

Ecological Site Description—Rangeland

Dense Clay (DC), 11–14" MAP

MLRA: 58AC – Sedimentary Plains, Central
R058AC053MT



1. Physiographic features: This ecological site occurs on nearly level to strongly sloping sedimentary plains, terraces and fans.

Landform: lake plains, sedimentary plains, fans, and terraces

Elevation (feet): 2,250–4,500

Slope (percent): 0–15, mainly less than 8

Depth to Water Table (inches): greater than 60

Flooding: none

Ponding: none

Runoff Class: very high

Aspect: not significant

2. Soils: These are moderately deep to very deep non-granular clay soils that are strongly to very strongly alkaline near the surface. These soils typically are very hard to extremely hard when dry and very sticky when wet. They typically have a thin vesicular surface crust, which restricts water permeability. The subsoil is either massive, or has a very strong columnar structure. Permeability and root development are severely limited by the surface crust, hard subsoil, and alkalinity.

Available water holding capacity to 40 inches is 5 to 7 inches. Reaction (pH) (1:1 water): moderately alkaline to very strongly alkaline (7.9–9.6).

3. Associated sites: Clayey, ClayPan, and Saline Upland.

4. Similar sites: Saline Upland, ClayPan, Shale

The Saline Upland site differs by not having the very hard layer near the surface and by having a plant community of mainly salt tolerant species. In addition, the electro conductivities significantly limit, if not prohibit, the potential for any form of mechanical treatment or reseeding on the Saline Upland.

Soils in the Saline Upland site generally are given a Capability Class rating of 7. (Soils in the Dense Clay site are generally Capability Class 6.)

The ClayPan site differs by generally having 2–8 inches of soil over the hard, argillic layer, less bare ground, and higher production.

The Shale site differs by having soils that are usually shallow with very little soil profile evident.

5. Major Plant Community Types: The following are descriptions of several plant communities that may occupy this site:

Plant Community 1: Tall and Medium Grasses/ Forbs/ Shrubs: The physical aspect of this site is that of a very sparse grassland and shrubland that is typically dominated by cool season grasses and shrubs. Approximately 80–85% of the annual production is from grasses and sedges, 1–5% from forbs, and 5–10% is from shrubs and half-shrubs. The canopy cover of shrubs is 5-10%.

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community contains a diversity of tall and medium height, cool season grasses (**western or thickspike wheatgrass, green needlegrass, and bluebunch wheatgrass**), and short grasses (**blue grama, Sandberg bluegrass**). There are numerous forbs that occur in smaller percentages. Shrubs and half-shrubs such as **Nuttall's saltbush and winterfat** are common. **Wyoming big sagebrush** is also often a common component of this community.

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This plant community is well adapted to the Northern Great Plains climatic conditions. The diversity in plant species and presence of tall, deep-rooted perennial grasses allows for drought tolerance. Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. Abundant plant litter is available for soil building and moisture retention. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. This plant community provides for soil stability and a functioning hydrologic cycle.

Plant Community 2: Medium and Short Grasses and Sedges/ Shrubs and Half-shrubs: This community occurs due to minor climate shifts or slight variations in soils and/or topography or disturbance, including non-prescribed grazing. Dominants include **Wyoming big sagebrush** and **western/thickspike wheatgrass, Sandberg bluegrass and blue grama**. The medium and tall grasses such as **green needlegrass and bluebunch wheatgrass** will still be present, sometimes in relatively large amounts. The desirable shrubs/half-shrubs such as Nuttall's saltbush and winterfat will be somewhat less prevalent. Palatable and nutritious forbs will begin to be replaced by less desirable and more aggressive species such as scarlet globemallow.

Grass biomass production and litter become reduced on Community 2 as the taller grasses become less prevalent, increasing evaporation and reducing moisture retention. Additional open space in the community can result in undesirable invader species. These plant communities provide for moderate soil stability.

Plant Community 3: Shrubs/ Short Grasses/ Half-shrubs/ Cacti: This is a disturbance-induced community, with dominants including **Wyoming big sagebrush, or greasewood** in some situations. Short grasses such as **Sandberg bluegrass and blue grama** become more prevalent. Mid-seral species such as **western or thickspike wheatgrass** will still be relatively abundant. The taller grasses (bluebunch wheatgrass and green needlegrass) will still be present, but in much smaller amounts. Palatable forbs will be mostly absent. **Fringed sagewort and plains pricklypear** will tend to become more abundant.

Plant Community 4: Shrubs & Half-Shrubs/ Annuals/ Cacti/ Short Grasses: If heavy disturbance continues, plant community 3 can deteriorate to one primarily composed of **Wyoming big sagebrush / greasewood, fringed sagewort, and broom snakeweed, short grasses (Sandberg bluegrass, blue grama), annual grasses (cheatgrass or Japanese brome, sixweeks fescue), annual forbs (pepperweed, fanweed), and plains pricklypear**. There will still be some of the mid-seral species such as western or thickspike wheatgrass present. The taller grasses will occur only rarely, often underneath the shrub canopy or mixed in with the cactus. Palatable forbs will be mostly absent. **Weedy forbs (e.g., kochia)** are likely to invade.

Plant Communities 3 and 4 are much less productive than Plant Communities 1 or 2, and have lost many of the attributes of a healthy rangeland. The loss of deep perennial root systems reduces total available moisture for plant growth. Reduction of plant litter will result in higher surface soil temperatures and increased evaporation losses. Annual species are often aggressive and competitive with seedlings of perennial plants. This community can respond positively to improved grazing management but it will take additional inputs to move it towards a community similar in production and composition to that of Plant Community 1 or 2. The landscape features often associated with this ecological site as well as the droughty nature of the soils severely limits the use of most common structural improvement practices.

5a. Cover and structure (Historic Climax Plant Community)

COVER TYPE	BASAL COVER (%)	CANOPY COVER (%)	AVERAGE HEIGHT (inches)
Cryptogams	0–T	0–T	0.25
Grasses/ sedges	3–7	30–50	24
Forbs	1–2	1–5	18
Shrubs	T–1	5–10	24
Trees	T–1	0–10	30–40 feet
Litter	15–25		
Coarse fragments	0–5		
Bare ground	60–80		

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5b. Major Plant Species Composition - Historical Climax Plant Community

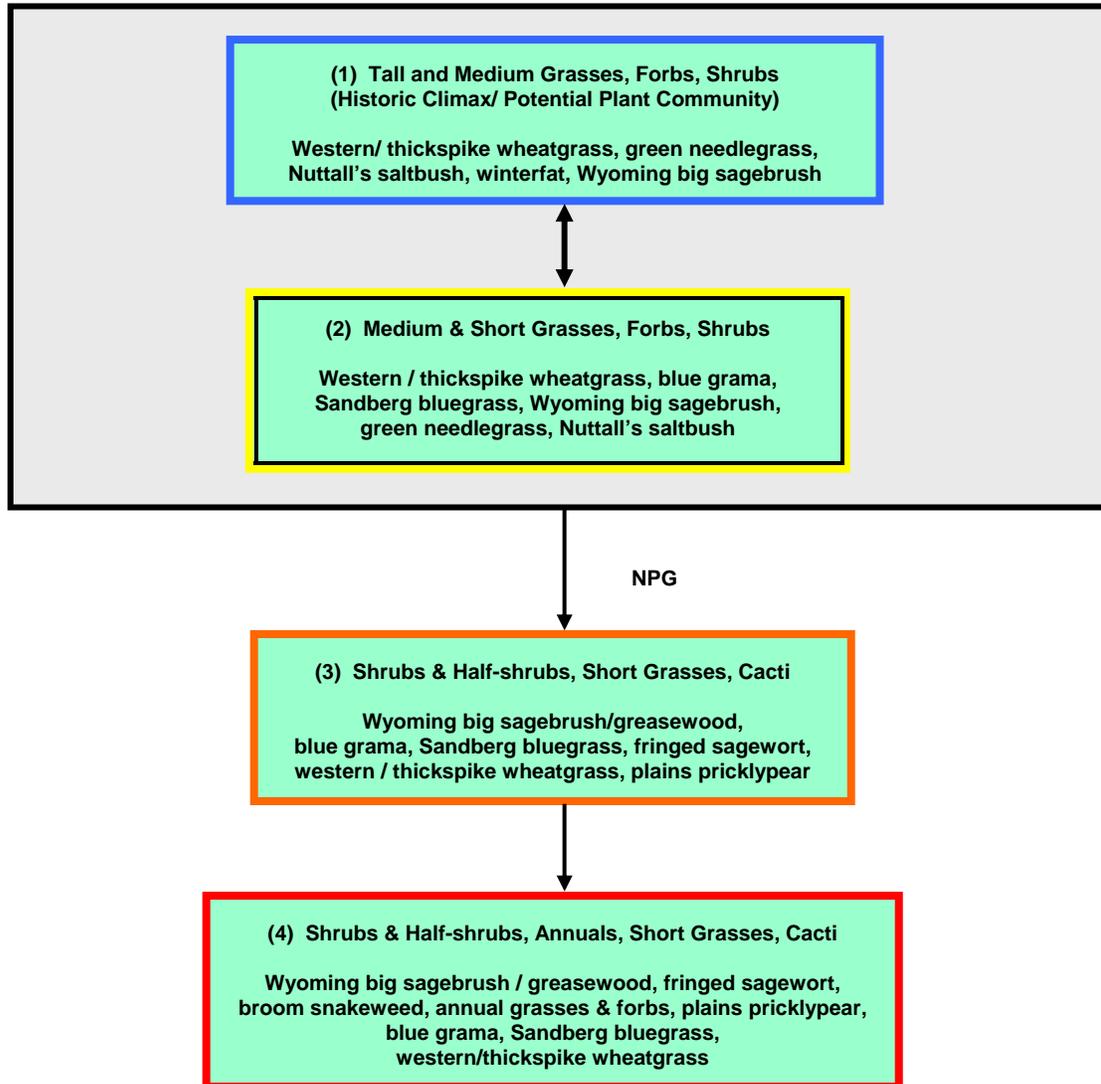
Common Name	Plant Symbol	Plant Group	Percent Comp.	Group Max. %	Mean Annual Precipitation (inches)			
					11	12	13	14
					(lbs./acre)	(lbs./acre)	(lbs./acre)	(lbs./acre)
Grasses and Sedges 85–90%					575-608	640-675	700-743	765-810
Western or Thickspike wheatgrass	PASM ELLAL	14	20-40		135-270	150-300	165-330	180-360
Green needlegrass	NAV14	2	15-30		101-202	112-225	124-248	135-270
Bluebunch wheatgrass	PSSP6	2	5-10		34-68	38-75	41-82	45-90
Sandberg bluegrass	POSE	12	0-10}	10	0-68	0-75	0-82	0-90
Plains reedgrass	CAMO	16	0-10}					
Needleleaf sedge	CADU6	16	0-5}	5	0-34 No more than 34 for any one	0-38 No more than 38 for any one	0-41 No more than 41 for any one	0-45 No more than 45 for any one
Montana wheatgrass	ELLAA	14	0-5}					
Prairie junegrass	KOMA	12	0-5}					
Blue grama	BOGR2	15	0-5					
Bottlebrush squirreltail	ELEL5	10	0-5					
Other native grasses	2GP		0-5}					
Foxtail barley	HOJU	12	0-T	T	0-T	0-T	0-T	0-T
Tumblegrass	SCPA	11	0-T					
Forbs 5%					T-34	T-38	T-41	T-45
Prairie thermopsis	THRH	20	0-5}	5	T-34 No more than 34 for any one	T-38 No more than 38 for any one	T-41 No more than 41 for any one	T-45 No more than 45 for any one
Wild onion	ALLIU	32	0-5}					
Eriogonum spp.	ERIOG	23	0-5}					
Biscuitroot spp.	LOMAT	24	0-5}					
Western yarrow	ACMI2	19	0-5}					
Wild parsley	MUDI	24	0-5}					
Scarlet globemallow	SPCO	20	0-5}					
Douglas knotweed	PODO4	24	0-5}					
Stemless hymenoxys	HYAC	24	0-5}					
Bastard toadflax	COUM	20	0-5}					
Slenderleaf collomia	COLI2	24	0-5}					
Hood's phlox	PHHO	28	0-5}					
Other native forbs	2FP		0-5}					
Shrubs and Half-shrubs 5–10%					34-68	38-75	41-82	45-90
Winterfat	KRLA2	35	0-5	5	0-34	0-38	0-41	0-45
Nuttall's saltbush	ATNU2	34	0-5	5	0-34	0-38	0-41	0-45
Wyoming big sagebrush	ARTRW	37	0-10	10	34-68 No more than 34 for any one	38-75 No more than 38 for any one	41-82 No more than 41 for any one	45-90 No more than 45 for any one
Fringed sagewort	ARFR4	38	1-5					
Rabbitbrush	ERNAN5	32	0-5					
Greasewood	SAVE4	37	0-5					
Other native shrubs	2SB		0-5					
Broom snakeweed	GUSA2	37	0-T	T	0-T	0-T	0-T	0-T
Plains pricklypear	OPPO	38	0-T					
Total Annual Production (lbs/ac):					675	750	825	900

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5c. Plant Communities and Transitional Pathways (diagram)



Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success. Yellow boxes indicate caution that the community may be in danger of crossing a threshold. Orange boxes represent communities that have crossed over thresholds from the HCPC and may be difficult to restore with grazing management alone. Red boxes represent communities that have severely shifted away from the HCPC and probably cannot be restored without mechanical inputs.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

PG = Prescribed Grazing: Use of a planned grazing strategy to balance animal forage demand with available forage resources. Timing, duration, and frequency of grazing are controlled and some type of grazing rotation is applied to allow for plant recovery following grazing.

NPG = Non-Prescribed Grazing: Grazing which has taken place that does not control the factors as listed above, or animal forage demand is higher than the available forage supply.

Fire: Prescribed fire or non-prescribed wildfire.

Matted: >50% cover

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6. 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 sedges) 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.

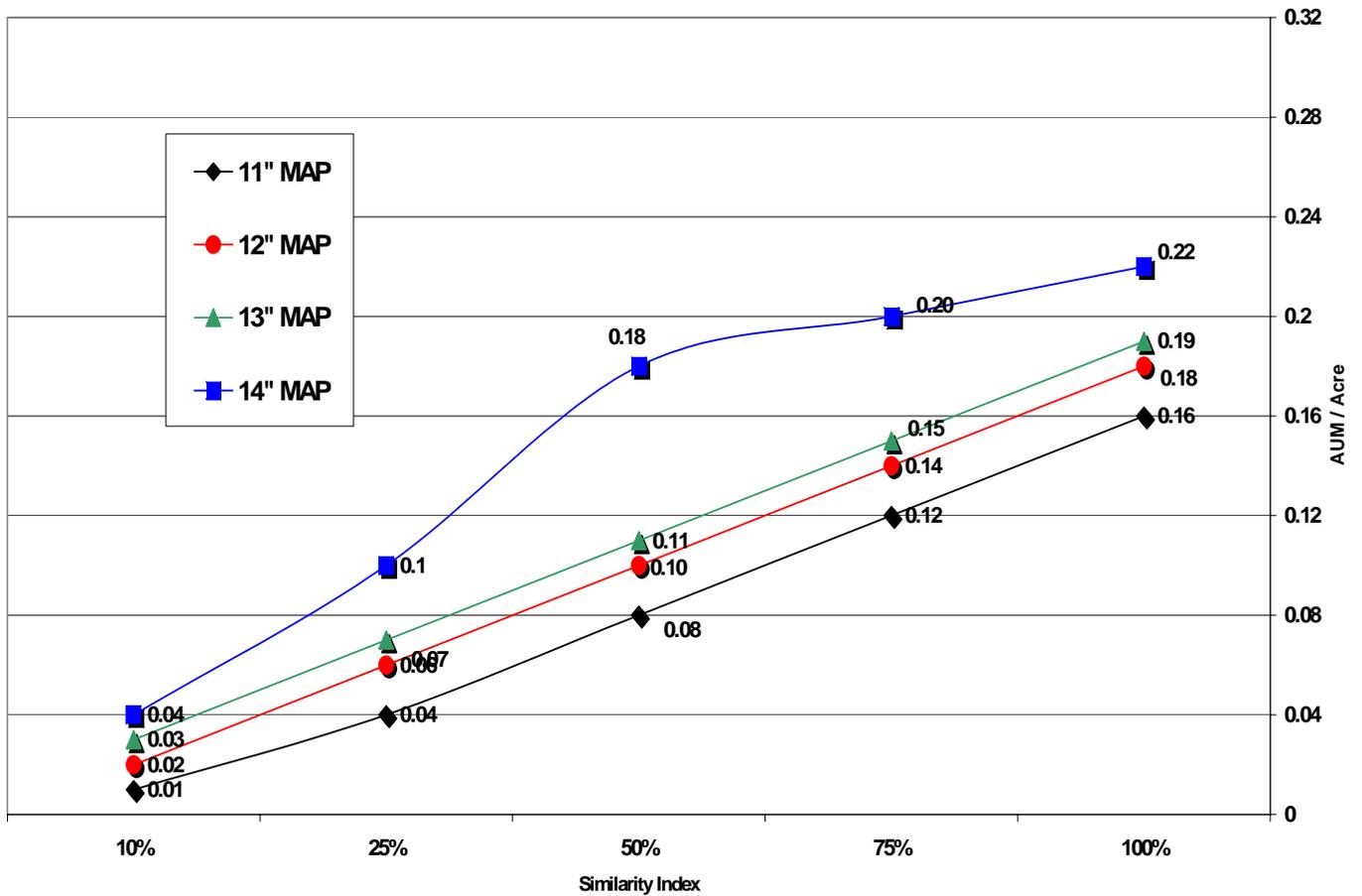
6a. Guide to Safe Stocking Rates: The following charts provide guidance for determining an initial safe stocking rate. Animal Unit Month (AUM) figures are based on averages of forage production from data collected for this site over several years. The characteristic plant communities and production values listed may not accurately reflect the productivity of a specific piece of land. These tables should not be used without on-site information collected to determine the average forage productivity of the site. Adjustments to stocking rates for each range unit must be made based on topography, slope, distance to livestock water, and other factors which effect livestock grazing behavior.

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Stocking Rate Guide (Cattle)
Dense Clay 11-14", 58AC



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6b. Stocking Rate Guide:

Major Plant Community Dominant Plant Species	MAP	Total Production (pounds/ac)	Cattle			Sheep		
			Forage Production	AUM/ac	Ac/AUM	Forage Production	AUM/ac	Ac/AUM
1. Tall and Medium Grasses, Forbs, Shrubs (HCPC) <i>Western/ thickspike wheatgrass, green needlegrass, Nuttall's saltbush, winterfat, Wyoming big sagebrush</i> (S.I. >75%)	13–14"	825-900	700-800+	.19-.22 +	4.6-5.2	750-850+	.20-.23 +	4.3-4.9
	11–12"	675-750	575-675+	.16-.18 +	5.4-6.4	600-700+	.16-.19 +	5.2-6.1
2. Medium & Short Grasses, Forbs, Shrubs <i>Western/ thickspike wheatgrass, blue grama, Sandberg bluegrass, Wyoming big sagebrush, green needlegrass, Nuttall's saltbush</i> (S.I. 40–75%)	13–14"	455-765	275-650	.08-.18	5.6-13.3	300-700	.08-.19	5.2-12.2
	11–12"	370-640	225-550	.06-.15	6.7-16.3	250-575	.07-.16	6.4-14.6
3. Shrubs & Half-shrubs, Short Grasses, Cacti <i>Wyoming big sagebrush/ greasewood, blue grama, Sandberg bluegrass, fringed sagewort, western/ thickspike wheatgrass, plains pricklypear</i> (S.I. 20–40%)	13–14"	290-585	150-350	.04-.10	10.5-24.4	175-375	.05-.10	9.8-20.9
	11–12"	235-490	125-300	.03-.08	12.2-29.3	125-325	.03-.09	11.3-29.3
4. Shrubs & Half-shrubs, Annuals, Short Grasses, Cacti <i>Wyoming big sagebrush/ greasewood, fringed sagewort, broom snakeweed, annual grasses & forbs, plains pricklypear, blue grama, Sandberg bluegrass, western /thickspike wheatgrass</i> (S.I. < 20%)	11–14"	135-360	25-125	.01-.03	29.3- 146.4	50-150	.01-.04	24.4-73.2

Stocking rates are calculated from average forage production values using a 25% Harvest Efficiency factor for preferred and desirable plants, and 10% Harvest Efficiency for less desirable species. AUM calculations are based on 915 pounds per animal unit month (AUM) for a 1,000-pound cow with calf up to 4 months. No adjustments have been made for site grazability factors, such as steep slopes, site inaccessibility, or distance to drinking water.

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7. Wildlife Interpretations: The Dense Clay ecological site often occupies large acreages of relatively level ground, which provide uninterrupted expanses of habitat for area sensitive species such as sage grouse and other ground-nesting birds. With the exception of the bison, modern day wildlife populations are probably similar to the historical species composition. A diverse shrub and half-shrub component provides nutritious browse for pronghorns and mule deer, especially if thermal cover is available nearby in stream bottoms and/or rough topography. Concave depressions can hold temporary water, which may supply breeding sites for a variety of amphibians. Although this site is less, productive compared to sites having more favorable soil conditions, habitat structure is relatively complex as a result of the diversity of plant life forms.

Plant Community 1: Tall Grasses/ Forbs/ Shrubs (HCPC): The diversity of forbs, half-shrubs and shrubs provides feeding substrate for a variety of pollinating insects, which are prey for many birds, reptiles and small mammals. Woodhouse's toad, the prairie rattlesnake, and the short-horned lizard are representative amphibians and reptiles. The relatively open ground provides lek sites for sage grouse; a diverse forb community produces insects and succulent vegetation for grouse broods and adults. Small mammal communities are dominated by seed-eaters such as the deer mouse and the largely carnivorous northern grasshopper mouse. The predominance of grasses plus a diversity of forbs, shrubs and half-shrubs in this community favors grazers and mixed feeders such as bison, pronghorn, and elk.

Plant Community 2: Medium and Short Grasses and Sedges/ Shrubs and Half-shrubs: Pollinator insect species diversity may decline with the loss of some succulent, palatable forbs. A reduction in litter cover and residual plant material during early spring decreases nesting habitat value for sage grouse and other ground-nesting birds. The potential increase in big sagebrush cover may benefit sage grouse nesting and winter habitat to some extent. Pronghorn and mule deer still find winter browse but overall nutrition value declines with the reduction in winterfat and Nuttall's saltbush cover. Herbivorous small mammals, such as voles, may decline with the reduction in litter cover.

Plant Community 3: Shrubs/ Short Grasses/ Half-shrubs/ Cacti: Insect species diversity further declines with the simplification of the plant community, although some species, such as grasshoppers, may be very abundant during population highs. Sparse vegetation and increased bare ground may provide suitable habitat for a few nesting bird species (i.e., horned larks) but the lack of complex vegetative structure and residual cover makes this community poor habitat in general for most ground-nesting birds and relatively poor big game habitat. Pronghorn and mule deer may forage in this type throughout the year. However, nutritional levels for big game are greatly reduced and are available for a much shorter period as compared to the HCPC. Small species diversity is quite low; populations are dominated by the adaptable deer mouse.

Plant Community 4: Shrubs & Half-Shrubs/ Annuals/ Cacti/ Short Grasses: Insects may be very abundant during population highs (i.e. grasshoppers) but diversity is low, especially of pollinators. Amphibian habitat is very degraded; ephemeral pools evaporate rapidly and the soil surface is very dry and hot during summer. Ground nesting bird habitat value is poor because of the lack of litter cover and residual plant cover in early spring. Sage grouse and Brewer's sparrows may be fairly abundant in the heavier sagebrush cover but probably suffer heavy losses while nesting on the poorly protected ground surface. Mountain plovers prefer to nest in this community type if a somewhat pebbly surface is present. Mule deer and pronghorn may utilize sagebrush and fringed sagewort during winter in this community.

8. Hydrology Data: 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.

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9. Site Documentation:

Authors: Original: NRCS, 1983 Revised: MJR, REL, RSN, POH, 2003

Supporting Data for Site Development:

NRCS–Production & Composition Record for Native Grazing Lands (Range-417): 8

BLM–Soil & Vegetation Inventory Method (SVIM) Data: 2

NRCS–Range Condition Record (ECS-2): 25

NRCS–Range/Soil Correlation Observations & Soil 232 notes: 13

Ecological Site Reference: NRCS 417 No.: Golden Valley County 520

Field Offices where this site occurs within the state:

Big Sandy	Columbus	Harlowton	Roundup
Big Timber	Crow Agency	Joliet	Stanford
Billings	Fort Belknap	Lewistown	White Sulphur Springs
Chinook	Hardin	Malta	Winnett

Site Approval: This site has been reviewed and approved for use:

Loretta J. Metz
State Rangeland Management Specialist

10/22/2004
Date

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TECHNICAL GUIDE
SECTION II
Sandy, 11–14" MAP

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Dense Clay, 11-14" MAP,
Sedimentary Plains, Central
Plant Community 1
HCPC



Dense Clay, 11-14" MAP,
Sedimentary Plains, Central
Plant Community 1



Dense Clay, 11-14" MAP,
Sedimentary Plains, Central
Plant Community 1

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Dense Clay, 11-14" MAP,
Sedimentary Plains, Central
Plant Community 1
HCPC
Musselshell County



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Sedimentary Plains, Central
Plant Community 1
HCPC
Musselshell County