm and cool season short grasses and sedges. Forbs contribute about 5% of the total annual production. Poverty sumpweed, onion, hoods phlox, scarlet globemallow, wooly plantain, and biscuitroot are common forbs. The latter group contains a mix of warm and cool season species whose relative occurrence on the site is largely influenced by the timing and amount of precipitation. Nuttall saltbush and greasewood are two common shrubs on this site. Both species make most of their growth during the cool part of the growing season. While Nuttall saltbush is rated a valuable forage plant for livestock and wildlife, greasewood can be poisonous in some situations. Pricklypear cactus and fringed sagewort (a warm season half-shrub) can occur in the HCPC. Shrubs normally make up about 25% of the total annual production. Broom snakeweed, annual bromes, and annual forbs are not a part of the HCPC. Their presence indicates possible ecological deterioration, or downward trend. Trend is difficult to interpret because large areas of bare ground between plants are fairly common. Total annual production averages 500 lbs/ac during normal years. However, production declines as the site regresses from the HCPC to lower successional communities. Regression may result from grazing management strategies that do not allow adequate recovery periods between grazing events, drought, and/or the disruption of the normal fire sequence. The above disturbances favor the replacement of alkali sacaton and western wheatgrass by blue grama, sandberg bluegrass, prairie junegrass, poverty weed, hairy golden aster, and hoods phlox. Nuttall saltbush may also be replaced by broom snakeweed, fringed sagewort, etc. Cheatgrass and Japanese brome may invade the site. As the result of these vegetative changes, there is less litter to protect the soil and less infiltration. Hydrologic cycles are impaired when plant communities are unable to effectively use precipitation. Plant cover (litter and canopy of grasses, forbs and shrubs) is from 40-50%. Basal cover varies from 7-15%. Litter varies from 20-30%. Consequently, bare ground averages 50%. Thus, infiltration rates are lower, and runoff and erosion are higher than desired on this ecological site. Runoff and soil erosion normally increase as the HCPC regresses to earlier seral states.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	275	392	471
Shrub/Vine	95	140	168
Forb	22	28	34
<b>Total</b>	<b>392</b>	<b>560</b>	<b>673</b>

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0%
Grass/grasslike foliar cover	0%
Forb foliar cover	0%
Non-vascular plants	0-1%
Biological crusts	0-1%
Litter	20-30%
Surface fragments >0.25" and <=3"	0-1%
Surface fragments >3"	0-1%
Bedrock	0-1%
Water	0%
Bare ground	50-60%

**Table 7. Soil surface cover**

Tree basal cover	0%
Shrub/vine/liana basal cover	1-5%
Grass/grasslike basal cover	5-10%
Forb basal cover	1-2%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

**Table 8. Canopy structure (% cover)**

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	—	0-5%	15-25%	20-30%
>0.15 <= 0.3	—	35-45%	45-55%	45-55%
>0.3 <= 0.6	—	45-55%	20-30%	20-30%
>0.6 <= 1.4	—	5-15%	0-5%	—
>1.4 <= 4	—	—	—	—
>4 <= 12	—	—	—	—
>12 <= 24	—	—	—	—
>24 <= 37	—	—	—	—
>37	—	—	—	—

## Community 1.2

### Plant Community A ( State #1)

\*Successional Pathway from HCPC to Plant Community A: Non-prescribed grazing, drought and/or a cessation of the natural fire regime will cause regression from HCPC to Community A. Plant Community A (State #1): Non-prescribed grazing and drought reduce plant height and plant litter. Surface runoff and soil temperature increases, infiltration decreases, and shallow-rooted short grasses (sandberg bluegrass, blue grama, and prairie junegrass) and sedges gain a competitive advantage over medium height, deep-rooted cool season perennial grasses (alkali sacaton and western wheatgrass). They are able to compete more successfully with the mid-grasses because of the ability of relatively shallow root systems to utilize shallowly penetrating moisture, characteristic of this site. In contrast to the HCPC, total annual production is 60-80% of potential production (400 vs. 500 lbs/ac). Western wheatgrass and alkali sacaton contribute less than 50% of the annual production. They are less vigorous and individual plant growth is reduced from what it is in the HCPC. Production of the short grasses increases relative to their percentage contribution in the HCPC. Although a few annual forbs are present on disturbed areas, the forb component continues to contribute about 5% of the total annual production. Total shrub production remained at about 25%; however, production of fringed sagewort increased at the expense of Nuttall saltbush and greasewood. Plant community A is called the "pre-threshold community". It is critical that this community be recognized and strategies implemented to prevent further regression. Compared to the HCPC, water flow patterns are more numerous than expected, there is slight to moderate active pedestalling, there is more bare ground than expected, there is moderate movement of smaller size litter deposits into depressions or against obstructions, infiltration is slightly to moderately affected by the shift toward more short grasses in the plant community, and the reproductive

capability of alkali sacaton and western wheatgrass is somewhat limited relative to recent climatic conditions (USDI and USDA 2000). Although Community A can improve to the HCPC through successional processes, further disturbance will result in regression to a lower state. Once Community A regresses to a lower state, normal successional processes are restricted. \*Successional Pathway from Community A to HCPC: Favorable growing conditions, the implementation of prescribed grazing, or periodic fire will move Plant Community A to the HCPC. This succession is possible within a couple of years. \*Transitional Pathways from Community A to Communities B & C: Plant Community A will regress to Community B (State #2) under non-prescribed grazing, prolonged drought, or following periodic wildfire (which would reduce competitiveness of shrubs). It is theorized that Community A may also regress to Plant Community C under non-prescribed grazing and an extended period lacking a natural fire regime. The absence of fire would allow the shrubs to remain competitive against the short grasses. This transition is shown with a dashed arrow in the state and transition model. Regression rates vary with the intensity and frequency of the disturbances. Severe drought may cause retrogression within a couple years.

## **State 2**

### **Plant Community B (State #2)**

#### **Community 2.1**

##### **Plant Community B (State #2)**

This Community is dominated by a mix of cool and warm season short grasses. Blue grama, threadleaf sedge, sandberg bluegrass and other low successional grasses expanded their influence in the community by replacing most of the alkali sacaton and western wheatgrass. A few “stunted” western wheatgrass plants persist in this community. Poverty weed, hood phlox, and other low successional forbs contribute more than 5% of the total annual production. The density of fringed sagewort and broom snakeweed (warm season half-shrubs) increase relative to their presence in the State #1 Communities. Pricklypear cactus is usually conspicuous in this community. Total annual production averages 300 lbs/ac. In comparison to the HCPC, total plant basal cover averages about 10%. Litter varies from 10-15%. Bare ground increases to more than 60%. Thus, pedestalling, rills, flow patterns and litter deposits are visible. \*Successional Pathways from Community B to State #1: Plant community B is not noted for its resiliency. Plant Community B is a steady state and significant succession is not expected to occur. However, succession to State #1 may be possible with the combination of prescribed grazing and a prolonged period of favorable moisture. This potential succession is indicated by a dashed line in the state and transition diagram. \*Transition from Community B (State #2) to Community C (State #3): Community B is much less resistant to disturbance than Community A. Lower production, lower vegetative cover, less litter, and increased bare ground increases Community B's susceptibility to disturbance. Extended drought and non-prescribed grazing can cause regression to State #3 (Community C).

## **State 3**

### **Plant Community C (State #3)**

#### **Community 3.1**

##### **Plant Community C (State #3)**

Plant Community C is dominated by Nuttall saltbush, greasewood, fringed sagewort, and broom snakeweed. There has been a significant reduction in percentage of western wheatgrass. The remaining wheatgrasses produce few seed heads and lack vigor. Inland saltgrass, sandberg bluegrass, blue grama and other low-successional grasses and sedges contribute about 50% of the total annual production. Annual bromes and pricklypear cactus are conspicuous in the community. An increase in chenopod species is possible, but not enough sites have been inventoried to be certain. Total annual production averaged 200 lbs/ac, a 33% reduction from Community B. Litter cover averages about 10%. Water flow patterns are numerous and there is moderately active pedestalling. Bare ground is moderately to much higher than expected. Compared to the HCPC, there has been a structural shift from medium height to short grasses, and a functional shift from cool to warm season plants, and an increase in shrub species. Reproductive capability of cool season plants is greatly reduced relative to recent climatic conditions. \*Successional Pathways between Communities C and B: Community C is resistant to significant succession. It is theorized that another threshold separates Communities B and C. Blue grama and the other short grasses and sedges form a competitive community. The adverse soil conditions characteristic of this site, and a theorized shortage of wheatgrass and alkali sacaton seeds in the seed bank greatly restrict potential for significant succession. Succession is not expected to occur within a reasonable length of time. However, succession may be

possible with the combination of fire to reduce shrub competition, prescribed grazing to allow preferred species the opportunity to regain vigor and set seed, and a prolonged period of favorable precipitation. This potential succession is indicated by a dashed line in the state and transition diagram. Mechanical treatments and range seeding are not normally recommended on this site. Ecological processes will be adversely affected by poorly planned range improvement efforts.

## Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
<b>Grass/Grasslike</b>					
1	<b>Native perennial grasses</b>			6–392	
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	224–336	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	56–112	–
	saltgrass	DISP	<i>Distichlis spicata</i>	6–84	–
2	<b>Native perennial grasses and grasslikes</b>			6–56	
	Grass, perennial	2GP	<i>Grass, perennial</i>	6–11	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	6–11	–
	threadleaf sedge	CAFI	<i>Carex filifolia</i>	6–11	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	6–11	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	6–11	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	6–11	–
	Nuttall's alkaligrass	PUNU2	<i>Puccinellia nuttalliana</i>	6–11	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	6–11	–
<b>Forb</b>					
3	<b>Native perennial forbs</b>			6–28	
	Forb, perennial	2FP	<i>Forb, perennial</i>	6–11	–
	aster	ASTER	<i>Aster</i>	6–11	–
	milkvetch	ASTRA	<i>Astragalus</i>	6–11	–
	bastard toadflax	COUM	<i>Comandra umbellata</i>	6–11	–
	povertyweed	IVAX	<i>Iva axillaris</i>	6–11	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	6–11	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	6–11	–
<b>Shrub/Vine</b>					
4	<b>Native shrubs and half-shrubs</b>			1–140	
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	84–140	–
	Nuttall's saltbush	ATNU2	<i>Atriplex nuttallii</i>	84–140	–
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	1–28	–
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	6–28	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	6–28	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0–1	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–1	–

## Animal community

Livestock Management



The Saline Upland 10-14" p.z. ecological site is suited for livestock grazing. However, prescribed grazing management is needed. Forage production is limited by soil chemistry. Species composition is susceptible to heavy stocking and season long grazing. The cool season medium height grasses are generally selectively grazed giving the short grasses a competitive advantage. Grazing during early spring may also result in soil compaction. Any additional factor reducing infiltration and increasing runoff on this site is a management concern. Shorter grazing periods developed in conjunction with adequate periods of deferment to facilitate regrowth, replenish carbohydrate pools, and accumulate litter on the soil surface are recommended.

The Saline Upland 10-14" p.z. ecological site has a short grass component, as do most other sites in the northern mixed prairie. The short grasses usually increase with grazing and decrease with protection or prescribed grazing. However, succession is not guaranteed in the Northern Great Plains.

Sampling four-year old ungrazed exclosures and grazed areas with 35% utilization, Vogel and Van Dyne (1966) found essentially the same basal cover of grasses, sedges, forbs, litter and bare soil on protected and grazed sites. They concluded that four years was too short of a time for cover to change significantly. Hofmann and Ries (1989) observed similar results following a four-year study in North Dakota. Even after 41 years of exclosure, changes in species composition can be relatively small when the site is in the dry, low production portion of northern mixed prairie (Brand and Goetz, 1986). They concluded that site characteristics limited the development of potential vegetation with the exclusion of grazing, but the potential impacts of prescribed grazing on succession were not discussed. This ecological site is not as productive as the sites evaluated by Vogel and Van Dyne, Hofmann and Ries, or by Brand and Goetz. Therefore, range managers should recognize the environmental limitations of this site. While a prescribed grazing system is always a good recommendation, it may not guarantee significant succession. Seeding and/or mechanical treatment are not recommended.

This ecological site is suited for prescribed grazing by livestock. Because of the terrain and propensity of shrubs, this site may be more compatible for sheep, rather than cattle grazing. Although poisonous plants are not normally a problem, greasewood can cause some livestock losses. Most of the problems develop when livestock are moved onto this site in late summer or early fall. If the livestock are moved into this site from upland sites where forage is mature and limiting, grazing animals often ingest a high quantity of greasewood leaves. This can be dangerous because plants are high in oxalates and can cause bloat or poisoning. However, greasewood and some of the associated species are nutritious, and growing livestock can make good weight gains.

#### Wildlife Interpretations

The HCPC associated with this ecological site provides diverse and valuable wildlife habitat. This site often occurs as a mosaic with other ecological sites, thus creating "ecotones" that serve as a magnet to attract many species of wildlife. Antelope and mule deer prefer grazing this site because of the Nuttall saltbush and other shrubs. When this site occurs in the landscape as a mosaic with other sites, thermal and escape cover are provided for many species of wildlife. The lack of species diversity limits the value of the site for some species of wildlife. The bare ground and lack of litter also limits the potential of the site for upland birds and for ground-nesting birds.

This ecological site becomes less valuable for deer and antelope when plant diversity declines with regression. For example, the disappearance of either the alkali sacaton or western wheatgrass, and the reduction of Nuttall saltbush would shorten the length of the "green forage" season. The increase of blue grama, hoods phlox etc. is associated with the loss of palatable forbs. These changes also adversely impact foraging opportunities for deer, antelope, upland birds, etc. Because of insufficient vegetative structural diversity, residual grass carry-over and litter cover, the value of Communities B and C for wildlife habitat are greatly reduced.

#### 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.

### Hydrological functions

Water and alkalinity are the main factors limiting vegetative production on this site. Soil components in this ecological site are normally in Hydrologic Group D. These soils have a medium to very high runoff potential, with hydrologic runoff curves of 89 to 80. Field investigations are needed to adjust the runoff curves when plant communities deteriorate from the HCPC. Areas with ground cover less than 50% have the greatest potential for

reduced infiltration and higher runoff.

## **Recreational uses**

This site provides hunting opportunities for upland game species. Outdoor enthusiasts may also appreciate the serenity and openness of its site.

## **Wood products**

This site has no significant value for wood products.

## **Other information**

This ecological site is not highly resistant to disturbances. Species diversity is adversely affected by season long continuous grazing and by heavy stocking. Medium height grasses are replaced by short grasses. There is also a shift from predominately herbaceous plants in State #1 to more woody plants in States #2 and #3. The number of structural/functional groups is reduced with regression from the HCPC. The amount of solar energy that is captured and converted to carbohydrates for plant growth is reduced in States #2 and #3. A reduction in total vegetative growth results in less potential vegetation that can be transformed into litter. Litter reductions result in less infiltration, and more runoff and soil erosion.

## **Inventory data references**

SCS-Range-417

ECS-1

Modified Double Sampling

Ross, R.L. and H.E. Hunter. 1976. Climax vegetation of Montana. USDA Soil Conservation Service. Bozeman, MT.

USDA-SCS-MT 1981 Technical Range Site Description

## **Other references**

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Frost, C. C. 1998. Presettlement fire frequency regimes of the United States: a first approximation. Pages 70-81. in Teresa L. Pruden and Leonard A. Brennan (eds.). Fire in ecosystem management: shifting paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings. No. 20. Tall Timbers Research Station, Tallahassee, FL.

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Hofmann, L. and R.E. Ries. 1989. Animal performance and plant production from continuously grazed cool-season reclaimed and native pastures. J. Range Manage. 42:248-251.

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## Approval

Kirt Walstad, 6/14/2023

## 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)	Dr. John Lacey, Maxine Rasmussen, Jon Siddoway & Rick Bandy
Contact for lead author	
Date	03/30/2005
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

## Indicators

- 1. Number and extent of rills:** Rills should not be present in HCPC. On slopes at or > 8%, in plant community A, rills would be visible, ½ inch deep or more, linear, rarely exceeding 1 foot in length. Distance between rills is irregular.

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- 2. Presence of water flow patterns:** Water flow patterns should not be present in HCPC. On slopes at or > 8%, in plant community A, water flow patterns would be visible as long (more than 1foot) and continuous across the landscape.

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- 3. Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would essentially be nonexistent in HCPC. On slopes at or than 8%, if in plant community A, pedestals and terracettes are frequent and ½ - ¾ inch above the soil surface.

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- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 40-50% of the soil surface could be bare in HCPC. If in plant community A, 45-60% of the soil surface can be exposed.

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- 5. Number of gullies and erosion associated with gullies:** Gullies are not evident in any of the State 1 reference plant communities.

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- 6. Extent of wind scoured, blowouts and/or depositional areas:** Wind scoured, blowouts and/or depositional areas are not evident in any of the State 1 reference plant communities.

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- 7. Amount of litter movement (describe size and distance expected to travel):** Litter movement is not expected with

HCPC. On slopes > 8%, in plant community A, litter, both fine and coarse, movement is visible, into depressions or natural obstacles.

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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):** Stability class anticipated to be 4 or 5 under plant canopy. In all State 1 reference plant communities, soil stability class is expected to be 2 or 3 from the large interspaces.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The surface layer is usually 0-2" deep and typically have clay loam and silty clay. Surface color is light brownish gray. Soil organic matter ranges from 0.5-2%.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** In HCPC,, 40-50% plant canopy and 30-50% basal cover with small gaps between plants should reduce raindrop impact and slow overland flow, providing increased time for infiltration to occur. Healthy, deep rooted native grasses enhance infiltration and reduce runoff. Infiltration rate is very slow. If in plant community A, 20-30% plant canopy and 30-40% basal cover with large gaps between plants, amplifies raindrop impact and increases overland flow. The site tends to be more xeric as runoff increases. Because of the high sodium content, exposed soil can develop a hard crust as the sodium disperses the soil particles.
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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):** No compaction layer should be evident in any of the State 1 plant communities.  
Restrictive, very hard claypan begins at 4 - 6 inches.
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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: HCPC: Mid-stature, cool season rhizomatous grasses> mid stature, warm season bunch grasses> short warm season rhizomatous grasses > shrubs > forbs. Plant community A: Mid-stature, cool season rhizomatous grasses> short warm season rhizomatous grasses > mid stature, warm season bunch grasses > shrubs > forbs.
- 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):** Plant mortality and decadence very low in HCPC and Plant community A. In periods of drought, shrubs would exhibit decadence in the state 1 reference communities
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14. **Average percent litter cover (%) and depth ( in):** Litter cover is in contact with soil surface. Litter decreases in Plant community A to 30-40% and depth is immeasurable.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 350 - 600 #/acre.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Blue grama, inland saltgrass, bottlebrush squirreltail, poverty weed, knotweeds, plains prickly pear, broom snakeweed, greasewood.

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17. **Perennial plant reproductive capability:** All species have a somewhat restricted ability to reproduce in HCPC. In Plant community A, plant seedlings will be weighed in favor of marginal and undesirable species. Replacement of desirable species will be very few.

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