

FORAGE SUITABILITY GROUP

CLAYEY, 10-14" ppt/ >90 Freeze Free Days

FSG No.: G058AG001MT

Major Land Resource Area: 058A -

Physiographic Features

In general the Forage Suitability Group sites in MLRA 58A can occur on nearly level to 15% slopes. Site elevations range from approximately 1600 feet to over 5000 feet. Typical of the diversity of the rolling high plains terrain, physiographic features vary widely. Semi-arid steppe occupies vast areas of the MLRA but is often dissected with naturally occurring ephemeral gullies, creek beds and Yellowstone or Missouri river tributaries. Land breaks near these tributaries and southern areas of the MLRA can be intermittently wooded with pine and some hardwoods. Knobs, buttes and other land features of resistant materials generally mark the landscape.

The Clayey FSGs occur on a variety of land formations, but occur predominantly on stream terraces, fans, drainageways, "bottomlands" or till and sedimentary plains.

	<u>Minimum</u>	<u>Maximum</u>
Elevation (feet):	1600	5000
Slope (percent):	0	15
Flooding:		
Frequency:	None	Occasional
Duration:	None	Brief
Ponding:		
Depth (inches):		
Frequency:	None	Occasional
Duration:	None	Brief
Runoff Class:	Low	Very high

Climatic Features

This forage suitability group (FSG) lies amidst a semi-arid northern grass prairie environment. Typical continental climate conditions exist with extremes in both temperature and rainfall intensity expected. Vast daily temperature fluctuations and desiccating winds can create rigorous evapotranspiration conditions and a severe over-winter environment for all vegetation communities and agronomic crop species selected as forages.

The Rocky Mountains to the west are distant enough so true chinook conditions are rare but down slope winds, gulf moisture and Canadian storm fronts often collide causing severe summer thunder storms, intense short duration rain events and hail.

Growth of native cool season plants begins in early April and continues to about the first of July depending on the year. Native warm season plants begin growth about mid-May and continue to mid-August. Adapted introduced grass and legume species can expand on native vegetation growing season windows to some degree. Some "green up" of cool season plants may occur in September and October of most years when moisture is present. Growing conditions that significantly affect the choice and establishment of forage species in this FSG are temperature extremes and lack of dependable insulating winter snow cover. The MLRA lies in USDA Plant Hardiness Zones 3a, 3b, 4a, 4b, and 5a.

Detailed information, which describes the physiography, groundwater, soils drainage and climate is available by referring to the local USDA-NRCS County Soil Survey. Site specific climatic data within MLRA 58A can be found at the following web site; <http://www.wrcc.sage.dri.edu/> OR <http://www.wcc.nrcs.usda.gov/cgibin/state.pl?state=mt>.

More than 100 climate stations are located within this MLRA. With such wide variations in climate information, the user should access the station closest to the site being evaluated.

Freeze-free period (28 deg)(days): 90 148
 (9 years in 10 at least)

Last Killing Freeze in Spring (28 deg):
 (1 year in 10 later than)

Last Frost in Spring (32 deg):
 (1 year in 10 later than)

First Frost in Fall (32 deg):
 (1 year in 10 earlier than)

First Killing Freeze in Fall (28 deg):
 (1 year in 10 earlier than)

Length of Growing Season (32 deg)(days): 79 130
 (9 years in 10 at least)

Growing Degree Days (40 deg):

Growing Degree Days (50 deg):

Mean annual precipitation (inches): 10 14

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
 Precip. More Than

Monthly Average: 0.51 0.36 0.70 1.32 2.27 2.33 1.58 1.15 1.26 1.08 0.55 0.46

Temp. Min.

Temp. Max.

Temp. Avg. 19.3 25.9 34.9 45.3 55.2 64.4 70.6 69.6 58.3 46.7 31.7 22.0

<u>Climate Station</u>	<u>Location</u>	<u>From</u>	<u>To</u>
MT4715	Knobs, MT	1971	2000
MT5303	MacKenzie, MT	1971	2000
MT6601	Plevna, MT	1971	2000
MT8169	Terry 21 NNW, MT	1971	2000
MT3939	Harlowton, MT	1971	2000
MT7263	Ryegate 18 NNW, MT	1971	2000
MT0466	Barber, MT	1971	2000
MT4522	Jordan, MT	1971	2000
MT1169	Brockway 3 WSW, MT	1971	2000
MT5754	Mizpah 4 NNW, MT	1971	2000

MT8607	Volborg, MT	1971	2000
MT1127	Broadus, MT	1971	2000
MT7740	Sonnette 2 WNW, MT	1971	2000
MT1297	Busby, MT	1971	2000
MT4364	Hysham 25 SSE, MT	1971	2000
MT0802	Billings Water Plant, MT	1971	2000
MT0807	Billings WSO, MT	1971	2000
MT0819	Birney, MT	1971	1999
MT1084	Brandenberg, MT	1971	2000
MT1758	Circle, MT	1971	2000
MT1905	Colstrip, MT	1971	2000
MT3013	Flatwillow 4 ENE, MT	1971	2000
MT3581	Glendive, MT	1971	2000
MT3915	Hardin, MT	1971	2000
MT4345	Huntley Experiment Stn, MT	1971	2000
MT4358	Hysham, MT	1971	2000
MT5690	Miles City FAA Airport, MT	1971	2000
MT5870	Moorhead 9 NE, MT	1971	2000
MT5872	Mosby 2 ENE, MT	1971	2000
MT6691	Powderville 8 NNE, MT	1971	2000
MT7136	Rock Springs, MT	1971	2000
MT7214	Roundup, MT	1971	2000
MT7234	Roy 24 NE Mobridge, MT	1971	1993
MT7728	Roy 8 NE, MT	1971	2000
MT8165	Terry, MT	1971	2000

Soil Interpretations

This FSG consists of moderately deep to very deep, well-drained, usually fertile soils formed in clayey alluvium. Electrical conductivity ranges from 0 to <4 mmhos/cm. Sodium absorption ratio is <13. Available water holding capacity is 3 to >9 inches. Calcium carbonate equivalent is <15 percent.

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

	<u>Minimum</u>	<u>Maximum</u>
Depth:	20	72
Surface Fragments >3" (% Cover):		
Organic Matter (percent): (surface layer)	0.5	5.0
Electrical Conductivity (mmhos/cm): (0 - 24 inches)	0	4
Sodium Absorption Ratio:	0	13

(0 - 12 inches)		
Soil Reaction (1:1) Water (pH):	5.5	8.5
(0 - 12 inches)		
Available Water Capacity (inches):	3	11
(0 - 60 inches)		
Calcium Carbonate Equivalent (percent):	0	15
(0 - 12 inches)		

Adapted Species List

The following forage species have been separated by common grouping methods which relate to principle growth period or taxonomic differences. Within these categories a further subdivision has been provided denoting whether the plant is native (N) or introduced (I) and recommended for dryland or irrigated conditions. Since some forages can be valuable when grown under dryland conditions but provide enhanced yield or additional cuttings when irrigated they may appear under both categories. Some species are more or less exclusive to only one management system and are represented as such. In the central area of MLRA 58A the adaptability of warm season native grasses diminishes.

<u>Cool Season Grasses</u>	<u>Scientific Symbol</u>	<u>Dryland</u>	<u>Irrigated</u>
Basin wildrye (N)	LECI4	YES	NO
Beardless wheatgrass (N)	PSSPI	YES	YES
Big bluegrass (N)	POSE	YES	YES
Creeping meadow foxtail (I) 1/	ALAR	NO	YES
Crested wheatgrass (I)	AGCR	YES	NO
Green needlegrass (N)	NAVI4	YES	NO
Hybrid wheatgrass (I) 2/	ELHO3	YES	NO
Indian ricegrass (N)	ACHY	YES	NO
Intermediate wheatgrass (I) 2/	THIN6	YES	YES
Meadow bromegrass (I)	BRBI2	NO	YES
Orchardgrass (I)	DAGL	NO	YES
Pubescent wheatgrass (I) 2/	THIN6	YES	YES
Russian wildrye (I)	PSJU3	YES	NO
Slender wheatgrass (N)	ELTR7	YES	YES
Streambank wheatgrass (N)	ELLA3	YES	NO
Tall fescue (I) 3/	LOAR10	NO	YES
Tall wheatgrass (I)	THPO7	YES	YES
Western wheatgrass (N)	PASM	YES	YES
<u>Warm Season Grasses</u>	<u>Scientific Symbol</u>	<u>Dryland</u>	<u>Irrigated</u>
Switchgrass (N)	PAVI2	YES	NO
<u>Legumes</u>	<u>Scientific Symbol</u>	<u>Dryland</u>	<u>Irrigated</u>
Alfalfa (I)	MESA	YES	YES
Alsike clover (I)	TRHY	NO	YES
Birdsfoot trefoil (I)	LOCO6	NO	YES
Cicer milkvetch (I)	ASCI4	NO	YES

<u>Other Perennial Forbs</u>	<u>Scientific Symbol</u>	<u>Dryland</u>	<u>Irrigated</u>
Maximilian sunflower (N)*	HEMA2	YES	NO
Purple/white prairieclover (N)*	DAPU5	YES	NO
Winterfat (N)*	KRLA2	YES	NO

<u>Annual Species</u>	<u>Scientific Symbol</u>	<u>Dryland</u>	<u>Irrigated</u>
Field peas (I)	PISAA2	YES	NO
Hay/feed barley (I)	HORDE	YES	YES
Hay/feed oats (I)	AVENA	YES	YES
Lentils (I)	LENS	YES	NO
Peas/small grain (I)	LATHY	YES	YES
Rye, wheat, spelt, triticale	TRITI	YES	YES

Adaptation of forages to this Forage Suitability Group (FSG) covers a relatively wide range of potentials from highly adapted to moderately well adapted. Since various cultivars within a specie can be more or less productive on a particular site within this FSG the species in general will be listed if it will thrive on one or more of these sites. It is up to the FSG (user) to determine the appropriate scope of adaptation the listed species (or their cultivars) have which will lead to their successful establishment and acceptable yields.

If site is determined to be deeply subirrigated (water table within 48 to 72 inches of soil surface), then irrigation may not be necessary, or if so, in limited amounts.

*These species only recommended for components of native mixtures.

- 1/ Can be grown on dryland if site is subirrigated
- 2/ Recommended only for upper end of 10-14" precipitation zone
- 3/ Endophyte-free

Production Estimates

The following data represents "best available estimates" from many sources on representative species adapted to this FSG. In time and as documented data acquisition allows, specific plot, field trial or field clipping information will be incorporated into this document.

All pasture production estimates are determined as initial stocking rates and developed by multiplying a predicted forage yield times an expected harvest efficiency of 30%, then dividing that value by 1 animal unit month's "consumption" (915 lbs air dry).

Production estimates represent total annual production.

<u>Forage Crop</u>	<u>Dryland</u>		<u>Irrigated</u>	
	<u>Low</u> (lbs/ac/yr)	<u>High</u> (lbs/ac/yr)	<u>Low</u> (lbs/ac/yr)	<u>High</u> (lbs/ac/yr)
Alfalfa	1000	2000	1750	3500
Alfalfa/ cool season grass	1000	2000	1750	3500
Cool season natives grown on former cropland	1000	2000		
Crested wheatgrass	800	1540		
Dryland sorghum-sudan hybrids	1000	1750		

Field peas/ oats, barley, millet	1000	2040		
Intermediate/ pubescent wheatgrass	600	1400	1100	2450
Lentils	800	1700		
Regar meadow brome/ orchard grass			1200	2450
Russian wildrye	1100	1800		
Warm season natives grown on former cropland	900	1500		

Pasture	<u>Dryland</u>		<u>Irrigated</u>	
	<u>Low</u> (AUMs/ac)	<u>High</u> (AUMs/ac)	<u>Low</u> (AUMs/ac)	<u>High</u> (AUMs/ac)
Alfalfa	0.3	0.7	0.6	1.1
Alfalfa/cool season grass	0.3	0.7	0.6	1.1
Cool season natives grown on former cropland	0.3	0.7		
Crested wheatgrass	0.3	0.5		
Dryland sorghum-sudan hybrids	0.3	0.6		
Field peas/ oats, barley, millet	0.3	0.6		
Intermediate/ pubescent wheatgrass	0.2	0.5	0.4	0.8
Lentils	0.3	0.6		
Regar meadow brome/ orchard grass			0.4	0.8
Russian wildrye	0.4	0.6		
Warm season natives grown on former cropland	0.3	0.5		

1 AUM = 915 lbs air-dry

Forage Growth Curves

Growth Curve Number: MT58AG02
Growth Curve Name: 10-14" dryland alfalfa, 1 cutting
Growth Curve Description:

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	20	30	20	0	10	20	0	0	0

Growth Curve Number: MT58AG04
Growth Curve Name: 10-14" dryland alfalfa (0-25%) with cool season grass(>75%)
Growth Curve Description:

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	20	30	15	10	5	20	0	0	0

Growth Curve Number: MT58AG06
Growth Curve Name: 10-14" logged ponderosa pine sites with cool season understory
Growth Curve Description:

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	35	40	10	0	5	0	0	0

Growth Curve Number: MT58AG08
Growth Curve Name: 10-14" dryland intermediate/ pubescent wheatgrass/Altai wildrye
Growth Curve Description:

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	45	35	5	0	5	0	0	0

Growth Curve Number: MT58AG09
Growth Curve Name: 10-14" dryland Russian wildrye
Growth Curve Description:

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	5	25	35	25	0	0	10	0	0	0

Growth Curve Number: MT58AG10
Growth Curve Name: 10-14" dryland crested and Siberian wheatgrass
Growth Curve Description:

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	5	25	55	10	0	0	5	0	0	0

Soil Limitations

The Clayey FSG is limited by permeability (moderately slow to very slow). This creates more potential for runoff and water erosion. Some soils within this FSG have a lower AWC (3-6"), which may decrease production of deep-rooted perennials, such as alfalfa, by approximately 25%. Also, moderately deep soils within this FSG are not recommended for irrigation or for use as pasture, but may be limited to use for reclaimed natives.

Management Interpretations

The impact on yields can be reduced by selecting species adapted to the tight, slowly permeable conditions of these soils when establishing new stands or renovating stands. To reduce the potential for sheet and rill erosion, especially on steeper slopes, include sod forming grass species in stands. Integrate both wind and water erosion control practices during the establishment period. Facilitating practices such as salting, water developments, fencing, trails, and herding can often be used effectively to change livestock behavior and use patterns.

While flooding events on these sites are not common, they can negatively impact plant growth if they occur in the spring or during growing season. Flooding duration, or how long the plant is under water, will have a greater impact on the plant than flooding frequency. Machinery and livestock also need to be excluded during these times to prevent wheel ruts, soil

compaction, and trampling.

Management can include considerations for wildlife. Timing of haying and livestock grazing can avoid peak nesting and fawning periods. Consider planting species with later maturity to allow nests to fledge before harvesting. Avoid mowing around the field; mow back and forth or from the inside to the outside of the field.

For detailed descriptions of management guidelines, refer to the NRCS Prescribed Grazing (528) and Pasture and Hay Planting (512) specifications.

Site Documentation

Similar Sites:

Similar FSG's:

FSG ID

G058AG009MT

FSG Narrative

Clayey, saline soils have elevated saline levels, which limit plant species selection and production.

Inventory Data References:

Inventory Data References:

- Agriculture Handbook 296 - Land Resource Regions and Major Land Resource Areas
- Natural Resources Conservation Service (NRCS) National Water and Climate Center
- National Soil Survey Information System (NASIS) for soil surveys in Montana
- NRCS National Range and Pasture Handbook
- NRCS Field Office Technical Guides
- Various Agricultural Research Service, Cooperative Extension Service, and NRCS research trials for plant adaptation and production
- "Dryland Pastures in Montana and Wyoming" Species and Cultivars, Seeding Techniques and Grazing Management, Montana State University, EB19
- "Salinity and Sodicity and North Dakota Soils", North Dakota State University, EB57-
USDA Plant Hardiness Zone Maps

State Correlation:

This site has been correlated with the following states:

MT

Forage Suitability Group Approval:

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Original Date: 10/26/2005

Approval by: Loretta J. Metz

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