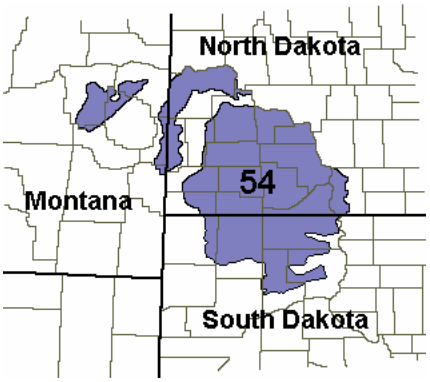
FORAGE SUITABILITY GROUP (FSG)

Clayey Subsoil

FSG No.: G054XY210ND

Major Land Resource Area (MLRA): 54 - Rolling Soft Shale Plain



Physiographic Features

The soils in this group are found on sedimentary and till plains, fans, terraces, and flood plains.

	Minimum	Maximum
Elevation (feet):	1600	3600
Slope (percent):	0	15
Flooding:		
Frequency:	None	Occasional
Duration:	None	Brief
Ponding:		
Depth (inches):		
Frequency:	None	None
Duration:	None	None
Runoff Class:	Low	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 54. Average annual precipitation for all climate stations listed below is about 17 inches. About 78 percent of that occurs during the months of April through September. On average, there are about 25 days with greater than .1 inches of precipitation during the 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 23 inches at McLaughlin, South Dakota (SD), to 48 inches at Glad Valley, SD. Snow cover at depths greater than 1 inch range from 20 days at Bison, SD, to 92 days at Hebron, North Dakota (ND).

Average July temperatures are about 71°F and average January temperatures are about 13°F. Recorded temperature extremes in the MLRA during the years 1961 to 1990 are a low of -49°F at Breien, ND, and a high of 111 recorded at Hettinger, ND. The MLRA lies in USDA Plant Hardiness Zones 3b, 4a, and 4B.

At Bismarck, the closest station with such records, the average morning relative humidity in June is about 84 percent and average afternoon humidity is 55 percent. It is cloudy an average of 165 days a year.

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)	108	140
Last Killing Freeze in Spring (28 deg): (1 year in 10 later than)	May 31	May 12
Last Frost in Spring (32 deg): (1 year in 10 later than)	Jun 07	May 23
First Frost in Fall (32 deg): (1 year in 10 earlier than)	Aug 29	Sep 11
First Killing Freeze in Fall (28 deg): (1 year in 10 earlier than)	Sep 07	Sep 23
Length of Growing Season (32 deg)(days): (9 years in 10 at least)	93	122
Growing Degree Days (40 deg):	3774	4647
Growing Degree Days (50 deg):	2033	2700
Annual Minimum Temperature:	-35	-20
Mean annual precipitation (inches):	16	18

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	0.12	0.10	0.32	0.56	1.08	1.75	0.92	0.76	0.37	0.22	0.13	0.16
Precip. More Than	0.80	0.80	1.61	3.17	4.32	4.95	3.48	2.76	2.29	1.72	0.91	0.96
Monthly Average:	0.33	0.36	0.81	1.90	2.66	3.22	2.19	1.68	1.45	1.00	0.74	0.41
Temp. Min.	-2.0	4.4	16.0	28.7	40.2	50.1	54.6	52.2	41.4	31.0	16.8	3.0
Temp. Max.	27.2	32.9	43.3	58.9	70.8	80.7	89.2	88.1	76.2	63.4	44.0	29.9
Temp. Avg.	12.7	18.5	29.2	43.4	55.1	64.9	71.3	69.5	57.9	46.4	30.1	16.5

Climate Station	Location	From	To
ND0766	Beulah, ND	1961	1990
ND1052	Breien, ND	1961	1990
ND1370	Carson, ND	1961	1990
ND2183	Dickinson, ND	1961	1990
ND2365	Dunn Center, ND	1961	1990
ND4102	Hebron, ND	1964	1990
ND4178	Hettinger, ND	1961	1990
ND5479	Mandan Exp Station, ND	1961	1990
SD0701	Bison, SD	1961	1990
SD2429	Dupree, SD	1961	1990
SD2852	Faith, SD	1961	1990
SD3316	Glad Valley, SD	1961	1990
SD4864	Lemmon, SD	1961	1990
SD5046	McLaughlin, SD	1961	1990
SD5381	McIntosh, SD	1961	1990
SD8528	Usta, SD	1961	1990

Soil Interpretations

This group consists mostly of well drained, medium to fine textured soils, formed in residuum or alluvium and other sediments. Some of these soils are loamy on the surface, but all have clayey subsoils. Permeability is moderately slow to slow.

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

	Minimum	Maximum
Depth:	20	
Surface Fragments >3" (% Cover):	0	3
Organic Matter (percent):	1.0	6.0
Electrical Conductivity (mmhos/cm): (0 - 24 inches)	0	16
Sodium Absorption Ratio: (0 - 12 inches)	0	15
Soil Reaction (1:1) Water (pH): (0 - 12 inches)	6.1	9
Available Water Capacity (inches): (0 - 60 inches)	3	11
Calcium Carbonate Equivalent (percent): (0 - 12 inches)	0	13

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 at http://plants.usda.gov/

Cool Season Grasses	Symbol	Adapted
Altai wildrye	LEAN3	F
Crested wheatgrass	AGCR	G
Dahurian wildrye	ELDA3	G
Green needlegrass	NAVI4	G
Intermediate wheatgrass	THIN6	F
Meadow bromegrass	BRBI2	G
Newhy hybrid wheatgrass		G
Pubescent wheatgrass	THIN6	F
Russian wildrye	PSJU3	G
Siberian wheatgrass	AGRF	F
Slender wheatgrass	ELTR7	G
Smooth bromegrass	BRINI2	F
Tall wheatgrass	THPO7	F
Western wheatgrass	PASM	G
Warm Season Grasses		
Blue grama	BOGR2	G
Little bluestem	SCSC	F
Sideoats grama	BOCU	F
Switchgrass	PAVIV	F

Legumes	Symbol	Adapted
Alfalfa	MESA	G
American vetch	VIAM	F
Canada milkvetch	ASCAC6	F
Cicer milkvetch	ASCI4	F
Purple prairieclover	DAPUP	F
Sweetclover	MELIL	G
White clover	TRRE3	F
White prairieclover	DACAC	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. 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	Management Intensity	
	High (lbs/ac)	Low (lbs/ac)
Alfalfa	6000	2500
Alfalfa/Crested wheatgrass	4900	1700
Alfalfa/Intermediate wheatgrass	4900	2400
Alfalfa/Pubescent wheatgrass	4900	2400
Alfalfa/Smooth bromegrass	4900	2400
Crested wheatgrass	4000	1800
Green needlegrass	3000	1300
Intermediate wheatgrass	4300	1600
Smooth bromegrass	4300	1600
Western wheatgrass	3000	1300

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: ND0001
Growth Curve Name: Alfalfa
Growth Curve Description: Alfalfa

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	25	30	20	15	5	0	0	0

Growth Curve Number: ND0002
Growth Curve Name: Cool season grass
Growth Curve Description: Cool season grass

Percent Production by Month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	40	35	10	5	5	0	0	0

Growth Curve Number: ND0003
Growth Curve Name: Warm season grass
Growth Curve Description: Warm season grass

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

Soil Limitations

The primary limiting factors to these soils are there tight, slowly permeable nature. Because of their slow water intake runoff is increased causing the soils to be somewhat droughty. Water holding capacity ranges from moderate to high. Forage production on soils of moderate water holding capacity will be noticeably affected during dry growing seasons. 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 moderate 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.

Pasture and hayland can include considerations for wildlife. Delaying grazing on portions of the pasture or rotating pastures will allow nest initiation of grassland nesting birds or species of concern. Nest initiation of most grassland nesting birds occurs from April 15 to June 1. Delaying haying until after July 15 allows for most species to fledge their young. Consider planting species with later maturity to allow for harvesting after nests

have fledged. Avoid mowing around the field. Mow back and forth or from the inside to the outside of the field. Consider using flushing bars on swathers and mowers.

FSG Documentation

Similar FSG's:

FSG ID	FSG Narrative
G054XY800SD	Saline/Sodic - Dry 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 for soil surveys in North Dakota, South Dakota, and Montana counties in MLRA 54
NRCS North Dakota and Montana Field Office Technical Guide and South Dakota Technical Guide
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: Montana, North Dakota, and South Dakota

Forage Suitability Group Approval:

Original Author:	Tim Nordquist
Original Date:	2/25/03
Approval by:	Dave Schmidt
Approval Date:	9/15/04