

FORAGE SUITABILITY GROUP CLAYEY SUBSOIL

FSG No.: G060AY210SD

Major Land Resource Area: 60A - Pierre Shale Plains and Badlands

Physiographic Features

The clayey group of soils is predominately found in upland positions including hill slopes, piedmonts, sedimentary plains, alluvial fans and fan remnants, and stream terraces. Some are also found on flood plains and drainage ways.

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	2600	3300
Slope (percent):	0	15
Flooding:		
Frequency:	None	Frequent
Duration:	None	Brief
Ponding:		
Depth (inches):		
Frequency:	None	None
Duration:	None	None
Runoff Class:	Medium	Very high

Climatic Features

This group occurs in a mid-continental climate characterized by wide seasonal temperature and precipitation fluctuations and extremes.

Annual precipitation varies widely from year to year in MLRA 60A. Average annual precipitation for all climate stations listed below is about 15 inches. About 77 percent of the annual precipitation occurs during the months of April through September. On average there are about 24 days with greater than .1 inches of precipitation during that same time period. Precipitation is less than needed for optimum forage production and is the single largest factor limiting production from this group on non-irrigated lands.

Average annual snowfall ranges from 25 inches at Newell, South Dakota (SD,) to 45 inches at Oelrichs, SD. Snow cover at depths greater than 1 inch range from 40 days at Newell, SD, to 82 days at Colony, Wyoming (WY.)

Average July temperatures across the MLRA are about 74⁰F and average January temperatures are about 20⁰F. Recorded temperature extremes in the MLRA during the years 1961 to 1990 are a low of -47 at Redbird, WY, and a high of 114 recorded at Oelrichs, SD. The MLRA lies mostly in USDA Plant Hardiness Zones 4a and 4b.

At Rapid City, SD, the closest station with records, it is cloudy about 139 days a year. Average morning relative humidity in June is about 78 percent and average afternoon humidity is 49 percent.

The climate data listed in the tables below represent high and low ranges and averages for the climate stations and dates listed. For additional climate data access the National Water and Climate Center at <http://www.wcc.nrcs.usda.gov>.

	From	To
Freeze-free period (28 deg)(days): (9 years in 10 at least)	118	137
Last Killing Freeze in Spring (28 deg): (1 year in 10 later than)	May 26	May 14
Last Frost in Spring (32 deg): (1 year in 10 later than)	Jun 07	May 26
First Frost in Fall (32 deg): (1 year in 10 earlier than)	Sep 02	Sep 13
First Killing Freeze in Fall (28 deg): (1 year in 10 earlier than)	Sep 11	Sep 21
Length of Growing Season (32 deg)(days): (9 years in 10 at least)	96	117
Growing Degree Days (40 deg):	4231	4913
Growing Degree Days (50 deg):	2400	2852
Annual Minimum Temperature:	-30	-20
Mean annual precipitation (inches):	14	17

Monthly precipitation (inches) and temperature (F):

2 years in 10:	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
Precip. Less Than	0.11	0.09	0.30	0.65	1.05	1.04	1.06	0.52	0.37	0.38	0.20	0.15
Precip. More Than	0.49	0.74	1.27	2.50	4.02	4.63	2.98	2.22	1.68	1.62	0.89	0.66
Monthly Average:	0.33	0.42	0.83	1.71	2.69	2.78	1.99	1.47	1.24	1.03	0.53	0.41
Temp. Min.	5.3	10.9	20.0	30.6	40.5	49.8	56.3	53.2	41.7	29.9	18.2	6.5
Temp. Max.	34.3	40.5	49.5	61.5	71.8	82.5	91.2	89.8	79.0	65.6	48.3	36.3
Temp. Avg.	19.9	25.3	34.0	45.8	56.0	66.0	73.6	71.5	60.2	48.0	33.5	22.0

<u>Climate Station</u>	<u>Location</u>	<u>From</u>	<u>To</u>
SD0236	Ardmore, SD	1961	1990
SD6054	Newell, SD	1961	1990
SD6212	Oelrichs, SD	1961	1990
SD8911	Wasta, SD	1961	1990
SD9537	Zeona, SD	1961	1990
WY1905	Colony, WY	1961	1990
WY7555	Redbird, WY	1961	1990

Soil Interpretations

The clayey subsoil group consists of well drained, moderately deep to very deep, medium to fine textured soils formed from fine textured alluvium and materials weathered from shale, mudstone, and other sedimentary rock formations. Available water capacity ranges from low to high, and permeability is mostly slow and very slow.

Some of these soils have medium surface textures, but all have clayey subsoils. Also, many of them are slightly saline.

Drainage Class:	Well drained	To	Well drained
Permeability Class: (0 - 40 inches)	Moderately slow	To	Very slow
Frost Action Class:	Low	To	Low

	<u>Minimum</u>	<u>Maximum</u>
Depth:	20	
Surface Fragments >3" (% Cover):	0	3
Organic Matter (percent): (surface layer)	0.5	4.0
Electrical Conductivity (mmhos/cm): (0 - 24 inches)	0	8
Sodium Absorption Ratio: (0 - 12 inches)	0	15
Soil Reaction (1:1) Water (pH): (0 - 12 inches)	5.6	9
Available Water Capacity (inches): (0 - 60 inches)	3	12
Calcium Carbonate Equivalent (percent): (0 - 12 inches)	0	23

Adapted Species List

The following forage species are considered adapted to grow on the soils in this group. Additional information concerning plant characteristics of a number of the listed species as well as individual cultivars of many of those species can be accessed on the web at <http://www.plants.usda.gov>.

	<u>Dryland</u>	<u>Irrigated</u>
Cool Season Grasses		
Altai wildrye	F	NS
Crested wheatgrass	G	NS
Green needlegrass	G	NS
Intermediate wheatgrass	G	G
Meadow brome	F	G
Orchardgrass	NS	G
Pubescent wheatgrass	G	G
Russian wildrye	G	NS
Smooth brome	F	G
Streambank wheatgrass	F	NS
Thickspike wheatgrass	F	NS
Western wheatgrass	G	NS
Warm Season Grasses		
Big bluestem	F	G
Little bluestem	F	NS
Sideoats grama	G	NS
Switchgrass	F	G
Legumes		
Alfalfa	G	G
Birdsfoot trefoil	NS	G
Canada milkvetch	F	NS
Cicer milkvetch	G	F
Purple prairieclover	F	NS
Red clover	NS	G
Sainfoin	F	NS
White prairieclover	F	NS

G - Good adaptation for forage production on this group of soils in this MLRA

F - Fair adaptation but will not produce at its highest potential

NS - Species is not adapted to the site and should not be planted

Production Estimates

Production estimates listed here should only be used for making general management recommendations. Onsite production information should always be used for making detailed planning and management recommendations.

The high forage production estimates listed below are based on dense, vigorous stands of climatically adapted, superior performing cultivars. They are properly fertilized for high yields and pest infestations are kept below economic thresholds. Mechanical harvests are managed to maintain stand life by cutting at appropriate stages of maturity and harvest intervals. If grazed, optimum beginning and ending grazing heights are adhered to. Adequate time is allowed for plant recovery before entering winter dormancy under both uses.

The production estimates listed below represent total annual above ground plant production on an air-dry-matter basis. Estimates of hay and grazing yields can be calculated from these numbers by multiplying them by a harvest efficiency. A 70 percent harvest efficiency is commonly used when converting to hay yields. Pasture harvest efficiency is highly dependent on the grazing management system applied, ranging from 25 to 50 percent.

Forage Crop	Dryland		Irrigated	
	Management Intensity		Management Intensity	
	<u>Low</u> (lbs/ac)	<u>High</u> (lbs/ac)	<u>Low</u> (lbs/ac)	<u>High</u> (lbs/ac)
Alfalfa	2000	4300		
Alfalfa/Crested wheatgrass	1700	4000		
Alfalfa/Intermediate wheatgrass	1700	4000	8600	14300
Alfalfa/Pubescent wheatgrass	1700	4000	8600	14300
Alfalfa/Smooth brome grass			8600	14300
Crested wheatgrass	1400	3100		
Intermediate wheatgrass	1400	3100	6900	11400
Pubescent wheatgrass	1400	3100	6900	11400
Smooth brome grass			6900	11400

Forage Growth Curves

Growth curves estimate the seasonal distribution of growth of the various forage crops. They indicate when the forages may be available for grazing or mechanical harvest.

Growth Curve Number: SD0003
Growth Curve Name: Irrigated Alfalfa
Growth Curve Description: Irrigated Alfalfa, statewide

Percent Production by Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
0	0	0	5	25	25	20	15	10	0	0	0

Growth Curve Number: SD0004
Growth Curve Name: Cool season grass
Growth Curve Description: Cool season grass, statewide

Percent Production by Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
0	0	0	10	40	30	10	5	5	0	0	0

Growth Curve Number: SD0005
Growth Curve Name: Warm season grass
Growth Curve Description: Warm season grass, statewide

Percent Production by Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
0	0	0	0	10	40	35	15	0	0	0	0

Growth Curve Number: SD0002
Growth Curve Name: Alfalfa
Growth Curve Description: MLRA 65, 64, 60A

Percent Production by Month

<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
0	0	0	5	35	35	15	5	5	0	0	0

Soil Limitations

The primary limiting factors to these soils are their tight, slowly permeable nature, and the slight salinity of the subsoils of some soils. Because of their slow water intake, runoff is increased causing the soils to be droughty. This will be especially apparent on those soils with lower available water holding capacity. On steeper slopes, water erosion is a potential problem during establishment, when renovating stands, and in thin established stands. Livestock trail erosion is a potential problem in established stands.

Management Interpretations

The impact on yields due to the tight, slowly permeable nature of these soils, and slight salinity in some of their subsoils can be reduced by selecting species adapted to those soil conditions when establishing new stands or renovating stands. Including sod forming grass species in stands, especially on steeper slopes will reduce the potential for sheet and rill erosion. Incorporate erosion control practices during the establishment period. Properly locating facilitating practices such as fences, lanes, and water developments can help control livestock movement, reduce trailing perpendicular to steeper slopes, and evenly distribute grazing pressure.

FSG Documentation

Similar FSG's:

<u>FSG ID</u>	<u>FSG Narrative</u>
G060AY800SD	Claypan soils have elevated salinity, sodicity, and/or alkalinity and are less productive.

Inventory Data References

Agriculture Handbook 296-Land Resource Regions and Major Land Resource Areas
Natural Resources Conservation Service (NRCS) National Water and Climate Center data
USDA Plant Hardiness Zone Maps
National Soil Survey Information System (NASIS) for soil surveys in South Dakota, Nebraska, Wyoming, and Montana counties in MLRA 60A
South Dakota, Nebraska, Wyoming, and Montana NRCS Field Office Technical Guides
NRCS National Range and Pasture Handbook
Various Agricultural Research Service, Cooperative Extension Service, and NRCS research trials for plant adaptation and production.

State Correlation

This site has been correlated with the following states: MT, NE, SD, WY

Forage Suitability Group Approval

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