Forage Suitability Group Description

Forage Suitability Group Type: Pasture
Forage Suitability Group Name: Droughty Soils
Forage Suitability Group Number: G002XN402WA
Major Land Resource Area-[MLRA][LRU]: 002XN
Willamette and Puget Sound Valleys, North Puget

The following Common Resource Areas are included in this Forage Management Zone [MLRA][LRU]. (reference Pasture TN-101 Forage Zones)

NATIONAL CRA	CRA_NAME
2.10	Fraser Lowland
2.11	Eastern Puget Riverine Lowlands
2.11	Eastern Puget Mountain River Valleys 2.14
2.12	San Juan Islands
2.13	Olympic Rainshadow
2.5	Eastern Puget Uplands
2.6	Central Puget Lowland

For more information on MLRA's, refer to the following web site:
http://www.essc.psu.edu/soil_info/soil_lrr/
Additional information on Common Resource Areas is available on the eFOTG for NRCS-Washington: http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WA
and the following website:
http://soils.usda.gov/survey/geography/cra.html

These forage suitability groups occur in the North Puget Trough Zone of MLRA 2. This zone includes the lowlands surrounding Puget Sound and along the Strait of Juan de Fuca. This zone is bordered by the Cascade Mountains to the east and north and the Olympic Mountains to the west. Elevation ranges from sea level to approximately 500 feet.
This zone has been repeatedly glaciated. The Puget Sound Valley consists of nearly level lacustrine deposits as well as dissected glacial till and glacial outwash. River valley floodplains are overlain with alluvial deposits.
The average annual precipitation ranges from 18 to 60 inches, although most areas range from 30 to 50 inches. Annual precipitation less than 30 inches occurs in the rainshadow of the Olympic Mountains along the western border of this area. Higher average annual precipitation, 50 to 60 inches, occurs next to the foothills of the surrounding mountains. Most of the precipitation occurs as low-intensity, Pacific frontal storms (75%-fall and winter, 15%-spring.) Rain turns to snow at the higher elevations, although accumulations are usually small and of short duration. Summers are cool and dry. See the climate tables in this document for information on temperatures and frost-free periods.
The soils have a mesic soil temperature regime, a xeric soil moisture regime, and mixed mineralogy. Soils vary widely in their characteristics and range from moderately deep to very deep, very poorly drained to excessively drained, and sandy or gravelly to loamy or clayey. Nearly level, somewhat poorly drained, poorly drained, and moderately well drained soils formed in lacustrine sediments on terraces. Somewhat excessively drained soils formed in outwash sediments and alluvium on terraces and moraines. Moderately well drained soils formed in till on till plains and moraines. Gently sloping to steep, well drained soils formed in colluvium and residuum on foothills. Moderately well drained soils formed in a mixture of till, loess, and volcanic ash on hills.
This area supports forest vegetation in many places, upland and wet prairie vegetation in some places, and savanna vegetation in others. Much of the vegetation in this zone was prehistorically managed by fire, which is now rare, resulting in increasing cover by trees and brush. Douglas-fir is the dominant tree species. Bigleaf maple, western red cedar, and grand fir and red alder also are common. Stands of cottonwoods and willows grow on overflow channels, streambanks, and islands. Oregon white oak is present in native prairies and savannahs, although it grows slowly as it is near the northern edge of its ecological range. Red and western fescues, camas, biscuitroot and sedges are common in the prairies and savannas. Forest understory species include tall Oregon-grape, Indian plum, snowberry, hazel, oceanspray, serviceberry, rose, swordfern, dwarf Oregon-grape, and thimbleberry.

Physiographic Descriptions

	Minimum	*Average*	*Maximum*
Elevation (feet):	0		500

Slope (percent): 4 9 14

The soil series correlated to this Forage Suitability Group predominantly occur on these landforms.

plains	hillslopes	hills	terraces	outwash plains	dunes
33%	17%	16%	8%	5%	5%

Climatic Descriptions

Growing Season by Common Resource Area- Frost Free & Freeze Free (32, 28, & 24 degrees Fahrenheit

Common Resource Area		Probability	24 degrees F or lower From	24 degrees F or lower To	28 degrees F or lower From	28 degrees F or lower To	32 degrees F or lower From	32 degrees F or lower To
2.10	Last freezing temperature in spring	5 year in 10 later than--	2/10	3/2	3/11	4/1	4/18	4/28
2.10	First freezing temperature in fall	5 yr in 10 earlier than--	11/24	12/6	11/10	11/5	10/10	10/22
2.11	Last freezing temperature in spring	5 year in 10 later than--	1/31	2/4	2/28	4/5	4/15	4/8
2.11	First freezing temperature in fall	5 yr in 10 earlier than--	12/10	12/5	11/14	11/9	10/14	10/29
2.12	Last freezing temperature in spring	5 year in 10 later than--	1/26	1/26	2/17	2/17	3/20	3/20
2.12	First freezing temperature in fall	5 yr in 10 earlier than--	12/27	12/27	11/29	11/29	11/10	11/10
2.13	Last freezing temperature in spring	5 year in 10 later than--	2/5	2/5	3/11	3/11	4/14	4/14
2.13	First freezing temperature in fall	5 yr in 10 earlier than--	12/12	12/12	11/19	11/19	10/27	10/27
2.14	Last freezing temperature in spring	5 year in 10 later than--	2/18	2/18	3/23	3/23	4/30	4/30
2.14	First freezing temperature in fall	5 yr in 10 earlier than--	12/6	12/6	11/13	11/13	10/15	10/15
2.3	Last freezing temperature in spring	5 year in 10 later than--	1/19	1/19	2/19	2/19	4/4	4/4
2.3	First freezing temperature in fall	5 yr in 10 earlier than--	1/7	1/7	12/1	12/1	11/7	11/7
2.5	Last freezing temperature in spring	5 year in 10 later than--	2/17	2/17	3/18	3/18	4/18	4/18
2.5	First freezing temperature in fall	5 yr in 10 earlier than--	12/11	12/11	11/12	11/12	10/22	10/22
2.6	Last freezing temperature in spring	5 year in 10 later than--	1/15	12/29	2/22	3/7	3/12	4/6
2.6	First freezing temperature in fall	5 yr in 10 earlier than--	1/1	12/15	11/21	12/9	10/20	11/15

CRA:		From	To
2.10	**Growing Degree Days (40 degrees):**	**3780**	**4099**
	Annual Temperature Extremes (deg. F):	**-1**	**107**
	Mean annual precipitation (inches):	**36**	**46**
2.11	**Growing Degree Days (40 degrees):**	**3239**	**4616**
	Annual Temperature Extremes (deg. F):	**-1**	**107**
	Mean annual precipitation (inches):	**33**	**48**
2.12	**Growing Degree Days (40 degrees):**	**4226**	**4226**
	Annual Temperature Extremes (deg. F):	**-1**	**107**
	Mean annual precipitation (inches):	**27**	**27**
2.13	**Growing Degree Days (40 degrees):**	**3898**	**3898**
	Annual Temperature Extremes (deg. F):	**-1**	**107**
	Mean annual precipitation (inches):	**22**	**22**
2.14	**Growing Degree Days (40 degrees):**	**4240**	**4240**
	Annual Temperature Extremes (deg. F):	**-1**	**107**
	Mean annual precipitation (inches):	**66**	**66**

2.3	Growing Degree Days (40 degrees):	3735	3735
	Annual Temperature Extremes (deg. F):	-1	107
	Mean annual precipitation (inches):	26	26
2.5	Growing Degree Days (40 degrees):	4460	4460
	Annual Temperature Extremes (deg. F):	-1	107
	Mean annual precipitation (inches):	49	49
2.6	Growing Degree Days (40 degrees):	4356	4679
	Annual Temperature Extremes (deg. F):	-1	107
	Mean annual precipitation (inches):	37	90

Climate Report: Monthly Averages for MLRA-MLRU (Forage Management Zone within a MLRA)

Monthly Precipitation (inches) and Temperature (degrees Fahrenheit):

Month	Min. Daily Temp.	Max. Daily Temp	Avg. Daily Temp.	2 years in 10 Precip. less than	2 years in 10 Precip. greater than	Monthly Avg. Precip.	Avg. Snow(in.)
October	42	60	51	1.7	5.5	3.7	0
November	37	50	44	3.7	9.1	6.5	1
December	34	45	39	4.0	8.6	6.3	2
January	33	45	39	3.1	8.2	6.2	2
February	35	49	42	2.8	6.4	4.6	1
March	37	53	45	2.7	5.6	4.2	0
April	40	59	49	2.0	4.1	3.1	0
May	45	64	55	1.4	3.5	2.5	0
June	49	69	59	1.1	3.0	2.0	0
July	52	74	63	0.5	2.0	1.3	0
August	53	75	64	0.4	2.2	1.4	0
September	48	70	59	0.6	3.5	2.1	0
					TOTALS:	44	6

Number of days per year with at least 1 inch of snow on the ground:

Least # Days	Avg. # Days	Most # Days
0	3	9

Climate Stations by Common Resource Area

CRA	Station	record from	record to
2.10	BELLINGHAM 2 N	1961	1984
2.10	BELLINGHAM FCWOS AP	1961	1990
2.10	BLAINE	1961	1990
2.10	CLEARBROOK	1961	1990
2.11	KENT	1961	1990
2.11	ARLINGTON		
2.11	EVERETT JR COLLEGE	1961	1990
2.11	MOUNT VERNON 3 WNW	1961	1990
2.11	PUYALLUP 2 W EXP STN	1961	1990
2.11	SEDRO WOOLLEY 1 E	1961	1990
2.12	ANACORTES	1961	1990
2.13	COUPEVILLE 1 S	1961	1990
2.14	STARTUP 1 E	1961	1990
2.3	PORT ANGELES	1961	1990
2.3	CHIMACUM 4 S		
2.5	MONROE	1961	1990
2.6	BREMERTON	1961	1990
2.6	SEATTLE JACKSON PARK	1961	1985
2.6	SEATTLE TCOMA WSCMO AP	1961	1990
2.6	SHELTON	1961	1990
2.6	CUSHMAN POWERHOUSE 2		

For local climate stations that may be more representative, refer to http://www.wcc.nrcs.usda.gov

Representative Soil Features

These soils typically are coarse textured with high amounts of sand and gravel, resulting in low available water holding capacity in the rooting zone. Due to the limited water holding capacity of the soil profile caused by the sandy or gravelly parent material, there is significantly declining forage production during early June and almost no production July through early October.

	MINIMUM	*MAXIMUM*
Depth (inches):	**36**	**70**
Surface Fragments 3-10" (% cover):	**0**	**38**
Surface Fragments > 10" (% cover):	**0**	**3**
Organic Matter % (surface):	**0.05000000075**	**75**
Organic Matter % (0-12 inches):	**0**	**18**
Electrical Conductivity mmhos/cm:	**-**	**-**
Sodium Absorption Ratio: (0-12 inches)	**-**	**-**
Soil Reaction (1:1) Water (pH) (0-12 inches):	**4.8**	**7.0**
Cation Exchange Capacity (%) (0-12 inches):	**1.0**	**44.0**
Calcium Carbonate Equivalent (%) (0-12 inches):	**-**	**1.0**
Available Water Capacity (inches) (0-40 inches):	**0.7**	**4.7**

Characteristic Soil Series

Dominant Series

The soil series with the dominant acres correlated to this Forage Suitability Group are listed below. The Forage Suitability Group has been correlated to soil series encompassing approximately 397000 acres.

Everett	Hoypus	Indianola	Ragnar	Pilchuck	Puyallup
28%	10%	10%	9%	6%	5%

SOIL SERIES CORRELATED TO THIS FSG - SORTED ALPHABETICALLY

Barneston	Barneston	Barnhardt	Birdsview	Carlsborg	Carlsborg	Carlsborg	Carlsborg	Carstairs	Cathcart	Cathcart
Cathcart	Dick	Dick	Ebeys	Ebeys	Everett	Everett	Everett	Everett	Everett	Everett
Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett
Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett	Everett
Greenwater	Grove	Grove	Guemes	Hiddenridge	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus
Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	Hoypus	

Influencing Water Features

	Minimum	*Maximum*
Flooding Frequency Class:	None	Frequent
Water Table Depth (April-June):	26	46
HYDRIC Rating:	No	Yes
Drainage Class:	Excessively drained	Moderately well drained
Ponding Frequency:	None	None
Ponding Duration:		
Ponding Depth:		

Adapted Species

The following species are considered adapted for the soils in this Forage Suitability Group for the uses checked.

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://plants.usda.gov/. NRCS-WA Plant Materials Technical Note 1 provides additional information on species adapted to western Washington conditions.

Soil type / *Plant*	*Grazing only or Grazing-Hay*	*Exclusively for Hay or Silage*	*Winter-Early Spring Pasture*	*Exercise or Confinement Area*	*Temporary Cover*
Excessively drained, very dry in summer.					
Alfalfa	☑	☑	☐	☐	☐
Annual Ryegrass	☐	☐	☑	☑	☑
Austrian Winter Peas	☐	☐	☐	☐	☑
Barley	☐	☐	☐	☐	☑
Bentgrass	☑	☐	☐	☑	☐
Cereal Rye	☐	☐	☐	☐	☑
Fine Fescue	☐	☐	☐	☑	☐
Oats	☐	☐	☐	☐	☑
Orchardgrass	☑	☑	☑	☐	☐
Perennial Ryegrass	☐	☐	☑	☑	☑
Red Clover	☑	☑	☐	☐	☐
Spring Wheat	☐	☐	☐	☐	☑
Tall Fescue	☑	☑	☑	☑	☐
Timothy	☐	☑	☐	☐	☐
Triticale	☐	☐	☐	☐	☑
White Clover	☑	☑	☐	☐	☐
Winter Wheat	☐	☐	☐	☐	☑

Production Estimates

Yield Estimations and Yield Adjustments: This table gives guidance for estimating potential hay yields for soils with varying management factors as compared to soils under a high level of management. A high level of management typically includes factors such as: selection of the proper species and suitable high-yielding plant varieties; proper seeding rates and seedbed preparation; appropriate and timely harvest; control of weeds, plant diseases, harmful insects; and optimum levels of soil fertility. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yield estimate for fields with a high level of management is listed in the soil survey for each soil map unit. This is found in Section 2 of the electronic Field Office Technical Guide (eFOTG). Use the potential yield listed in the eFOTG as a starting point when evaluating actual estimated yield for the field through inventory tools. In this section of the Forage Suitability Group, yield interpretations have been developed for several typical types of management in the area, expressed as a percentage of the potential yield under high management listed in the EFOTG Soil Survey.

The term “organic fertility” as used in this table is mechanically applied manures or composts, rather than manure directly deposited by grazing animals. Pastured lands differ from cropland and hayland in that nutrients are recycled within their boundaries. Most of the nutrients consumed are used to maintain the animal and are excreted. Grazing cattle excrete 75 percent of the nitrogen (50 percent of N is lost due to volatilization, 37.5percent returned to the ground), 80 percent of the phosphorus and 85 percent of the potassium. The nutrients may not be distributed evenly, but the nutrients are continually returned as long as the pasture is occupied by livestock. On cropland and hayland, all nutrients in the harvested crop leave the field.

The following yield interpretations should be used only as a guide, actual field yield estimations should be developed using inventory tools.

Low Management, moderate-high fertility: Harvest regime is too early for optimal forage quantiy or too late for optimal hay quality, fertility in soil is naturally high or amended as needed.

Low fertility, moderate-good management: Harvest regime is optimal for forage quality and quantity, fertility in soil is not amended to meet forage plant needs

High organic fertility, high management: Harvest regime is optimal for forage quality and quantity, manures or compost is mechanically applied to meet crop nutrient needs

Irrigated, high fertility or organic fertility, high management: Harvest regime is optimal for forage quality and quantity, manures or compost is mechanically applied to meet crop nutrient needs, irrigation is applied to meet crop moisture needs.

Effective drainage, high organic fertility, high management: Harvest regime is optimal for forage quality and quantity, manures or compost is mechanically applied to meet crop nutrient needs, and soil drainage is installed to minimize cropping limitations.

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 harvested plant production (hay yields- Tons/Acre) on an air-dry-matter basis.

			Irrigated	**Effective Drainage**
Low Management	**Moderate-Good Management**	**High Management**	**High Management**	**High Management**
Moderate-High Fertility	**Low Fertility**	**High Organic Fertility**	**High Fertility or Organic Fertility**	**High Organic Fertility**
0.5	0.75	1.5	2	N/A

FSG-Yield-Minimum - Average - Maximum of Soils Correlated to this Forage Suitability Group

Production Estimates Distribution

1 Tons/ Acre	1_5 Tons/ Acre	2 Tons/ Acre	2_5 Tons/ Acre	3 Tons/ Acre	3_5 Tons/ Acre	4 Tons/ Acre	4_5 Tons/ Acre	5 Tons/ Acre	5_5 Tons/ Acre	6 Tons/ Acre
3%	23%	50%	8%	8%	5%	2%				

	Pasture Yield: AUMS/Acres				
Hay Yield: Tons/Acre	Harvest Efficiency: see Harvest Efficiency Table For Grazing				
	0.25	0.35	0.45	0.55	0.65
1	*0.8*	*1.1*	*1.4*	*1.7*	*2.1*
1.5	*1.2*	*1.7*	*2.1*	*2.6*	*3.1*
2	*1.6*	*2.2*	*2.9*	*3.5*	*4.1*
2.5	*2.0*	*2.8*	*3.6*	*4.4*	*5.2*
3	*2.4*	*3.3*	*4.3*	*5.2*	*6.2*
3.5	*2.8*	*3.9*	*5.0*	*6.1*	*7.2*
4	*3.2*	*4.4*	*5.7*	*7.0*	*8.3*
4.5	*3.6*	*5.0*	*6.4*	*7.9*	*9.3*
5	*4.0*	*5.6*	*7.1*	*8.7*	*10.3*
6	*4.8*	*6.7*	*8.6*	*10.5*	*12.4*
7	*5.6*	*7.8*	*10.0*	*12.2*	*14.4*
8	*6.3*	*8.9*	*11.4*	*14.0*	*16.5*
9	*7.1*	*10.0*	*12.9*	*15.7*	*18.6*
10	*7.9*	*11.1*	*14.3*	*17.5*	*20.6*

Instructions: Find the estimated hay yield, determine the grazing system being applied (Harvest Efficiency Table for Grazing). Use the AUMS/Acre from the appropriate Harvest Efficiency Column.

Harvest Efficiency For Grazing - Total Season Per Herd1		
Number of Pasture Paddocks	**Approximate Days on Each Field**	**Grazing Efficiency**
Continuous	**>14 days**	**<=30%**
4 pasture	**9 day**	**35-45%**
5 pasture	**7 day**	**45-50%**
8 pasture	**4 day**	**50-60%**
24 pasture	**1 day**	**65%+**

Forage Growth Curves

These curves represent the average percent of total production that grows during that month.

Growth Curve Number	Growth Curve Name	Growth Curve Description
WA1222	Puget Trough Lowlands-Droughty/Limited Depth Soils	Droughty or limited depth soils (available water-holding capacity generally < 4.5"/40" soil depth)

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
6	3	1	3	8	14	22	19	17	6	0	1

Growth Curve Number	Growth Curve Name	Growth Curve Description
WA1224	Puget Trough Lowlands-Irrigated/Subirrigated	Irrigated fully to meet crop needs, or fully sub-irrigated in summer

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	2	1	1	2	6	10	17	16	15	14	11

Pasture Calendar for Western Washington

Month	Portion of Month	Vancouver/Cowlitz Basin		Puget Lowland		Foothills	Coastal Valleys
Soil Moisture Status during growing season:		Droughty to adequate	Optimal	Droughty to adequate	Optimal	all	all
MLRA or Common Resource Area:		2.3, 2.4	2.1, 2.2, 2.3, 2.9	2.6 - 2.8, 2.10 - 2.13		1.1, 1.2, 1.3, 1.5, 2.5, 4a.3, 4a.5, 3.1	4a.1, 4a.2
Ecozone Map region:		3d	2i, 3a, 3b, 3c	2c, 2d, 2e, 2f, 2g	2a, 2b	1c, 1d, 1e, 4a, 1g, 1h	1a, 1b, 1c, 1e, 1f
September **	1st 1/2	1	1	1	2a	2a	2a
September **	2nd 1/2	1	1	1/2a	2b	2a	2a
October	1st 1/2	2a	2a	2a	2b	2b	2a
October	2nd 1/2	2b	2b	2b	2b	2b	2b
November	1st 1/2	2b	2b	2b	2b	3	2b
November	2nd 1/2	3	3	3	3	3	2b
December	1st 1/2	3	3	3	3	4	2b
December	2nd 1/2	4	4	4	4	4	3
January	1st 1/2	4	4	4	4	4	4
January	2nd 1/2	5	4	4	4	4	5
February	1st 1/2	5	5	5	4	4	5
February	2nd 1/2	6a	5	5	5	4	6a
March	1st 1/2	6a	6a	6a	5	5	6a
March	2nd 1/2	6b	6a	6a	6a	5	6a
April	1st 1/2	6b	6b	6b	6a	6a	6b
April	2nd 1/2	6b	6b	6b	6b	6b	6b
May	1st 1/2	6b	6b	6b	6b	6b	6b
May	2nd 1/2	6b	6b	6b	6b	6b	6b
June	1st 1/2	7	7	7	6b	6b	6b
June	2nd 1/2	7/8	7/8	7	7	6b	6b
July	1st 1/2	9	9	8	8	7	7
July **	2nd 1/2	10	9	9	8	7	7
August **	1st 1/2	10	10	10	9	8	8
August **	2nd 1/2	10	10	10	9	9	8

** Dependent on soil moisture and precipitation. Water will maintain growth or break dormancy.

Description of Grassland Growth Period

Period	Title	Brief Description
1	***Semi-dormancy***	Recovering from summer dormancy, root growth
2a	***Steady regrowth***	New green sprigs with much brown, root growth
2b	***Steady regrowth***	Looks mostly green with little brown, root growth
3	***Declining regrowth***	Slowing plant top & root growth, tops may yellow
4	***Very slow growth***	Plants semi-dormant, maintenance growth
5	***Increasing growth***	Plant uses reserves to increase growth of shoots & roots
6a	***Rapid growth - cool soils***	Plant uses reserves as in 5, above, but at a faster rate
6b	***Rapid growth - warming so***	Tops show rapid growth, quality declines w/o harvest
7	***Slowing growth***	Top growth slows, managed harvest maintains quality
8	***Steady growth***	Less top growth, root shedding begins
9	***Slow growth***	Rapid root shedding, drought/heat may start dormancy
10	***Dormancy***	Dormancy w/o irrigation, stubble mgmt critical for regrow

Pasture Calendar Summary

Pasture Calendar Summary

	Growth Activity	Environment	Management Action	Avoid these Actions
1 Semi-dormancy	Limited growth unless irrigated; root growth starts; growing points developing; protein increasing; carbohydrates being stored in stem bases; winter weeds sprout	Rains return; temperatures cooler, esp. at night; days shorter; soils warm	Fall soil test, lime or fertilize; use confinement area.	Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers. Over-fertilization
2a Steady regrowth	New green growth with much brown; roots and growing points establishing and growing; carbohydrates stored in stem bases; high protein and carbohydrate levels, highest digestibility of the year.	Day length decreasing (fall equinox), regular rains; soil and air temperatures cool; soil nitrogen mineralization increasing if moisture available.	Fall soil test, lime or fertilize; use confinement area	Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers. Over-fertilization
2b Steady regrowth	Mostly green with little brown, root growth continues; high protein and carbohydrate levels, highest digestibility of the year.	Soil nitrogen mineralization rapid, steady rainfall; soils cool further.	Fall soil test, lime; monitor soils for saturation and remove livestock to avoid compaction; use confinement area.	Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers. Over-fertilization
3 Declining regrowth	Slowing forage and root growth; root shedding; tops yellow; protein levels drop, carbohydrate levels remain high	Short day length slows forage growth; heavy rains; soil nutrients less available; flooding possible on low-lying fields.	Use confinement area.	Grazing or equipment use on saturated soils. Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers. Over-fertilization
4 Very slow growth	Semi-dormant; maintenance growth; root shedding; protein levels drop, carbohydrate levels stay high	Short days; cold air temperatures; heavy rains; soil nutrients less available; soil temperatures cool; flooding possible on low-lying fields.	Use confinement area. Start tracking T-Sum.	Grazing or equipment use on saturated soils. Over fertilization. Grazing below increased residual heights: 4 inches-bunchgrasses, 3 inches-sodformers.
5 Increasing growth	Stem base reserves used for shoot and root growth; production increasing; protein and carbohydrate levels low.	Day length increasing; air temperatures warming; soil nutrients increasingly available after T-Sum 200 but mineral deficiency symptoms may occur due to cool soils; soils warming and drying	Monitor T-Sum. First application of nutrients and lime. Check for weed problems. Use confinement area.	Grazing or equipment use on saturated soils. Over fertilization. Grazing below increased residual heights: 4 inches-bunchgrasses, 3 inches-sodformers.
6a Rapid growth - cool soils	Stem base reserves used for shoot and root growth at a faster rate; seedhead developing; protein and carbohydrate levels low; digestibility high, fiber low.	Day length increasing (spring equinox); air temperatures increasing, nights cool; soils cool; soil nutrients increasingly available.	Apply nutrients and lime if not previously done; use confinement area; overseed confinement areas; reseed scheduled pastures; control weeds.	Grazing or equipment use on saturated soils. Over fertilization. Grazing below increased residual heights: 4 inches-bunchgrasses, 3 inches-sodformers.
6b Rapid growth - warming soils	Rapid growth; quality declines w/o harvest; seedheads emerging; regrowth rapid; root growth slowing, carbohydrate levels increasing in lower leaves and stem; digestibility high, fiber low.	Day length significantly longer; air temperatures increasing; nights cool, but not frosting; soils warming; soils nutrients more available, but may not meet plant needs.	1st/2nd application of nutrients and lime; reseed scheduled pastures; over-seed confinement areas; control weeds.	Grazing or equipment use on saturated soils. Over fertilization. Grazing below increased residual heights: 4 inches-bunchgrasses, 3 inches-sodformers.
7 Slowing growth	Slowing growth, mostly from vegetative tillers; digestibility lower but still high quality; seedheads emerge on late species such as timothy; regrowth time increasing; root growth slowing, carbohydrate levels declining.	Longest days of the year (summer solstice); soil moisture adequate but less available; air temperatures warming day and night; soil temperatures warming; soil nutrients very available.	Monitor growth rates; control weeds; monitor irrigation needs; 2nd/3rd application of nutrients. Cut hay before mature seed-setting phase.	Grazing below increased residual heights: 4 inches-bunchgrasses, 3 inches-sodformers.
8 Steady growth	Less forage growth, root shedding begins; protein levels adequate; carbohydrate levels decline; digestibility lower and fiber higher; lack of moisture and high temperatures slows growth, may start dormancy.	Air temperatures (day and night) and soil temperatures are warm; little rainfall; evaporation increases.	Monitor growth rates. Use confinement area if stubble height can't be maintained. Cut hay before mature seed-setting phase.	Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers.
9 Slow growth	Rapid root shedding; forage growth slowing; drought/heat result in very little growth or start dormancy; protein levels adequate, low carbohydrate levels, digestibility improving	Air temperatures usually higher than optimum for forage growth; little rainfall; soil temperatures warm, day length decreasing.	Use confinement area to maintain stubble height. Cut hay before mature seed-setting phase.	Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers.
10 Dormancy	Dormancy w/o soil moisture or irrigation; protein levels adequate, carbohydrate levels low and static because no growth is occurring.	Day length decreasing; air temperatures peak; little or no rainfall; soil temperatures peak	Use confinement area to maintain stubble height..	Grazing below minimum residual heights: 3 inches-bunchgrasses, 2 inches-sodformers.

Forage Suitability Group Interpretations

Grazing Management Interpretations

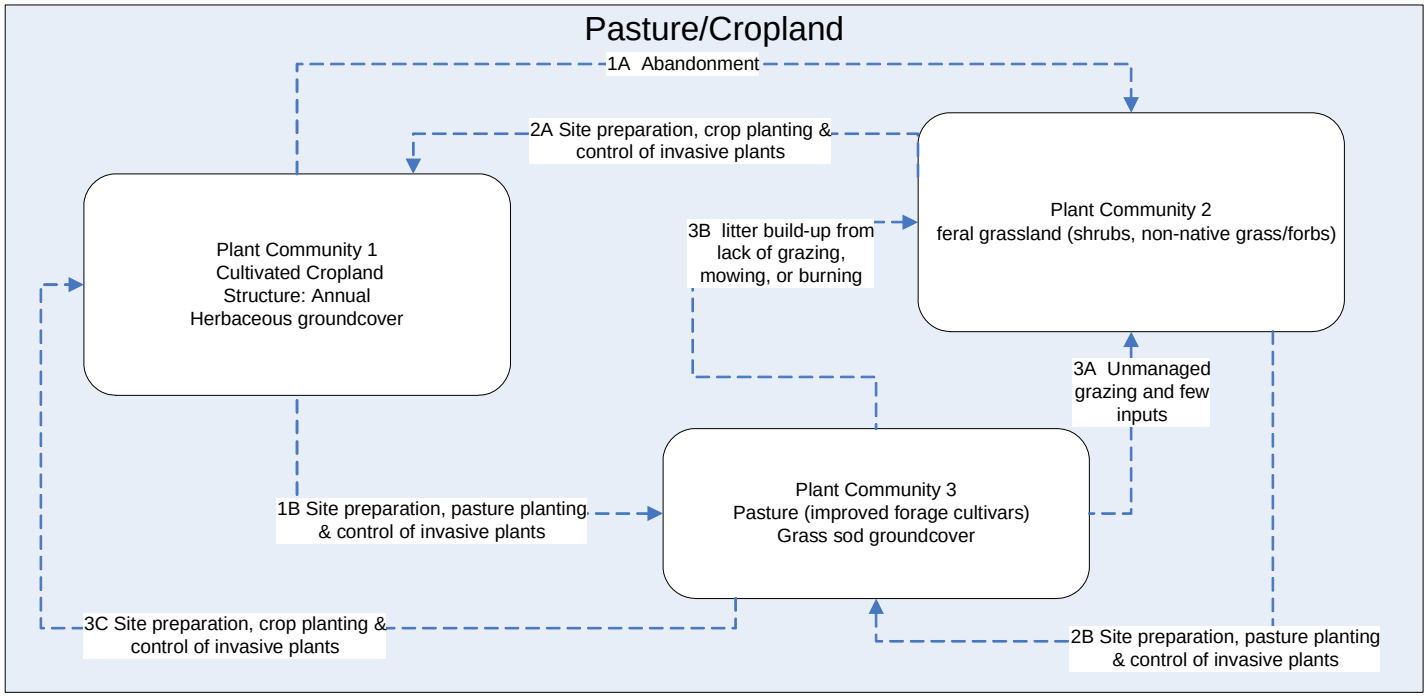
Management Limitations: Because of the coarse soil material, there is also an increased risk for leaching of fertilizers and other chemicals below the root zone.
Management Advantages: Often this is a good site for spring and fall pasture, because the soils are rarely saturated and livestock can graze early and late forage growth with minimal soil compaction. These soils also tend to warm up a little earlier in the spring, and forage often starts growth here slightly sooner than on heavier soils. This can also be a good site for winter confinement areas if the pasture is on a gentle slope, although some plant damage can occur, and supplemental feed will be required.

Wildlife Interpretations

Management of Improved Grassland for Wildlife Habitat

Grasslands in western Washington are important habitats for many wildlife species. They provide feed, cover and nesting habitat. Improved grasslands are especially important for grazing animals, because this habitat provides palatable, highly nutritious feed during critical seasons of the year. Elk and wintering waterfowl use this habitat extensively when it is available, as do several native butterfly species. Management to produce high quality livestock forage will also produce nutritious forage for wildlife. These management activities include designing grazing systems, haying or mowing scheduling, and timing of fertilizer applications to produce leafy green stems during the target feeding period.

Cropland Pastureland Plant Community



Agroecology of the Cropland-Pastureland Plant Communities

An agronomic ecosystem is constrained by the climate and the soil resource, including soil biota. The soil and vegetative components are inseparably connected through interacting ecological processes of (1) hydrology (the capture, storage, and redistribution of precipitation); (2) energy capture (conversion of sunlight to plant and animal matter); and (3) nutrient cycling (the cycle of nutrients through the physical and biotic components of the environment). The functioning of the management unit ecosystem is evalutated using the Pasture Condition Scoresheet. All management actions must be accomplished within the constraints imposed by the management unit ecosystem. On pastured lands, the system is driven by the grazing management regime that is applied. On cropped (machine harvested) lands, the system is driven by planting and harvesting regimes. Cropped and pastured agronomic ecosystems in western Washington typically consist of three general plant communities depending on planting and harvesting regimes (by grazing animal or machine). A complete lack of management inputs or intentional tree planting will result in a return to dominance by coniferous or coniferous and deciduous species.

Plant Community Number: 1 **Common Name:** Cultivated

Structure: Cropland

Plant Community 1 consists of a range of crops, including: annually planted species such as cereal grains, corn, vegetable crops and flowers; short-lived perennials such as strawberries; and more permanent shrubby crops such as caneberries, blueberries, grapes and woody herbs.

Pathway

A Gradual- In the absence of agronomic activities seeds from surrounding disturbed communities will be transported to the site through factors such as wind, flood water, animals or vehicle traffic.

B Abrupt - Agronomic activities such as tillage, addition of significant fertility or other soil amendments such as lime, mowing, burning, harvest or chemical control of vegetation, planting the site to grassland

Plant Community Number: 2 **Common Name:** Feral Grassland & Shrubland

Structure: Grasses, forbs and/or shrubs

Plant Community 2 is characterized by a low level of agronomic inputs such as added fertility, intensive grazing management, clipping or weed control. This plant community is dominated by introduced species, such as velvetgrass (Holcus lanatus), bentgrass (Agrostis spp.), sweet vernalgrass (Anthoxanthum odoratum), tall oatgrass (Arrhenatherum elatius), red fescue (Festuca rubra), Canada bluegrass (Poa compressa), and various introduced weedy forbs. Sites with extremely low fertility or heavy grazing pressure will have a higher proportion of annual species such as medics (Medicago spp.), annual bluegrass (Poa annua), soft chess (Bromus mollis), and annual fescues (Vulpia spp.). Wetland areas are often dominated by reed canarygrass (Phalaris arundinaceae) and meadow foxtail (Alopecurus pratensis). This plant community can include remnants of commonly seeded introduced pasture species such as orchardgrass (Dactylis glomerata), tall fescue (Schedonorus arundinacea), timothy (Phleum pratense), big trefoil (Lotus uliginosis), red clover (Trifolium pratense) and white clover (Trifolium repens).

Pathway

A Abrupt-Agronomic activities such as tillage, addition of significant fertility or other soil amendments such as lime, chemical control of vegetation and planting the site to cultivated crop.

B Abrupt-Agronomic activities such as tillage, addition of significant fertility or other soil amendments such as lime, chemical control of vegetation and planting the site planting the site to improved forage species.

Plant Community Number: 3 **Common Name:** Improved Grassland

Structure: Grasses and forbs

Plant Community 3 receives regular agronomic inputs such as added fertility or other soil amendments such as lime, intensive grazing management or clipping and weed control. This plant community includes commonly seeded introduced pasture species such as orchardgrass (Dactylis glomerata), perennial ryegrass (Lolium perenne), tall fescue (Schedonorus arundinacea), timothy (Phleum pratense), big trefoil (Lotus uliginosis), red clover (Trifolium pratense), white clover (Trifolium repens) and alsike clover (Trifolium hybridum). Wetland areas often also support reed canarygrass (Phalaris arundinaceae) and meadow foxtail (Alopecurus pratensis). Additional introduced species that commonly occur in Feral Grassland and Shrub Communities (see Community 2, above) will also occur in this community, although in minor amounts.

Pathway

A Gradual-Overgrazing and a lack of agronomic activities, such as added fertility, clipping or weed control causes a shift in species composition away from desirable forage species.

B Gradual-Lack of grazing and clipping results in excessive litter buildup favoring those species better suited to low fertility and excessive litter conditions. These species may include velvetgrass (Holcus lanatus), bentgrass (Agrostis spp.), sweet vernalgrass (Anthoxanthum odoratum), tall oatgrass (Arrhenatherum elatius), red fescue (Festuca rubra), Canada bluegrass (Poa compressa), and various introduced weedy forbs.

C Abrupt-Agronomic activities such as tillage or chemical control of vegetation, addition of significant fertility or other soil amendments such as lime and planting the site to cultivated crop

Supporting Information

Associated Sites:

There are seven Forage Suitability Groups (FSG) developed for each MLRA-LRU:

Series	FSG Name	FSG Description
100	Wet Soils	Soils with a high water table (less than 6" below soil surface) for a significant portion of the year
200	Seasonally Wet Soils	Soils with a seasonal high water table within 12" of the soil surface
300	Limited Depth Soils	Soils with a dense layer or bedrock generally less than 36 inches below the soil surface
400	Droughty Soils	Soils with low available water-holding capacity and without modifying factors such as a high water table or summer moisture
500	Very Productive Agricultural Soils	Soils with good available water-holding capacity, & no slope, high water table, or tillage restrictions.
600	Moderately Productive Agricultural Soils	Soils with moderate available water-holding capacity, moderate slope or tillage restrictions, but generally without a high water table.
700	Sloping to Steep Soils	Soils with moderate available water-holding capacity, no high water table restrictions, but slope > 8% causes management restrictions.

State Correlation:

Inventory Data References

Type Locality

Relationship to Other Established Classifications:

Level IV Ecoregions of the Conterminous United States

Other References:

- Christy, John A., J.S. Kagan, and A.M. Wiedemann. 1998. Plant Associations of the Oregon Dunes National Recreation Area. USDA Forest Service Pacific Northwest Region, Technical Paper R6-NR-ECOL-TP-09-98. http://oregonstate.edu/ornhic/publications.html
- Christy, John. 1993. Classification of Native Wetland Plant communities in Oregon Oregon Natural Heritage Program. http://oregonstate.edu/ornhic/plants/index.html
- Early Spring Forage Production for Western Oregon Pastures Jan 2004. http://extension.oregonstate.edu/catalog/pdf/em/em8852-e.pdf
- Floberg, J., M. Goering, G. Wilhere, C. MacDonald, C. Chappell, C. Rumsey, Z. Ferdana, A. Holt, P. Skidmore, T. Horsman, E. Alverson, C. Tanner, M. Bryer, P. Iachetti, A. Harcombe, B. McDonald, T. Cook, M. Summers, D. Rolph. 2004. Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment, Volume One: Report. Prepared by The Nature Conservancy with support from the Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre. http://conserveonline.org/docs/2004/06/WPG_Ecoregional_Assessment.pdf http://www.ecotrust.org/placematters/assessment.html
- Franklin, J.L. & C.T. Dyrness. 1988. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis OR.
- Fransen, S., G. Pirelli, M. Chaney, and L. Brewer. 2003. The Westside Pasture Calendar. Oregon State Univ. Ext. Bull., Corvallis, OR (in review).
- Jagtenberg, W.D. Predicting the Best Time to Apply Nitrogen to Grassland in Spring. 1970. Journal of the British Grassland Society, vol 25, no 4. pp 266-270.
- Omernik, J.M. and A.L. Gallant.. 1986. Ecoregions of the Pacific Northwest. United States Environmental Protection Agency, Corvallis, OR. EPA/600/3-86/033.
- Pater, D.E., S.A. Bryce, T.D. Thorson, J. Kagan, C. Chappell, J. Omernik, S.H. Azevedo, and A.J. Woods. Ecoregions of Western Washington and Oregon. Map. United States Environmental Protection Agency, and other state and federal co-operators, Corvallis, OR. 1998
- Thiele, S., D.E. Pater, T.D. Thorson, J. Kagan, C. Chappel;, and J. Omernik. 1981. Level III and IV Ecoregions of Oregon and Washington. Map. United States Environmental Protection Agency, and other state and federal co-operators, Corvallis, OR.
- USDA-Natural Resources Conservation Service, Various Published Soil Surveys.
- USDA-Natural Resources Conservation Service. National Soil Information System, Information Technology Center, 2150 Centre Avenue, Building A, Fort Collins, CO 80526. (http://nasis.Natural Resources Conservation Service.usda.gov)
- USDA-Natural Resources Conservation Service. National Water and Climate Center, 101 SW Main, Suite 1600, Portland, OR 97204-3224. (http://wcc.Natural Resources Conservation Service.usda.gov)
- USDA-Natural Resources Conservation Service. 1997 revised 2003. National Range and Pasture Handbook. Washington, DC. USDA. 2005.
- USDA-Natural Resources Conservation Service. 2001. The PLANTS Database, Version 3.1 (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- USDA-Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States. Agriculture Handbook 296b DRAFT. Washington, DC.
- USDA-Soil Conservation Service. 1981. Land Resource Regions and Major Land Resource Areas of the United States. Agriculture Handbook 296. Washington, DC.
- Washington State Department of Natural Resources. Washington Natural Heritage Program. 2006. Plant Associations in Washington's Puget Trough Ecoregion. http://www.dnr.wa.gov/nhp/refdesk/communities/index.html
- Washington State Department of Natural Resources. Washington Natural Heritage Program. 2006. Plant Associations of Balds and Bluffs of western Washington. http://www.dnr.wa.gov/nhp/refdesk/communities/pdf/balds_veg.pdf

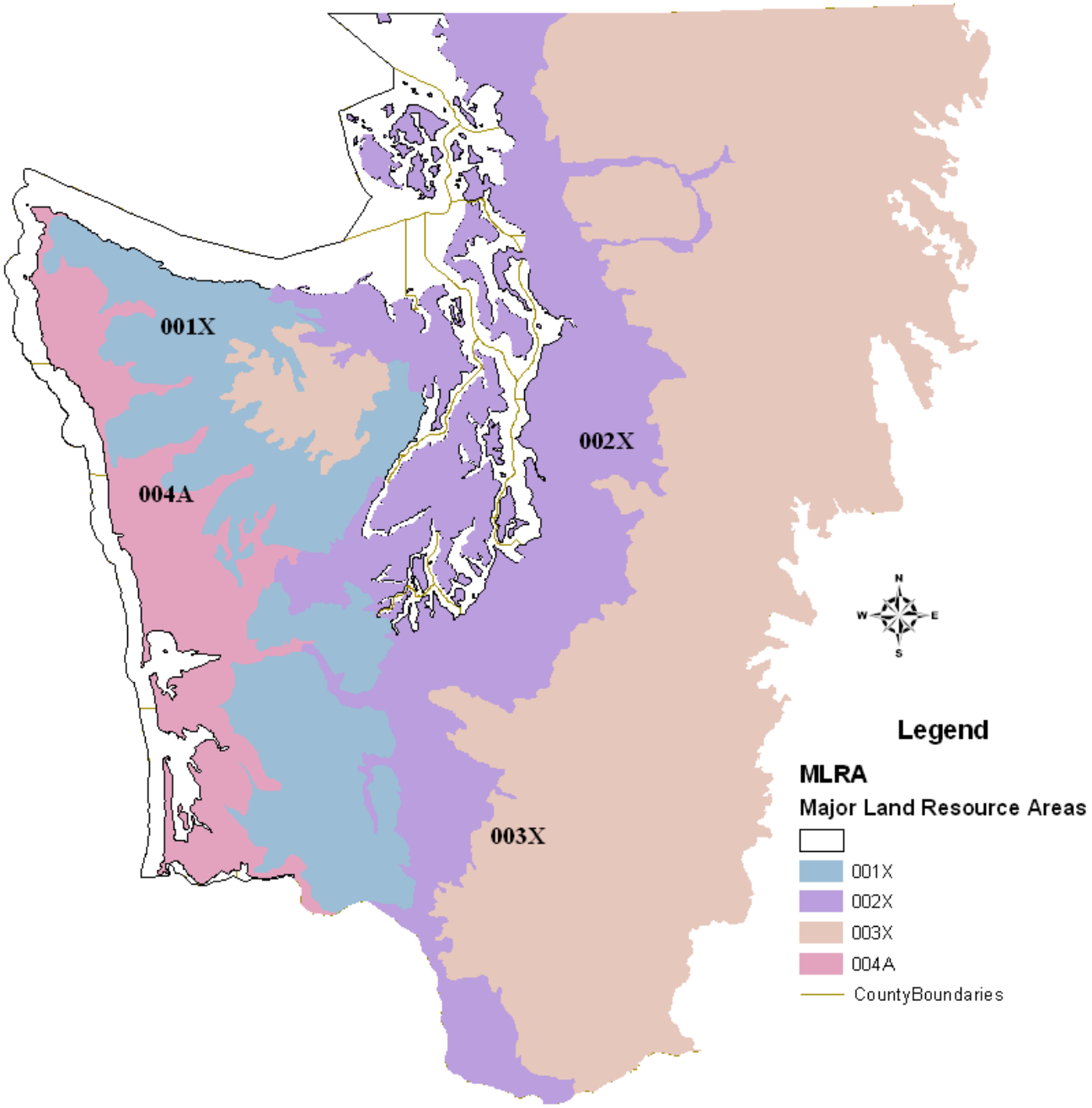
Forage Suitability Group Description Approval

Author	Date
// Marty Chaney	9/18/2008

Approval by:	Approval Date::
// Gerald Rouse	9/18/2008

State Range Management Specialist

MLRA Map


001X
002X
004A
003X
N
W
E
S
Legend
MLRA
Major Land Resource Areas
001X
002X
003X
004A
CountyBoundaries

Forage Management Zones Map