FORAGE SUITABILITY GROUP
Limy Upland

FSG No.: **G060AY400SD**
Major Land Resource 60A - Pierre Shale Plains and Badlands

Physiographic Features
The soils in this group are mostly found on upland slopes and ridges, piedmonts, and fans.

	Minimum	Maximum
Elevation (feet):	2600	3300
Slope (percent):	0	15
Flooding:		
Frequency:	None	None
Duration:	None	None
Ponding:		
Depth (inches):		
Frequency:	None	None
Duration:	None	None
Runoff Class:	Low	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% 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.

Average annual snowfall ranges from 25 inches at Newell, 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, WY.

Average July temperatures across the MLRA are about 74 degrees F., and average January temperatures are about 20 degrees F. 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% and average afternoon humidity is 49%.

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):	118	137
(9 years in 10 at least)		
Last Killing Freeze in Spring (28 deg):	May 26	May 14
(1 year in 10 later than)		
Last Frost in Spring (32 deg):	Jun 07	May 26
(1 year in 10 later than)		

	From	To
First Frost in Fall (32 deg):	Sep 02	Sep 13
(1 year in 10 earlier than)		
First Killing Freeze in Fall (28 deg):	Sep 11	Sep 21
(1 year in 10 earlier than)		
Length of Growing Season (32 deg)(days):	96	117
(9 years in 10 at least)		
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:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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

Climate Station	Location	From	To
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

These are moderately deep to very deep, well drained, medium to moderately fine textured soils with elevated calcium carbonate levels near the soil surface. Permeability ranges from low to moderate, and available water capacities range from low to high.

Drainage Class:	Well drained	To	Well drained
Permeability Class:	Slow	To	Moderate
(0 - 40 inches)			
Frost Action Class:	Low	To	Moderate

	Minimum	Maximum
Depth:	20	
Surface Fragments >3" (% Cover):	0	3
Organic Matter (percent):	0.5	2.0
(surface layer)		
Electrical Conductivity (mmhos/cm):	0	8
(0 - 24 inches)		
Sodium Absorption Ratio:	0	13
(0 - 12 inches)		
Soil Reaction (1:1) Water (pH):	7.4	8.4
(0 - 12 inches)		
Available Water Capacity (inches):	4	12
(0 - 60 inches)		
Calcium Carbonate Equivalent (percent):	0	28
(0 - 12 inches)		

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

Cool Season Grasses	Dryland	Irrigated
Altai wildrye	F	
Crested wheatgrass	G	
Green needlegrass	F	
Intermediate wheatgrass	F	
Newhy hybrid wheatgrass	F	
Pubescent wheatgrass	G	
Russian wildrye	G	
Streambank wheatgrass	G	
Thickspike wheatgrass	G	
Western wheatgrass	G	

Warm Season Grasses	Dryland	Irrigated
Big bluestem	F	
Little bluestem	G	
Prairie sandreed	F	
Sideoats grama	G	

Legumes	Dryland	Irrigated
Alfalfa	G	
Cicer milkvetch	G	
Purple prairieclover	F	
Sainfoin	F	
White prairieclover	F	

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

Production Estimates

Production estimates listed here should only be used for making general management recommendations. On site 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	Management Intensity Low (lbs/ac)	High (lbs/ac)
Alfalfa	2300	4300
Alfalfa/Crested wheatgrass	1700	3700
Alfalfa/Intermediate wheatgrass	2000	4000
Alfalfa/Pubescent wheatgrass	2000	4000
Crested wheatgrass	1700	2900
Intermediate wheatgrass	1700	2900
Pubescent wheatgrass	1700	3700

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, state wide

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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, state wide

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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, state wide

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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

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

Soil Limitations

The primary limitation to the soils in this group is the high lime content close to the soil surface. The lime reduces the availability of some plant nutrients. This reduces species choices and yield potential. Also, because most of these are sloping soils, they are subject to water and wind erosion, especially when establishing or renovating stands. They also tend to be droughty, especially those with lower available water capacity.

Management Interpretations

The impact on yields can be reduced by selecting forage species that are tolerant of the high lime levels inherent to these soils, and also to droughty conditions. Including sod forming grass species in stands, especially on steeper slopes will reduce the potential for sheet and rill erosion. Incorporate both wind and water 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 FSGs:

FSG ID	FSG Narrative
G060AY100SD	Loamy soils do not have as high a lime content near the surface and are more 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:

Original Author:	Tim Nordquist
Original Date:	4/17/02
Approval by:	Dave Schmidt
Approval Date:	