

Ecological site R058AC050MT

Saline Upland (SU)

RRU 58A-C 11-14" p.z.

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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.

Associated sites

R058AC040MT	Silty (Si) RRU 58A-C 11-14" p.z.
R058AC041MT	Clayey (Cy) RRU 58A-C 11-14" p.z.
R058AC053MT	Dense Clay (DC) RRU 58A-C 11-14" p.z.
R058AC054MT	Claypan (Cp) RRU 58A-C 11-14" p.z.

Similar sites

R058AC618MT	Saline Overflow (SOv) RRU 58A-C 11-14" p.z. The Saline Overflow site is also dominated by salt tolerant plants, but will have much greater production due to the extra water from overflow.
R058AC619MT	Saline Subirrigated (SSb) RRU 58A-C 11-14" p.z. The Saline Subirrigated site is also dominated by salt tolerant plants, but will have much greater production due to the extra water from subirrigation.
R058AC053MT	Dense Clay (DC) RRU 58A-C 11-14" p.z. The Dense Clay site will have a hard restrictive layer in the soil at or near the surface. Salt tolerant plants may be present, but are rarely dominant.

Table 1. Dominant plant species

Tree	Not specified
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Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs on nearly level to moderately steep sedimentary plains, hills, fans, and terraces where salt and/or alkali accumulations are apparent and salt-tolerant species dominate the plant community. Slope is usually 20% or less, but can be up to 35 to 40%.

Table 2. Representative physiographic features

Landforms	(1) Plain (2) Hill (3) Terrace
Elevation	690 – 1,370 m
Slope	0 – 20 %
Water table depth	150 cm
Aspect	Aspect is not a significant factor

Climatic features

Major Land Resource Area (MLRA) 58A in Montana is considered to have a continental climate characterized by cold winters, hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are typical. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains and the winds move freely across the plains and account for rapid changes in temperature. Seasonal precipitation is often limiting for plant growth. Annual fluctuations in species composition and total production are typical depending on the amount and timing of rainfall.

Temperatures can be very extreme in this part of Montana. Summer daytime temperatures are typically quite warm, generally averaging in the mid to lower 80°s F for July and August. Summertime temperatures will typically reach in the 100°s F at some point during the summer, and can reach 90° F any month between May and September. Conversely, winter temperatures can be cold, averaging in the low teens ° F or less for December and January. There will typically be several days of below zero temperatures each winter. It is not uncommon for temperatures to reach 30–40° F below zero, or even colder, most any winter.

Spring can be windy throughout this MLRA, with winds averaging over 10 mph about 15 percent of the time. Speeds of 50 mph or stronger can occasionally occur as a weather system crosses this part of Montana.

The majority of the rangeland in MLRA 58AC is within the 11 to 14 inch Mean Annual Precipitation (MAP) range. During an average year, 70 to 75 percent of the annual precipitation falls between April and September, which are the primary growing season months.

Snowfall is not heavy in the area, averaging 36 total inches in the Yellowstone Valley and about 39 inches throughout this MLRA. Heavy snowfall occurs infrequently, usually late in the winter or early spring. Snow cover is typically 1 to 3 inches.

The frost-free (32° F) season averages about 90 to 125 days each year in the uplands, to about 135 days along the Yellowstone River Valley. The freeze-free (28o F) season averages about 110 to 155 days annually.

For local climate station information, refer to <http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=mt>.

Table 3 Representative climatic features

Frost-free period (average)	140 days
Freeze-free period (average)	160 days
Precipitation total (average)	360 mm

Influencing water features

Soil features

The soils associated with this ecological site are moderately to strongly saline, derived from shale and other sedimentary rock. Surface textures are variable, typically loam, silt loam, silty clay loam. Soils are greater than 20 inches deep. Bare ground areas are significant, resulting from the salinity. The soil surface is typically crusted, and hard or very hard when dry. Salt crystals are often observable with a low power (i.e., 10 X) lens.

Table 4. Representative soil features

Surface texture	(1) Loam (2) Silt loam (3) Silty clay loam
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderate
Soil depth	50 cm
Surface fragment cover <=3"	0 – 10 %
Available water capacity (0-101.6cm)	7.62 – 15.24 cm
Electrical conductivity (0-101.6cm)	10 – 30 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	10 – 40

Soil reaction (1:1 water) (0-101.6cm)	7.9 – 9.6
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Ecological dynamics

The physical aspect of this site in the Historical Climax (HCPC) Plant Community is that of a sparse grassland/ shrubland dominated by salt tolerant plants. Approximately 45–50% of the annual production is from grasses and sedges, 1–5% from forbs, and 35–45% is from shrubs and half-shrubs. The canopy cover of shrubs is 1 – 10%.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Native grasses			527-757	
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	140-381	–
	tufted wheatgrass	ELMA7	<i>Elymus macrourus</i>	106-286	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	106-286	–
	saltgrass	DISP	<i>Distichlis spicata</i>	34-95	–
	Montana wheatgrass	ELAL7	<i>Elymus albicans</i>	1-50	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	1-50	–
	Nuttall's alkaligrass	PUNU2	<i>Puccinellia nuttalliana</i>	1-50	–
2	Native grasses			1-50	
	Grass, perennial	2GP	<i>Grass, perennial</i>	1-50	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	1-50	–
	plains reedgrass	CAMO	<i>Calamagrostis montanensis</i>	1-50	–
	sedge	CAREX	<i>Carex</i>	1-50	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	1-50	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	1-50	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	1-50	–
3	Native grasses			1-3	
	foxtail barley	HOJU	<i>Hordeum jubatum</i>	1-3	–
	tumblegrass	SCPA	<i>Schedonnardus paniculatus</i>	1-3	–
Forb					
4	Native forbs			1-50	
	Forb, perennial	2FP	<i>Forb, perennial</i>	1-50	–
	aster	ASTER	<i>Aster</i>	1-50	–
	buckwheat	ERIOG	<i>Eriogonum</i>	1-50	–
	povertyweed	IVAX	<i>Iva axillaris</i>	1-50	–
	desertparsley	LOMAT	<i>Lomatium</i>	1-50	–
	leafy wildparsley	MUDI	<i>Musineon divaricatum</i>	1-50	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	1-50	–
	American vetch	VIAM	<i>Vicia americana</i>	1-50	–
5	Native forbs (toxic properties)			1-3	

	twogrooved milkvetch	ASBI2	<i>Astragalus bisulcatus</i>	1-3	–
Shrub/Vine					
6	Native shrubs and half-shrubs			73-140	
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	34-140	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	1-140	–
	greasewood	SAVE4	<i>Sarcobatus vermiculatus</i>	1-50	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	1-50	–
	Nuttall's saltbush	ATNU2	<i>Atriplex nuttallii</i>	1-50	–
7	Native shrubs and half-shrubs			1-50	
	Shrub, broadleaf	2SB	<i>Shrub, broadleaf</i>	1-50	–
	prairie sagewort	ARFR4	<i>Artemisia frigida</i>	1-50	–
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	1-50	–
8	Native shrubs and half-shrubs			1-3	
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	1-3	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	1-3	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce high quality forage. However, forage production can be severely limited by the soil properties. Management objectives should include maintenance or improvement of the plant community. Shorter grazing periods and adequate re-growth after grazing are recommended for plant maintenance and recovery. Heavy stocking and season-long use of this site can be detrimental and will alter the plant community composition and production over time. Whenever Plant Community 2 (medium and short grasses and shrubs) occurs, grazing management strategies need to be implemented to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. This community will respond fairly quickly to improved grazing management, including increased growing season rest of key forage plants. Grazing management alone can usually move this community back towards the potential community. Plant Communities 3 and 4 have substantially reduced forage production, and a high percentage of aggressive, non-palatable species. Once these plant communities become established, it will be much more difficult to restore the site to a community that resembles the potential with grazing management alone. Additional growing season rest is often necessary for re-establishment of the desired species and to restore the stability and health of the site. Practices such as range seeding or mechanical treatment are generally not recommended on this site. Wildlife Interpretations: The Saline Upland ecological site often adds structural habitat diversity to a relatively uniform grassland landscape. Historically, large herds of migratory bison and pronghorn, and significant numbers of mule deer and sage grouse were probably the predominant wildlife species using this site. Today, although cattle have replaced bison, the wildlife species composition is probably similar to historic conditions. The high percentage of half-shrubs and shrubs provides thermal cover and winter nutritional value for big game animals and a diverse nesting habitat structure for a variety of birds. The intrinsically high percentage of exposed soil limits habitat value for ground-nesters. Hard pan areas can supply ephemerally ponded habitat for invertebrates and amphibians. Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs (HCPC): A variety of plant life forms and seasonality provides flowers for pollinating insects. Temporarily ponded areas on hard pan spots serve as breeding habitat for amphibians such as Woodhouse's toad. Representative reptiles include the prairie rattlesnake and bull snake. The prevalence of bare ground limits ground-nesting bird habitat value although species such as Brewer's, vesper and grasshopper sparrows, lark buntings, and meadow larks use this plant community. Small mammal populations are dominated by seed-eaters like the deer mouse and harvest mouse. Voles are limited by low litter and residual vegetation cover. The high percentage of shrubs and half-shrubs in this community favors browsers and mixed feeders like pronghorn and mule deer. Thermal and escape cover is available for big game animals. The mix of warm and cool season grasses and shrubs provides nutritious forage for ungulates over most of the year. Plant Community 2: Medium and Short Grasses / Shrubs: Habitat diversity for pollinating insects is somewhat reduced. An increasingly warmer, drier ground surface degrades amphibian habitat value to some extent. Ground-nesting birds lose even more ground cover for nest concealment and thermal cover. The loss of the warm season alkali sacaton shortens the period of high nutrition for big game species. Plant Community 3: Shrubs

and Half-Shrubs/ Short Grasses/ Cacti: Insect diversity is considerably reduced with the reduction in desirable grass, forb and shrub variety. A much drier soil surface reduces amphibian habitat value. Increased bare ground and further reductions in litter and residual grass cover degrade habitat value for ground-nesting birds and small mammals. Brewer's sparrows, lark buntings and meadowlarks are examples of songbird species which may use this community General wildlife habitat value and forage for big game species are considerably reduced with the loss of vegetative structural diversity. Thermal and hiding cover and some browse are available for big game animals. Plant Community 4: Shrubs/ Half-Shrubs/ Annual Grasses and Forbs/ Cacti/ Short Grasses: Insects may be very numerous during population outbreaks (i.e. grasshoppers) but species diversity is significantly reduced. Reptiles may be limited by cover and low prey populations. Nesting bird habitat value is very low because of the sparse ground cover. The adaptable deer mouse is the predominant small mammal. Pronghorn and mule deer may use the prostrate Nuttall's saltbush browse.

Hydrological functions

The runoff potential for this site is very high depending on slope and ground cover/health. Runoff curve numbers generally range from 84 to 93. The soils associated with this ecological site are generally in Hydrologic Soil Group D. The infiltration rates for these soils will normally be very slow.

Other information

The following is an example of how to calculate the recommended stocking rate. This example does not use production estimates from this specific ecological site. You will need to adjust the annual production values and run the calculations using total annual production values from the ecological sites encountered on each individual ranch/pasture. Before making specific recommendations, an on-site evaluation must be made. Example of total annual production amounts by type of year: Favorable years = 2200 lbs/acre Normal years = 1480 lbs/acre Unfavorable years = 1200 lbs/acre It is recommended that on slopes of 30% or less, stocking rate should be derived from the total annual production pounds minus 500 pounds for residual dry matter and 25% harvest efficiency. On slopes over 30%, stocking rate is derived from total annual production pounds minus 800 pounds for residual dry matter and 25% harvest efficiency. Refer to the NRCS National Range and Pasture Handbook for a list of Animal Unit Equivalents. Sample Calculations using Favorable Year production amounts: 30% slopes: $AUM/AC = [(2200-500)(0.25)]/915 \text{ lbs/month for one AU} = 0.46$ AUM/AC $AC/AUM = (1.0 \text{ AU})/(0.46 AUM/AC) = 2.2$ $AC/AUM > 30\% \text{ slopes: } AUM/AC = [(2200-800)(0.25)]/915 \text{ lbs/month for one AU} = 0.38$ AUM/AC $AC/AUM = (1.0 \text{ AU})/(0.38 AUM/AC) = 2.6$ AC/AUM NOTE: 915 lbs/month for one Animal Unit is used as the baseline for maintenance requirements. This equates to 30 lbs/day of air-dry forage (1200 lb cow at 2.5% of body weight).

Contributors

MJR, REL, RSN, POH
RSN

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)	Loretta Metz
Contact for lead author	
Date	04/06/2005
Approved by	

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills should not be evident in the reference state.

2. **Presence of water flow patterns:** Water flow patterns are generally not evident in the reference state.

3. **Number and height of erosional pedestals or terracettes:** Wind and water erosion should not be evident in the reference state.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**
Bare ground is less than 80% in the reference state. In HCPC, bare ground should not exceed 65%.

5. **Number of gullies and erosion associated with gullies:** Gully erosion is not evident in the reference state.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Under normal climatic conditions, these should not be evident.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement varies by size and depth of litter. In the reference state, litter should be coarse perennial grass leaves, anywhere from 1.5 inches up to 3 inches in length, plus small shrub leaves and minimal forb litter. Litter will not move more than a couple of inches from where it originated.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
Stability value of 3 in plant interspaces. Stability value of 4 under plant canopies and at plant bases. High salinity affects the soil surface aggregate stability.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Non-granular surface structure of <2 inch depth; brown to light brown color. Organic matter approximately 1-2%. Sodium absorption ratios are from 5-70; Electrical conductivity ranges from 4 to over 16 mmhos/cm.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Salt-tolerant shrubs and deep-rooted native perennial grasses optimize infiltration and runoff. Perennial plants (grasses, forbs and shrubs) should be spaced approx 2 to 5 feet apart in the reference state.

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 present in reference state.
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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: Mid- and short-height, native perennial bunchgrasses >= salt-tolerant shrubs >; native perennial and annual forbs.

Sub-dominant:

Other:

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Plant mortality of deep-rooted perennial bunchgrasses is low to moderate; mortality of salt-tolerant shrubs is very low. Decadence, especially of shrubs, is moderate, especially in prolonged periods of drought.
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14. Average percent litter cover (%) and depth (in):
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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 625 – 850 #/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: plains pricklypear, broom snakeweed, cheatgrass, Japanese brome, curlycup gumweed, greasewood.
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17. Perennial plant reproductive capability: This is not impaired in the reference state.
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