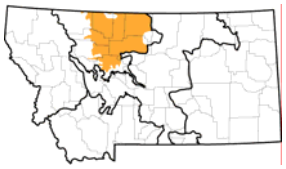
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION



ECOLOGICAL SITE CHARACTERISTICS

Site Type: Rangeland

Site Name: Dense Clay 10-14 inch, p.z. (precipitation zone)

Site ID: R052XN172MT

Major Land Resource Area: 52XN —Northern Glaciated Plains

Physiographic Features: This ecological site occurs on nearly level to gently rolling uplands, low terraces and fans. Slopes are usually less than 8%, but can go as high as 12%. Elevations normally vary from 2000 to 4000 feet.

Land Form:
(1) terrace
(2) fan
(3) plain

	Minimum	Maximum
Elevation (feet):	1875	4000
Slope (percent):	1	12

Water Table Depth (inches):

Flooding:

Frequency: none
Duration: none

Ponding:

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

Runoff Class: medium to very high

Aspect: occurs on all aspects

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 - Breddete
(2) #241692 - Chester
(3) #243558 - Glasgow AP
(4) #243996 – Havre WSOAP
(5) #245572 - Medicine Lake
(6) #247500 - Shelby

Influencing Water Features

This site is not influenced by water from wetlands or streams.

Representative Soil Features

These deep, well drained soils formed in alluvium. The soils usually contain a two-inch silty clay surface over hardpan. These soils are usually very hard when dry and very sticky when wet. They typically have a high content of sodium (alkali) which causes a dispersed condition and restricts water intake into the soil. Permeability is very slow. Root development is severely restricted by the surface crust, hard subsoil and alkalinity. Soil ph varies from 6.6 - 9.0. This site is characterized by the following soil components: Bowdoin, Absher, Vaeda and Vanda.

Predominant Parent Materials:
Kind: alluvium
Origin: glaciofluvial deposits or semi-consolidated sedimentary bedrock

Surface Texture: (1) clay
(2) silty clay
(3) silty clay loam
Surface Texture Modifier: (1) none
Subsurface Texture Group: Clayey
Surface Fragments < = 3" (% cover): 0
Surface Fragments >3" (% cover): 0
Subsurface Fragments < = 3" (% Volume): 0-10

Subsurface Fragments > 3" (% Volume): 0-5
Drainage Class: Moderately Well to Well
Permeability Class: Very slow

	Minimum	Maximum
Depth (inches):	>20	>72
Electrical Conductivity (mmhos/cm):	2	>16
Sodium Adsorption Ratio:	5	25
Calcium Carbonate Equivalent (percent):	0	10
Soil Reaction (1:1 Water):	6.1	9.0
Soil Reaction (0.1M CaC12):	---	---
Available Water Capacity (inches):	3	5

Plant Communities

Ecological Dynamics of the Site

This site developed through time under the influence of climate, geological materials, fire, plants and animals. In comparison to normal upland range sites, environmental characteristics of this site limit herbage production and subsequent fuel accumulation. Although the role of natural fire is probably less significant in the development of this site, fires may have occurred on a natural interval of 10-12 years (Frost 1998). Research 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 varies with timing of grazing and precipitation events, along with the functional and structural composition of the plant community.

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 tall and medium height cool season grasses, forbs and shrubs. About 85% of the annual production is from grasses and sedges, most of which is produced during the cool season. Forbs and shrubs contribute 5 and 10%, respectively, to total annual production. Total vegetative production averages 600 lbs/ac in normal years, 350 lbs/ac in "unfavorable" years, and 900 lbs/ac in "favorable" years.

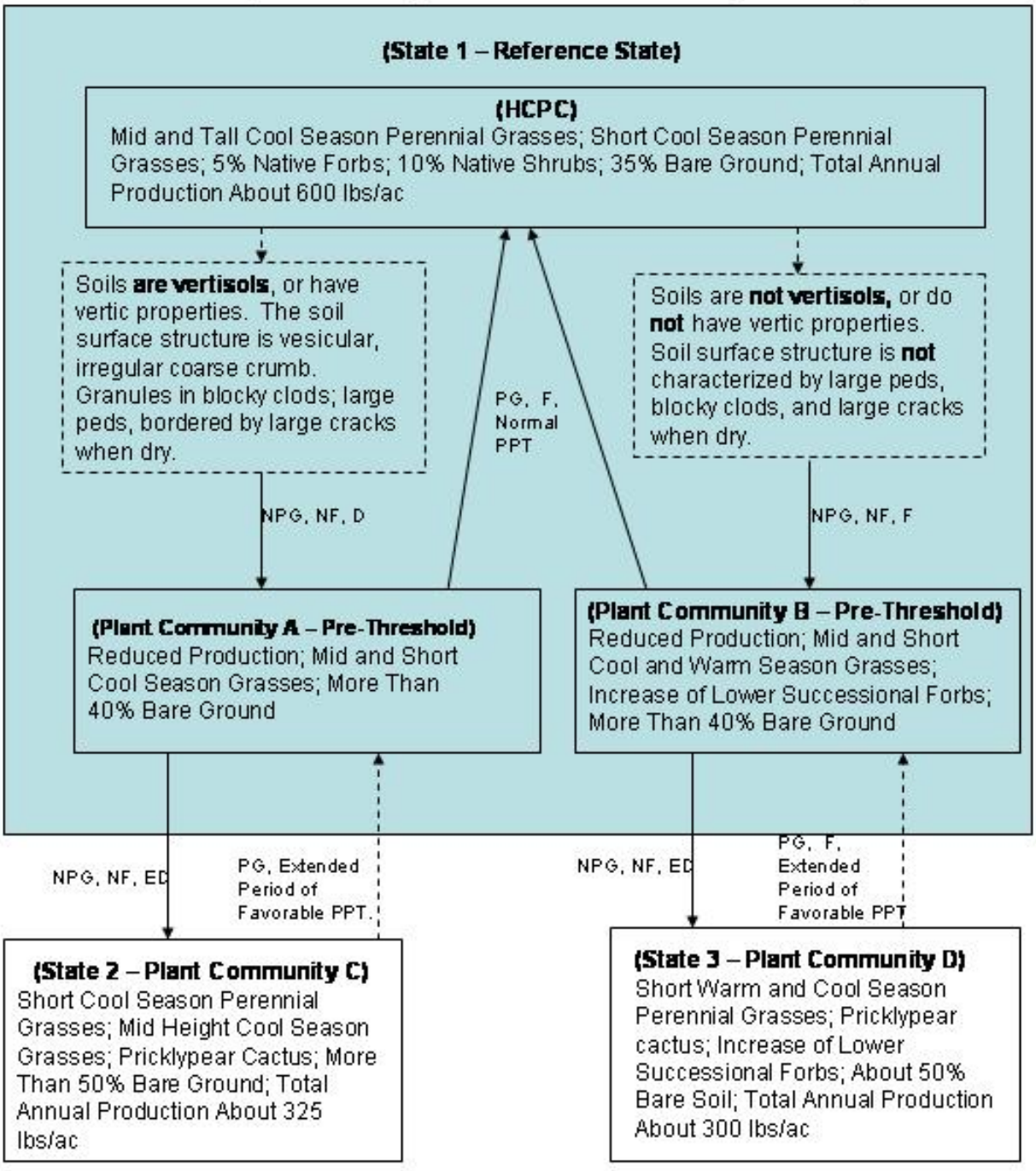
This site is moderately resilient to disturbance because plant growth is limited by soil characteristics. Departures from the HCPC generally result from management actions, drought, and/or a change in the natural fire regime. The site is considered fragile in the sense that vegetative vigor and composition will rapidly decline with continued adverse impacts. With favorable precipitation and/or prescribed grazing treatments the plant community can return to the HCPC. However, succession may be slow. Trends in plant community

dynamics, states, transitional pathways, and thresholds have been evaluated and determined through experience and research.

Successional pathways of Dense Clay 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 usually does not occur within a reasonable length of time, and/or without a large input of energy.

Three plant communities and the successional pathways that commonly occur within the Reference State (State #1) are shown in the following diagram. In addition, the transitions from Plant Community A (State #1) and from Plant Community B (State #1) to Plant Communities C (State #2) and D (State #3), are also illustrated. Ecological processes are discussed below in the plant community descriptions.

Dense Clay 10-14" p.z. RRUs 52XC, 52XN, 53AE



Legend: **NF** – No Fire; **F** – Fire; **NPG** – Non-Prescribed Grazing; **PG** – Prescribed Grazing; **D** – Drought (3-6 years); **PD** – Prolonged Drought (5-7 years); **ED** – Extended Drought (> 7 years); **PPT** - Precipitation

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

Western/thickspike wheatgrasses and green needlegrass are common cool season mid grasses on this ecological site. They account for about 80% of total plant production in the HCPC. Needleandthread, another cool season mid-grass is common and tends to replace the green needlegrass when it is stressed by lack of moisture, grazing pressure, etc. About 5% of the total production is comprised of a mix of cool season short grasses and grasslike plants. These species include sandberg bluegrass, prairie junegrass, needleleaf sedge and threadleaf sedge.

American vetch, a cool season nitrogen-fixing legume, is one of the most important members of the forb community. Milk vetches and prairie thermopsis are additional members of the legume family which may occur in the HCPC. Other common forbs include onion, hoods phlox, scarlet globemallow, wooly plantain, and biscuitroot. 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. Forbs contribute about 5% of the total annual production.

Nuttall saltbush and winterfat are the two most important browse species occurring on the site. While Nuttall saltbush expresses itself during the cool season, winterfat is a warm season plant. Shrubs such as big sagebrush, greasewood, silver sagebrush, pricklypear cactus and fringed sagebrush may also be found in the HCPC. Shrubs normally make up about 10% 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 600 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.

Following regression from the HCPC, soil structure appears to influence species composition. Surface layers that are vesicular, with large angular peds (blocky clods, etc) appear to limit or restrict the establishment and growth of short grasses (especially blue grama) (White and Lewis 1969). Consequently, the percentage of bare ground increases as the production of green needlegrass and western wheatgrass decline on these soils.

In contrast, production of shallow-rooted and/or predominantly lateral-rooted species such as needleandthread, blue grama, sandberg bluegrass, prairie junegrass, hairy goldenaster, and hoods phlox increase when surface soils are more granular, with smaller peds, etc. The large cracks that form between the peds of the heavy soils are theorized to restrict shallow root growth and/or shear the lateral roots that have thin cortices, resulting in a reduction of the short grasses.

Regardless of soil shrink/swell realities, winterfat and Nuttall saltbush may also be replaced by broom snakeweed, fringed sagewort, etc on the site. 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 basal cover averages 15%. Litter varies from 40-50%. Consequently, bare ground may range from 35-55%. Thus, infiltration is not optimized and runoff and erosion are not minimized on the Dense Clay 10-14" p.z. ecological site. Runoff and soil erosion normally increase as the HCPC regresses to earlier seral states.

(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 moisture cycle.

HCPC Plant Species Composition:

GRASSES /GRASSLIKES **85% of Community** Common Name*	Scientific Name*	Group	Group Allowable Pounds Per Acre Low	 High	Annual Production in Pounds Per Acre Low	 High
Western wheatgrass	*Pascopyrum smithii*	1	240	360	120	180
Thickspike wheatgrass	*Elymus macrourus*	1			120	180
Green needlegrass	*Nassella viridula*				90	180
Plains muhly	*Muhlenbergia cuspida*				30	90
Needle and thread	*Hesperostipa comata*				30	90
Blue grama*	*Bouteloua gracilis**				0	30
Sand dropseed*	*Sporobolus cryptandrus**				0	30
Plains reedgrass*	*Calamagrostis montanensis**		*60 lbs/ac is max		0	30
Threadleaf sedge*	*Carex filifolia**		allowed for this		0	30
Sandberg bluegrass*	*Poa secunda**		group.		0	30
Praire junegrass*	*Koeleria macrantha**				0	30
Bottlebrush squirreltail*	*Sitanion hystrix**				0	30
Other native grasses					0	30
					No more than 2 lbs for any one species.	

FORBS
5% of Community

Common Name	Scientific Name	Group	Group Allowable Pounds Per Acre Low	Group Allowable Pounds Per Acre High	Annual Production in Pounds Per Acre Low	Annual Production in Pounds Per Acre High
American vetch	*Vicia americana*				6	30
Scarlet globemallow*	*Sphaeralcea coccinea**				0	30
Aster*	*Aster spp.**				0	30
Prairie thermopsis*	*Thermopsis rhombifolia**				0	30
Pussytoes*	*Antennaria spp.**		*25 lbs/ac is max for		0	30
Bastard toadflax*	*Comandra umbellata**		this group, no more		0	30
Milkvetch*	*Astragalus spp.**		than 10 lbs/ac for a		5	30
Penstemon*	*Penstemon spp.**		single species.		0	30
Hoods phlox*	*Phlox hoodii**				0	30
Other native forbs*					0	30
					30 lbs/ac is maximum allowed for all forbs.	

SHRUBS AND HALF-SHRUBS
10% of Community

Common Name	Scientific Name	Group	Group Allowable Pounds per Acre Low	Group Allowable Pounds per Acre High	Annual Production in Pounds Per Acre Low	Annual Production in Pounds Per Acre High
Nuttall Saltbush	*Atriplex nuttallii*				6	60
Winterfat	*Krascheninnikovia lanata*				6	60
Big sagebrush*	*Artemisia tridentata**				0	60
Silver sagebrush*	*Artemisia cana**				0	60
Fringed sagewort*	*Artemisia frigida**				0	60
Plains pricklypear*	*Opuntia polyacantha**				0	T
Other native shrubs*					0	60
			60 lbs/ac is the max allowed for all shrubs.		*No more than 40 lbs/ac for all species in this Group; and no more than 20 lbs/ac for any one species.	

Structure and Cover

Soil Surface Cover (%)

Basal Cover				Non-Vascular Plants	Biological Crust	Litter	Surface Fragments >1/4 & <= 3"	Surface Fragments > 3"	Bedrock	Water	Bare Ground
Grass/ Grasslike	Forb	Shrub/ Vine	Tree								
9-12	1-2	1-5	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	40-50	0-T	0-T	T	0	30-40

Structure of Canopy Cover (%)

	Grass/Grasslike	Forb	Shrub/Vine	Tree
<= 0.5 feet	20	25	T	0
>0.5 - <=1 feet	50	50	40	0
>1 - <=2 feet	25	25	50	0
>2 - <=4.5 feet	5		10	0
>4.5 - <=13 feet				0
>13 - <= 40 feet				0

Annual Production by Plant Type:

Plant Type	Annual Production (lbs/AC) Low	RV*	High
Grasses /Grasslike	300	510	765
Forb	15	30	45
Shrub/Vine	35	60	90
Tree	T	T	T
Total	350	600	900

*RV means "representative value".

***Successional Pathway from HCPC to Plant Communities A and B (State #1):** Non-prescribed grazing, drought and/or a cessation of the natural fire regime will cause regression from HCPC to Communities A or B. The pathway to Community A occurs on soils with vesicular, irregular, coarse granules, and blocky clods. Large cracks form between the peds (aggregates) as these soils dry. The pathway to Plant Community B occurs on soils with much smaller soil peds. Large cracks between peds are not a normal occurrence on these soils. The regression to either Plant Community A or B may occur within a couple of years.

Plant Community A (State #1):

Range inventories conducted by NRCS on the Fort Peck and Fort Belknap Reservations indicate similarity indices of 45-64% are indicative of Community A. Non-prescribed grazing and drought reduce plant height and plant litter. Bare ground increases as the production of HCPC species decline. Surface runoff and soil temperature increases, and infiltration decreases. Production of shallow-rooted short grasses and sedges is limited by the large cracks that form between the peds as the soils dry. Pricklypear cactus is conspicuous in this community.

In contrast to the HCPC, total annual production averages about 475 lbs/ac. However, western and thickspike wheatgrasses and green needlegrass still contribute 70% of the annual production. However, they are less vigorous and individual plant growth is reduced from what it is in the HCPC. Production of the short grasses and lower-successional forbs increases slightly to what it was in

the HCPC. Although total shrub production did not change, production of silver sagebrush tends to replace production of winterfat and Nuttall saltbush.

Plant community A is called a "pre-threshold community". It is critical that this community be recognized and strategies implemented to prevent further regression. Although this community can improve to the HCPC through successional processes, further disturbance will result in regression to a lower state (State #2). Once Community A regresses to a lower state, normal successional processes are restricted.

(Insert Plant Community A photo)

Plant Community B (State #1):

NRCS range inventories indicate that Community B is characterized by similarity indices of 45-64%. The Community is dominated by a mix of medium and short grasses. Blue grama, threadleaf sedge, needleandthread and sandberg bluegrass increased in the community by replacing some of the mid grasses. However, western and thickspike wheatgrass and green needlegrass continued to contribute about 50% of the total annual production (average of 375 lbs/ac.).

In comparison to the HCPC, sandberg bluegrass, blue grama, and other short grasses have increased. In addition, sand dropseed and tumblegrass may appear in the community. Warm season forbs increase and replace American vetch and other high-successional forbs. The warm season half-shrub, fringed sagewort, may also increase in this community. Pricklypear cactus and broom snakeweed are conspicuous.

In comparison to the HCPC, litter varies from 25-35%. Bare ground increases to 50-60%. Thus, rills, flow patterns and movement of litter deposits are visible.

Plant community B is called a "pre-threshold community". It is critical that this community be recognized and strategies implemented to prevent further regression. Although this community can improve to the HCPC through successional processes, further disturbance will result in regression to a lower state (State #3). Once Community B regresses to a lower state, normal successional processes are restricted.

(Insert Plant Community B photo)

***Successional Pathways from Plant Communities A and B to HCPC:**
The Dense Clay 10-14" p.z. site is resilient within the Reference State. Normal growing conditions, the implementation of prescribed grazing, or the re-introduction of the natural fire regime will move Plant Communities A and B to the HCPC. This succession can occur within a couple of years.

***Transitions from Communities A & B to Plant Communities C & D:**
Plant Communities A & B are much less resistant to disturbance than the HCPC. Lower production, lower vegetative cover, less litter, and increased bare ground increases susceptibility to disturbance, stress etc. Extended drought and non-prescribed grazing are the most common causes of retrogression to either States #2 or #3.

Plant Community C (State #2):

Regression of Plant Community A crosses a threshold and results in Plant Community C. This community is a steady state, which is resistant to change. It is characterized by a significant reduction in production of medium-height, cool season grasses. The amount of bare ground increases significantly. The wheatgrasses contributed about 50% of total annual growth. Individual wheatgrass plants produce few seed heads and can be low in vigor. Similarity indices during the NRCS inventories on Fort Peck and Fort Belknap (2001-2004) were less than 35% for this Community. Pricklypear cactus, broom snakeweed and annual bromes are often common in this community. Total annual production averaged 325 lbs/ac, a 20% reduction from Community A.

Litter cover averages about 15%. Water flow patterns are numerous and there is moderate active pedestalling. Bare ground is moderately to much higher than expected. Compared to the HCPC, production of tall and medium height grasses has decreased, and bare ground has increased. The ecological processes of energy flow, hydrologic cycle, and nutrient cycle are disrupted.

(Insert Plant Community C photo)

Plant Community D (State #3):

Regression of Plant Community B ends in Plant Community D. This community is a steady state, which is resistant to change. It is characterized by a mix of warm and cool season short grasses. Blue grama, needleandthread and sandberg bluegrass are the most common plants. Western and thickspike wheatgrasses contribute about 15% to the total annual production. Production of low-successional forbs decreased relative to Community B. Total annual production usually varies from 250-300 lbs/ac during favorable years.

The NRCS inventories indicate a few winterfat and Nuttall saltbush plants persist in this community. However, dry weight production of these high-successional shrubs decreased relative to the dry weight production of broom snakeweed, pricklypear cactus and fringed sagewort.

(Insert Plant Community D photo)

***Successional Pathways Between Communities C and D:**
Differences in soil structure are largely responsible for the species composition of these two plant communities. Therefore, successional pathways between these communities are unlikely.

***Transition from Plant Communities C & D to Communities A & B:**
Plant communities C & D are resistant to significant succession. The adverse soil conditions and a theorized inadequate seed bank of high successional species greatly restrict potential for succession to State #1. Although succession usually does not occur within a reasonable length of time, anecdotal evidence indicates succession may occur with the combination of prescribed grazing, the resumption of a normal fire regime, and an extended period of favorable precipitation. Favorable environmental factors may favor succession of Plant Communities C and D to Plant Communities A and B, respectively. These possibilities are depicted by dashed arrows in the state and transition diagram.

In comparison to "normal" ecological sites (Silty 10-14" p.z., Clayey 10-14" p.z. and Sandy 10-14" p.z.) having soils > 20 inches in depth, the average annual aboveground production on this Dense Clay 10-14" p.z. ecological site is 50-60% less. Mechanical treatments and range seeding are not recommended on this site.

Ecological Site Interpretations

Animal Community

Livestock Management

The Dense Clay 10-14" p.z. ecological site is suited for livestock grazing. However, prescribed grazing management is needed. Forage production is limited by a hardpan and excessive sodium. 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 on soils with low shrink/swell potential. Grazing during early spring may result in soil compaction. Any additional factors reducing infiltration and increasing runoff on this site is a management concern. Shorter grazing periods, adequate periods of non-use following grazing to facilitate plant regrowth and an accumulation of litter are recommended.

The Dense Clay 10-14" p.z. ecological site that has large peds (aggregates) in the surface soil does not have a significant component of short grass species. The blocky clods and large cracks are not conducive for the growth of shallow-, lateral-rooted short grasses. In contrast, the soils without the large peds do have a short grass component as the site transitions from HCPC to other plant communities. The short grasses usually increase with grazing and decrease with adequate plant rest and recovery periods found in prescribed grazing management systems. However, succession in direct response to a change in grazing pressure 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, seeding and/or mechanical treatment are not recommended.

Wildlife Interpretations

The HCPC associated with the Dense Clay 10-14" p.z. 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 magnets for many species of wildlife. Antelope and mule deer prefer grazing this site because of the Nuttall saltbush and winterfat, which are high in protein and palatable year-round. However, the landscape does not provide adequate thermal and escape cover. The lack of species diversity limits the value of the site for many 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.

The Dense Clay 10-14" p.z. ecological site becomes less valuable for deer and antelope when plant diversity declines with regression. For example, the disappearance of either the tall warm season grass or cool season grasses would shorten the length of the "green forage" season and reduce the standing residual height. The increase of blue grama, clubmoss, hoods phlox etc. is also associated with the loss of palatable forbs. These changes tend to adversely impact foraging opportunities for deer, antelope, upland birds, etc. Although Communities C and D have very little value for most wildlife species because of insufficient vegetative structural diversity, residual grass carry-over and litter cover, their habitat is critical for such species as the upland plover.

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

Water is the main factor limiting vegetative production on this site. Soil components in this ecological site are normally classed into 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 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 provides hunting opportunities for upland game species. Photographers are able to capture the beauty of big bare areas with huge cracks, and the blossoms of pricklypear cactus.

Wood Products

This site has no significant value for wood products.

Other 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. 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.

Supporting Information

Associated Sites The following sites may be found in association with the Dense Clay 10-14" p.z. ecological site. The Site ID indicates in which Rangeland Resource Units (RRU) these sites occur. For example, Site ID R052XN162MT occurs in RRU 52XN.

Site Name	Site ID	Site Narrative
Clayey 10-14" p.z.	R052XN162MT	soils >20 inches in depth, higher production, and no hardpan, different species composition
Shallow to Gravel 10-14" p.z.	R052XN176MT	similar position in landscape, soils with depth restriction that limits available moisture, soils 10-20" deep to sands or loamy sands
Shallow Clay 10-14" p.z.	R052XN179MT	soils 10-20" deep to bedrock, soils are clayey over clayey shale
Saline Upland 10-14" p.z.	R052XN170MT	does not have a very hard layer near surface, plant community contains salt-tolerant species

Similar Sites

Site Name	Site ID	Site Narrative
Dense Clay 10-14" p.z.	R052XC206MT R053AE073MT	
Clay Pan 10-14" p.z.	R052XN086MT	has 2-8" of soil over the hard argillic layer, less bare ground, and higher production

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	2	1991, 1992	MT	Phillips
ECS-1				
Modified Double Sampling*	30	2001-1004	MT	Blaine, Phillips, Valley Daniels, Roosevelt

*The range inventories on Fort Peck and Belknap Reservations mapped thousands of acres of the Dense Clay range site. The inventory data indicated significant production of needleandthread and blue grama. The actual occurrence of these species on the Dense Clay 10-14" p.z. site needs to be verified in the field. It is suggested that the field review examine the relationship between the current and past mapping and classification of soils into the Dense Clay, Clay Pan and the former Panspots range sites.

USDA-SCS-MT 1981 Technical Range Site Description

Type Locality

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

Relationship to Other Classifications:

Other References

Brand, M.D. and H. Goetz. 1986. Vegetation of exclosures in Southwestern North Dakota. J. Range Manage. 39:434-437.

Briske, D. D., S. D. Fuhlendorf, and F. E. Smeins, 2005. State-and-transition models, thresholds, and rangeland health: a synthesis of ecological concepts and perspectives. Rangeland Ecol. Manage 58:1-10.

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.

Heitschmidt, R. K., K. D. Klement, and M. R. Haferkamp. 2005. Interactive effects of drought and grazing on Northern Great Plains rangelands. Rangeland Ecol. Manage. 58:11-19.

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.

Vogel, W.G. and G.M. Van Dyne. 1966. Vegetation responses to grazing management on a foothill sheep range. J. Range Manage. 19:80-85.

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Site Description Revisions

The 2005 Dense Clay 10-14" p.z. ecological site description replaces earlier dated versions of the Dense Clay 10-14" p.z. and Panspots 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
Dr. John Lacey	02/28/2005	Loretta J. Metz	03/19/2005

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