

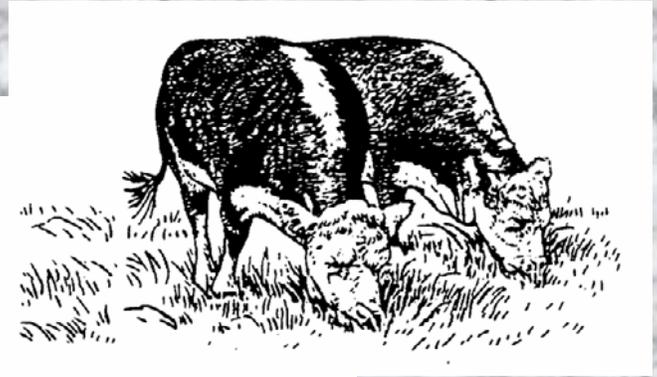
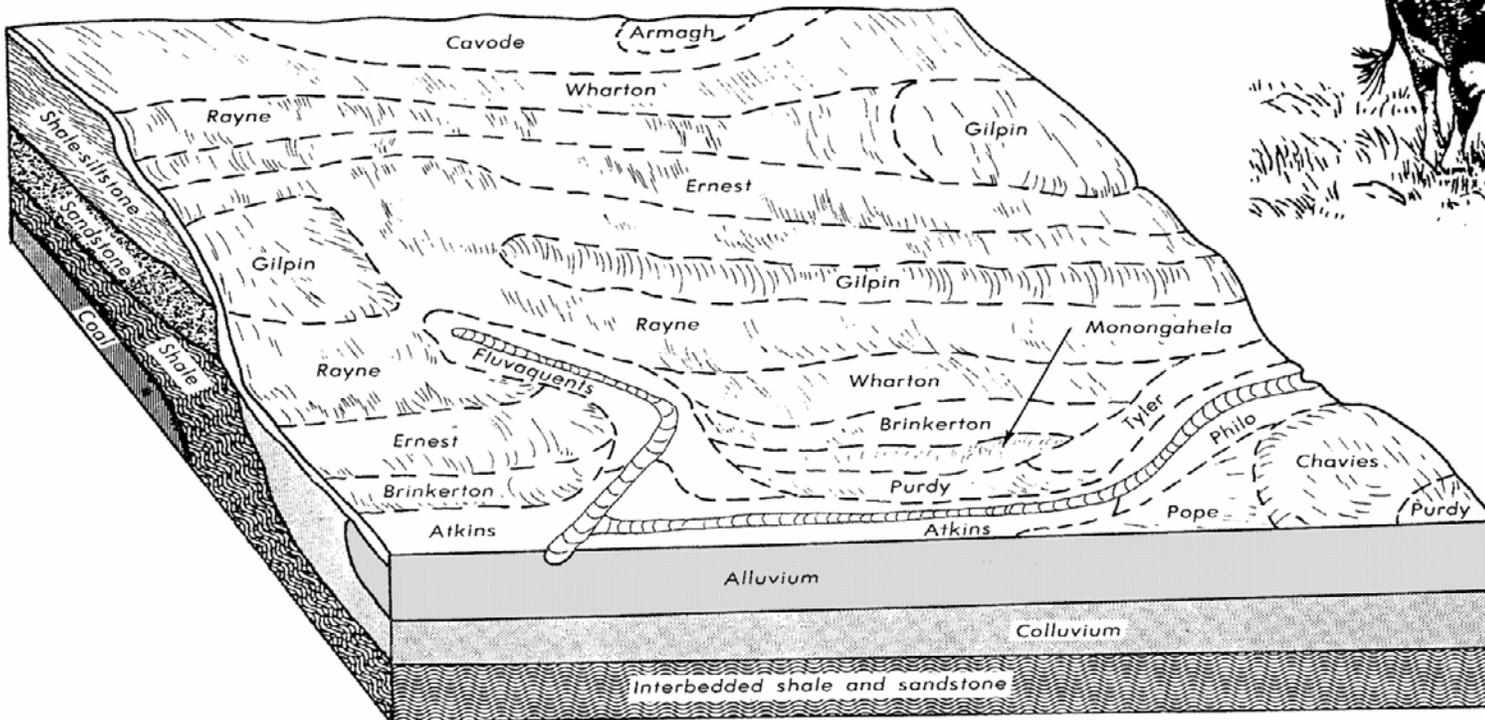
# **FORAGE SUITABILITY GROUPS: WHAT THEY ARE, CONSTRUCTING FSG REPORTS, & THEIR USE FOR MANAGING PASTURE AND HAY CROP LAND**

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# Forage Suitability Groups

- A group of one or more individual soil map unit components having similar potentials and limitations for forage production.



# Forage Suitability Groups

- **Sufficiently uniform to:**

**(1) Support the same adapted forage plants under the same management conditions;**



# Forage Suitability Groups

- **Sufficiently uniform to:**

**(2) Require similar conservation treatment and management to produce the forages selected in the quality and quantity desired; and,**



# Forage Suitability Groups

- **Sufficiently uniform to:**

(3) **Have comparable "potential" productivity.**

**Potential beyond its native state through agronomic improvement or agricultural engineering.**



# **FORAGE SUITABILITY GROUPS – HOW?**

- **Formulation and documentation procedures in the new NRCS National Range and Pasture Handbook (NRPH), revision 1.**

**National Range and  
Pasture Handbook  
Grazing  
Lands**

**Technology**

**Institute**

Revision 1

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Issued September 1997

Revised December 2003

# FORAGE SUITABILITY GROUPS – HOW?

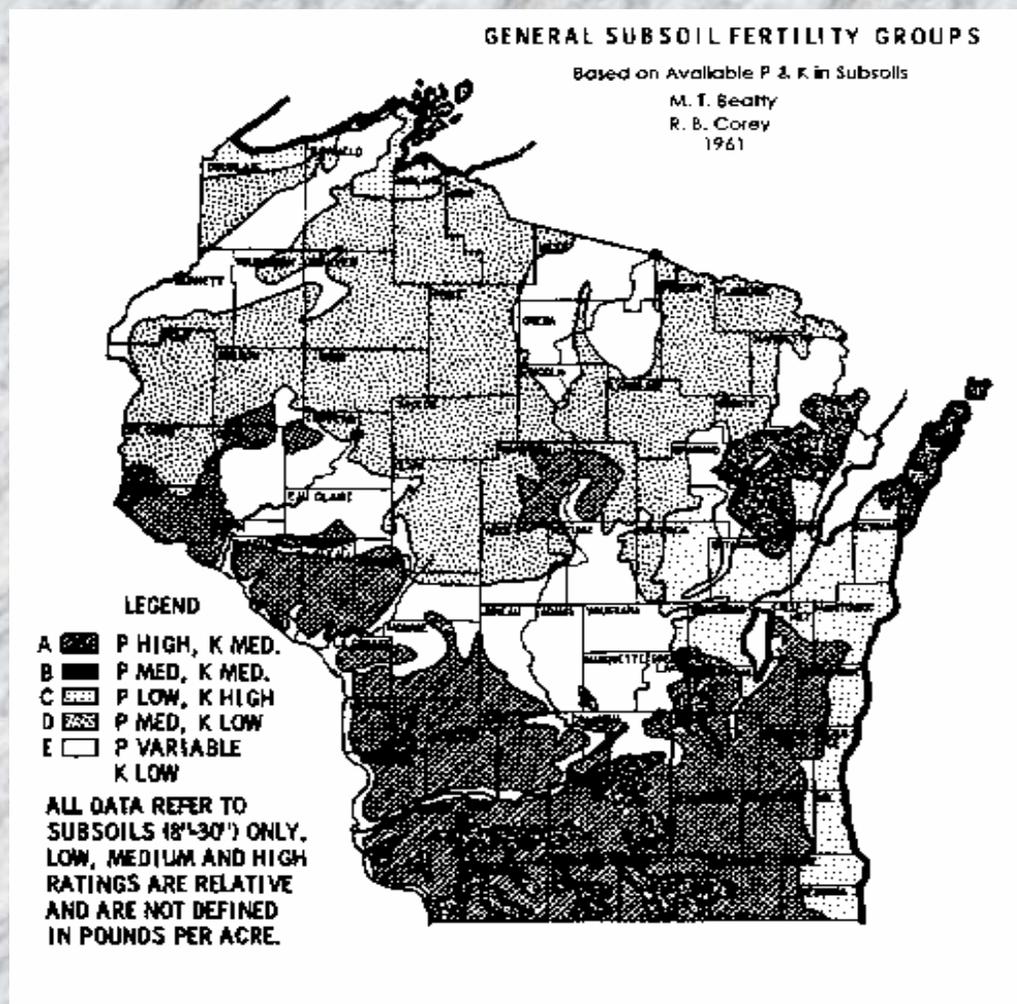
- National Soil Interpretation System (NASIS) is the basic tool used to sort the soil properties.
- Sorting routine developed to work in the NASIS soil database to group soils with similar forage productivity and management needs.

Table 1. Exhibit Table of Forage Suitability Groups (FSG) Criteria

Group	Soil Depth (cm)	Available Water Capacity (AWC) (cm)	Soil Reaction pH	Salinity, Elec. Condu. (EC) (mmhos/cm)	Drainage Class		Flood Frequency & Duration in Growing Season	Ponding Duration	Surface Rock or Coarse Fragments (% by Volume)	CaCO <sub>3</sub> Equivalent (%) 0-100cm	Slope (%)	Sodium Adsorpt. Ratio (SAR) 0-100cm	Shrink-swell (LEP) (%) 0-100cm	Cation Exchange Capacity (CEC?) Surface Layer
					Depth of Growing Season Water Table (cm)	Saturated Hydraulic Conductivity (Ksat) (micrometers/second)								
1W (Wet Soils)	>100	>15	5.6-7.3 0-100cm	<4 0-100cm	<45	≥1.4, <141 0-150cm	Not Occa., Freq., Very Freq., for Long or Very Long	Not Long or Very Long	0% >25cm, <25% 2mm to 10"	≤5	<15	<8	≤6	≥15
1SW (Saline Wet Soils)	>100	>15	5.6-7.3 0-100cm	≥4, <8 0-100cm	<45	≥1.4, <141 0-150cm	Not Occa., Freq., Very Freq., for Long or Very Long	Not Long or Very Long	0% >25cm, <25% 2mm to 10"	≤5	<15	<8	≤6	≥15
2S Sub-irrigated	>100	>15	5.6-8.4 0-100cm	<4 0-100cm	≥45, ≤150	≥1.4, <141 0-150cm	Not Occa., Freq., Very Freq., for Long or Very Long	Not Long or Very Long	0% >25cm, <25% 2mm to 10"	≤5	<15	<8	≤6	≥15
2Si-CEC Sub-Irrigated Mod. CEC	>100	>15	5.6-8.4 0-100cm	<4 0-100cm	≥45, ≤150	≥1.4, <141 0-150cm	Not Occa., Freq., Very Freq., for Long or Very Long	Not Long or Very Long	0% >25cm, <25% 2mm to 10"	≤5	<15	<8	≤6	>7, <15
2SS Saline Sub-Irrigated	>100	>15	5.6-8.4 0-100cm	≥4, ≤8 0-100cm	≥45, ≤150	≥1.4, <141 0-150cm	Not Occa., Freq., Very Freq., for Long or Very Long	Not Long or Very Long	0% >25cm, <25% 2mm to 10"	>5, ≤15	<15	<8	≤6	≥15
3CO Clayey overflow	>100	>15	5.6-8.4 0-100cm	<4 0-100cm	>150	≤1.4 0-100cm	Occa., Freq., Very Freq., for Extremely Brief, Very Brief, or Brief	Not Long or Very Long	0% >25cm, <25% 2mm to 10"	>5, ≤15	<15	<8	>6, ≤30	≥15

# FORAGE SUITABILITY GROUPS – HOW?

- Land grant universities throughout the US have additional pertinent soils information.



# **FORAGE SUITABILITY GROUPS – HOW?**

- **Management interpretations needed:**

- ✓ **Soil fertility management.**
- ✓ **Seasonal distribution of forage growth.**
- ✓ **Forage production figures for all *agriculturally important* soil map units.**
  1. **Haycrops.**
  2. **Pasture Crops.**
- ✓ **Grazing management of the pasture sward for plant vigor, persistence, and optimal grazable yield.**
- ✓ **Haycrop management for plant vigor, persistence, and optimal yield and quality of stored forage.**

# PROCEDURES USED IN ESTABLISHING FORAGE SUITABILITY GROUPS

1. Put together a team of soil scientists, agronomists, grazing land specialists, and animal scientists from Extension, NRCS, SWCD, ARS, and land grant universities. A joint effort will produce the best FSG's.



# PROCEDURES USED IN ESTABLISHING FORAGE SUITABILITY GROUPS

2. Either use the nationally established break points in the **NRPH** for limitation categories for each soil factor or adjust break points to tailor them to the **MLRA** to get a useful sort based on the range of values seen in the **MLRA**.

<u>SUBSOIL pH</u>	<u>Available Water Capacity</u>
<5.2	<3"
5.2-6.2	3"-6"
>6.2	>6"

## **PROCEDURES USED IN ESTABLISHING FORAGE SUITABILITY GROUPS**

- 3. Ascertain which forage species are best adapted to each FSG.**

**(Consult the NRPH Forage Suitability Group tables on forage suitability and tolerance to soil conditions: drainage, pH, inundation period, salt, and available aluminum, or other references and forage specialists as needed.)**

# PROCEDURES USED IN ESTABLISHING FORAGE SUITABILITY GROUPS

4. If an easily corrected limitation makes the soil suited to other forage species, list those species in the Soil Limitation section.



**LIME AN ACID SOIL:  
ADD SPECIES THAT  
RESPOND, SUCH AS  
ALFALFA.**

# PROCEDURES USED IN ESTABLISHING FORAGE SUITABILITY GROUPS

## 5. Determine potential forage yield by FSG for each adapted species.

FORAGE SPECIES	FORAGE SUITABILITY GROUPS - HAYCROP YIELDS					
	FSG536	FSG536	FSG536	FSG56	FSG56	FSG56
	very acid	acid	limy	very acid	acid	limy
	160-180gsl	160-180gsl	160-180gsl	160-180gsl	160-180gsl	160-180gsl
	Yield	Yield	Yield	Yield	Yield	Yield
Alfalfa	4016	6158	8925	5355	8211	11900
Hybrid Bermudagrass	6999	7216	7216	9090	9371	9371
Big Bluestem	4831	5978	6038	6528	8078	8160
Birdsfoot Trefoil	4677	6740	6877	5375	7747	7905
Kentucky Bluegrass	1788	2820	3972	2668	4209	5929
Ladino Clover	2146	3092	3155	3352	4831	4930
Orchardgrass	4045	5634	7223	5541	7717	9894
Red Clover	4463	6432	6564	5722	8247	8415
Perennial Ryegrass	2312	3648	5137	3451	5444	7668
Switchgrass	6245	7728	7806	7616	9425	9520
Tall Fescue	5023	7239	7387	6358	9163	9350

# **PROCEDURES USED IN ESTABLISHING FORAGE SUITABILITY GROUPS**

- 6. Once the FSG groupings are completed, develop narratives describing them and interpreting their value for forage and livestock production.**

**Currently, FSG's are documented and stored in a Microsoft Access™ template developed by the Grazing Lands Technology Institute. The data will eventually be stored in the Ecological Site Information System (ESIS).**

# Forage Suitability Groups

**Interpretive narratives written for each group.**

**1. Provide the soil and plant science basis for conservation planning individual tracts of grazing land.**

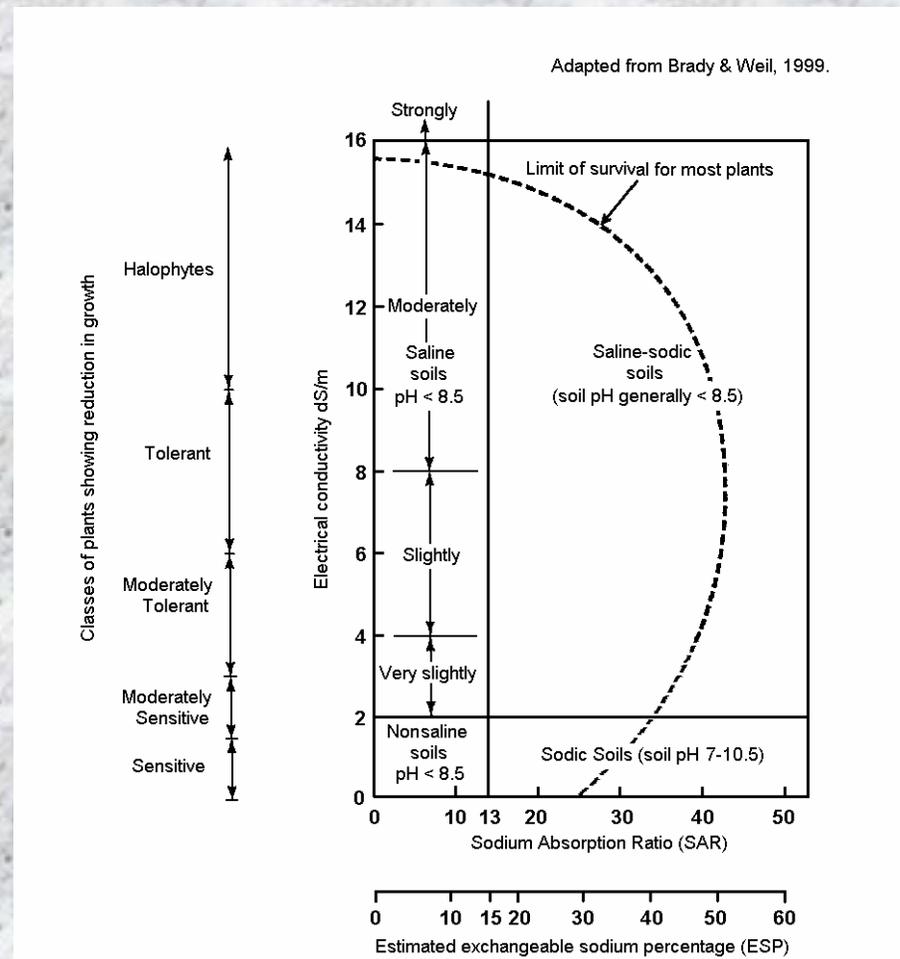
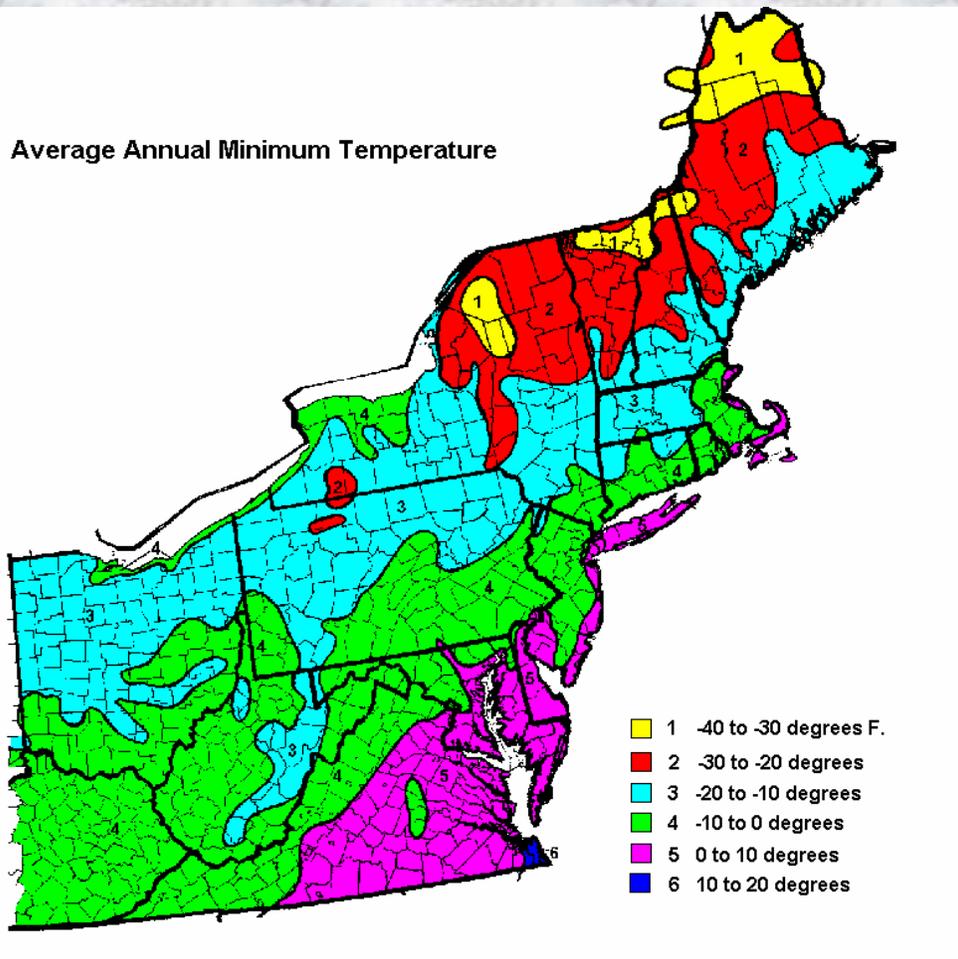
Forage Crop	Adaptation						
	Plant Type	Longevity Under Average Conditions	Winter Hardiness	Flood Tolerance	Drought Tolerance	Salinity Tolerance	Climate and Soil Drainage Class
<b>Kentucky Bluegrass</b>	Rhizomatous, sod-former	Long	Excellent	High	Good when plant is dormant.	Poor	Cool, humid, 20-50 in. precip. Well-drained to somewhat poorly drained soils.
<b>Smooth Bromegrass</b>	Rhizomatous, sod-former	Long	Excellent	High	Good when plant is dormant.	Fair	Cool, humid to semi-arid. Somewhat excessively-drained to poorly drained soils.
<b>Meadow Fescue</b>	Bunch	Medium	Good	High	Good	Fair	Cool, humid, 20-50 in. precip. zone. Somewhat excessively-drained to poorly drained soils.
<b>Orchardgrass</b>	Bunch	Medium (Stands thin over time.)	Fair (needs snow cover when ave. ann. min. temp. < -20° F.)	Medium	Good	Fair	Cool-warm, humid, 20-50 in. precip. zone. Somewhat excessively-drained to moderately well drained soils.

Adapted from "Establishing Perennial Hay and Pasture Crops", Alberta Agriculture, Food, and Rural Development, 2001

# Forage Suitability Groups

Interpretive narratives written for each group.

2. State which soil and climatic limitations are present.



# Forage Suitability Groups

Interpretive narratives written for each group.

3. Discuss their severity, associated management problems, and farming practices needed to overcome them.

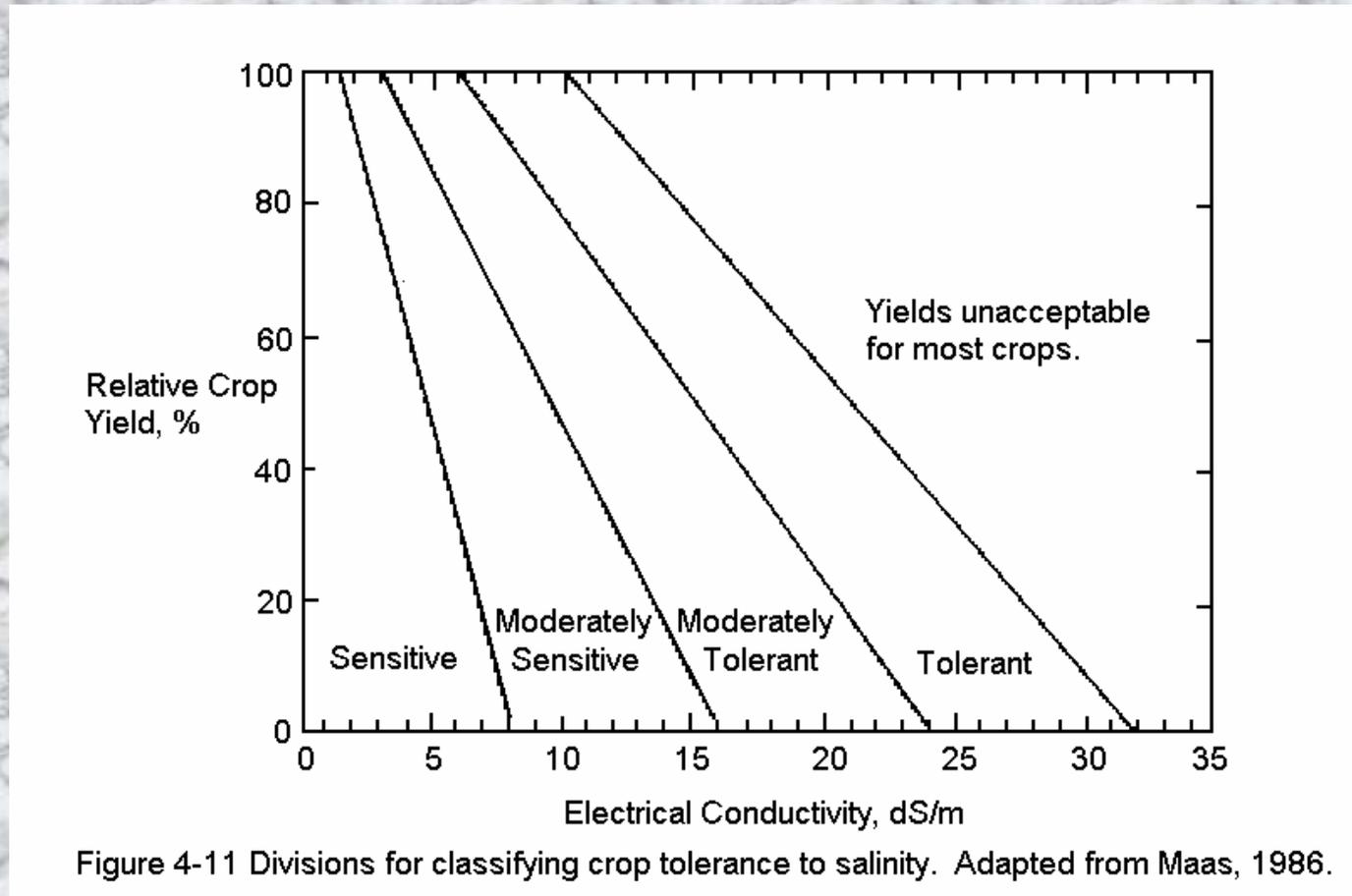


Figure 4-11 Divisions for classifying crop tolerance to salinity. Adapted from Maas, 1986.

# Forage Suitability Groups

**Interpretive narratives written for each group.**

**4. Give yearly forage production estimates & display monthly distribution of forage production on pasture for each adapted species or forage mixture.**

Forage Crop	<u>Dryland</u>		<u>Irrigated</u>	
	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	1400	4400	0	0
↓ Other listed species or mixtures	↓	↓	↓	↓
Red Clover-Orchardgrass	2000	7300	0	0
Pasture Crop	<u>Dryland</u>		<u>Irrigated</u>	
	Management Intensity		Management Intensity	
	<u>Low</u> (AUMs/ac)	<u>High</u> (AUMs/ac)	<u>Low</u> (AUMs/ac)	<u>High</u> (AUMs/ac)
Alfalfa-Orchardgrass	1.6	9.0	0.0	0.0
↓ Other listed species or mixtures	↓	↓	↓	↓
Switchgrass	0.8	4.7	0.0	0.0

**1 AUM = 790 lbs**

## Monthly Distribution of Pasture Production

**Growth Curve Number:** PA1403

**Growth Curve Name:** Ladino-orchardgrass, 140-160 gsl

**Growth Curve Description:** 30-50% Ladino Clover, 70-50% Orchardgrass

## 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	20	26	12	5	6	14	10	2	0

# Forage Suitability Groups

**Interpretive narratives written for each group.**

**5. All soils in each Major Land Resource Area (MLRA) are grouped into forage suitability groups (FSG's).**

**FSG No.: G147XY010PA - Shallow to mod. deep, well drained, shaly silt loam, low AWC, 16-35% slopes, acidic soils.**

## **Soil Map Unit List**

<b><u>Soil Survey Area</u></b>	<b><u>Map Unit Symbol</u></b>	<b><u>Soil Component Name</u></b>
Berks County	BkD2	Berks shaly silt loam
Berks County	BkE2	Berks shaly silt loam
Berks County	LzD2	Litz shaly silt loam
Berks County	LzE3	Litz shaly silt loam
Berks County	WeD2	Weikert shaly silt loam
Berks County	WeE2	Weikert shaly silt loam

# FSG NARRATIVE OUTLINE

## 6. AGRONOMIC ORIENTED CLIMATE FEATURES.

- Freeze-free period (28° F)
- First and last killing freeze (28° F)
- First and last killing frost (32° F)
- Growing season length (32° F) (90% probability)
- Growing degree-days (bases 40° & 50° F)
- Average annual minimum temperature (plant hardiness zone map, 1990)
- Average July temperature (° F)
- Mean annual precipitation (inches)

# **FSG NARRATIVE OUTLINE**

## **6. AGRONOMIC ORIENTED CLIMATE FEATURES.**

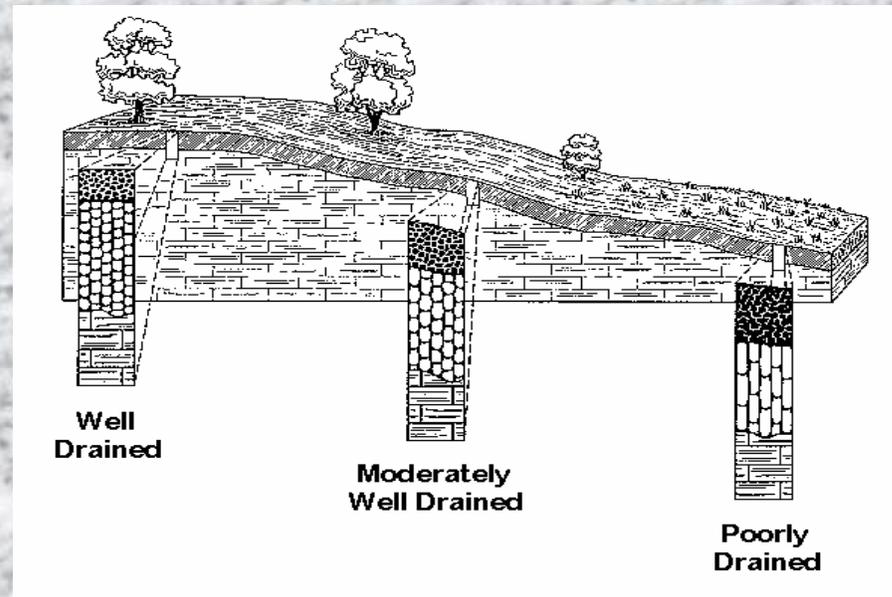
- **Growing season mean precipitation (inches)**
- **Monthly Precipitation and Temperature (maximums, minimums, and averages)**
- **Potential evapotranspiration**
- **Relative humidity**
- **Incidence of cloudiness**
- **Average no. of days between 0.1” rains**
- **Days of snow cover (1 inch or >)**

# FSG NARRATIVE OUTLINE

## 7. SOIL INTERPRETATIONS.

Describe the soil factors that this group of soils has in common.

Examples: depth, drainage class, texture, available water capacity, slope range, pH, SAR, salinity, and degree of stoniness.



# FSG NARRATIVE OUTLINE

## 9. ADAPTED SPECIES LIST.

List only those forage species that are adapted to both the soils in the group and the regional climate. Drained soil phases are placed in an FSG with a drainage class now present after drainage.

G147XY011PA

### Cool Season Grasses

Bentgrass - Grazed only  
Redtop  
Reed canarygrass  
Ryegrass, Annual or Perennial  
Tall fescue  
Timothy

### Warm Season Grasses

Big bluestem  
Caucasian bluestem  
Eastern gamagrass  
Little bluestem  
Purpletop  
Switchgrass

### Dryland

Adapted  
Adapted  
Adapted  
Adapted  
Adapted  
Adapted

### Dryland

Adapted  
Adapted  
Adapted  
Adapted  
Adapted  
Adapted

### Irrigated

Adapted  
Adapted  
Adapted  
Adapted  
Adapted  
Adapted

### Irrigated

N/A  
N/A  
N/A  
N/A  
N/A  
N/A

### Legumes

Alsike clover  
Birdsfoot trefoil  
Black medic - grazed only  
Crownvetch  
Ladino clover  
Red clover  
Vetch, common  
White clover

### Other Perennial Forbs

Bedstraw  
Chicory  
Dandelion  
Plantain

### Dryland

Adapted  
Adapted  
Adapted  
Adapted  
Adapted  
Adapted

### Dryland

Adapted  
Adapted  
Adapted  
Adapted

### Irrigated

Adapted  
Adapted  
N/A  
Adapted  
Adapted  
Adapted

### Irrigated

Adapted  
N/A  
Adapted  
N/A  
N/A

# FSG NARRATIVE OUTLINE

## 10. PRODUCTION ESTIMATES (ANNUAL).

Estimate total annual yields of forages and forage mixtures listed. Based on soil conditions and degree of management applied (high and low). Possible to show distribution of forage yield by hay cut sequence if data is available.

Forage Crop	<u>Dryland</u>		<u>Irrigated</u>	
	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	1400	4400	0	0
↓ Other listed species or mixtures	↓	↓	↓	↓
Red Clover-Orchardgrass	2000	7300	0	0
Pasture Crop	<u>Dryland</u>		<u>Irrigated</u>	
	Management Intensity		Management Intensity	
	<u>Low</u> (AUMs/ac)	<u>High</u> (AUMs/ac)	<u>Low</u> (AUMs/ac)	<u>High</u> (AUMs/ac)
Alfalfa-Orchardgrass	1.6	9.0	0.0	0.0
↓ Other listed species or mixtures	↓	↓	↓	↓
Switchgrass	0.8	4.7	0.0	0.0

**1 AUM = 790 lbs**

# FSG NARRATIVE OUTLINE

## 11. FORAGE GROWTH CURVES

For pastures, for each month list percentage of annual production that occurs then, or availability per month if forage is stockpiled or grazable residue is commonly used.

### Monthly Distribution of Pasture Production

**Growth Curve Number:** PA1403

**Growth Curve Name:** Ladino-orchardgrass, 140-160 gsl

**Growth Curve Description:** 30-50% Ladino Clover, 70-50% Orchardgrass

### Percent Production by Month

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0	0	5	20	26	12	5	6	14	10	2	0

# FSG NARRATIVE OUTLINE

## 12. SOIL LIMITATIONS.

**Specify which soil limitations will adversely affect forage production or impinge on management flexibility. Examples of the latter are need to defer grazing or delay harvest, reroute or reinforce laneways, and adjust fence-building procedures.**

***Name other forage species that are climatically adapted that will grow on soils in the group once soil limitations are removed.***

# FSG NARRATIVE OUTLINE

## 13. MANAGEMENT INTERPRETATIONS.

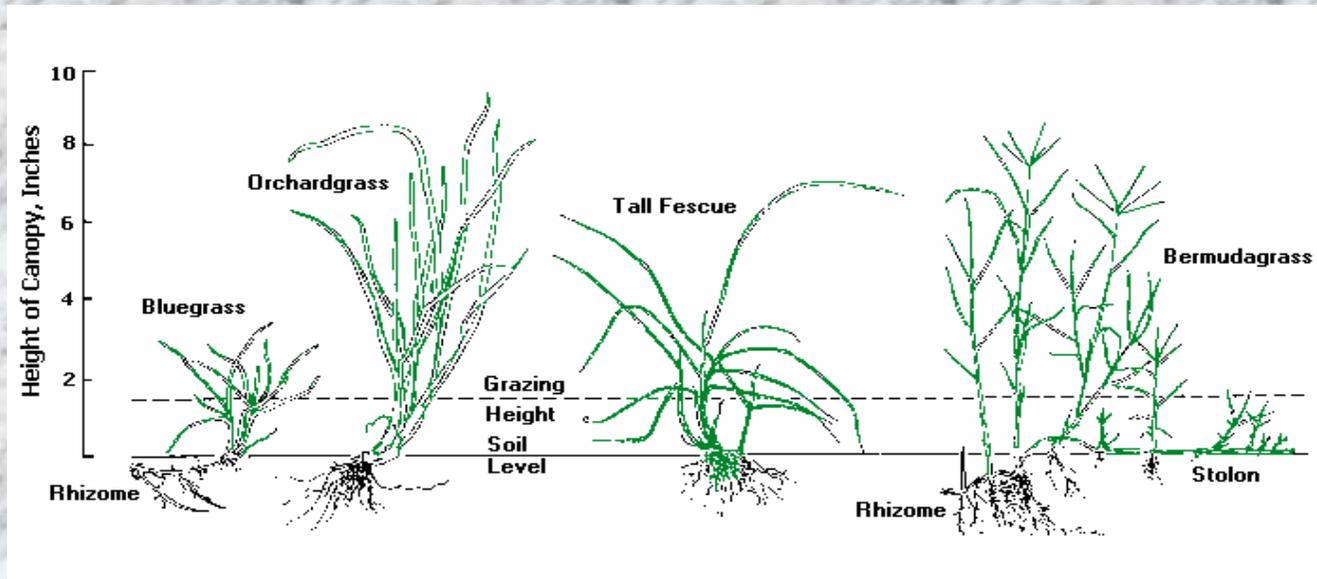
General agronomic, hay/silage harvest, and grazing management recommendations are given here based on soil and climatic limitations that present hurdles to optimal forage quality and/or yields, or affect livestock movement and forage intake.



# FSG NARRATIVE OUTLINE

## 14. MANAGEMENT DYNAMICS.

Explain how agronomic or grazing/harvest management affect forage productivity and quality. Optional section that can be instructive but must be brief. Discuss plant community dynamics that occur due to specific management inputs.



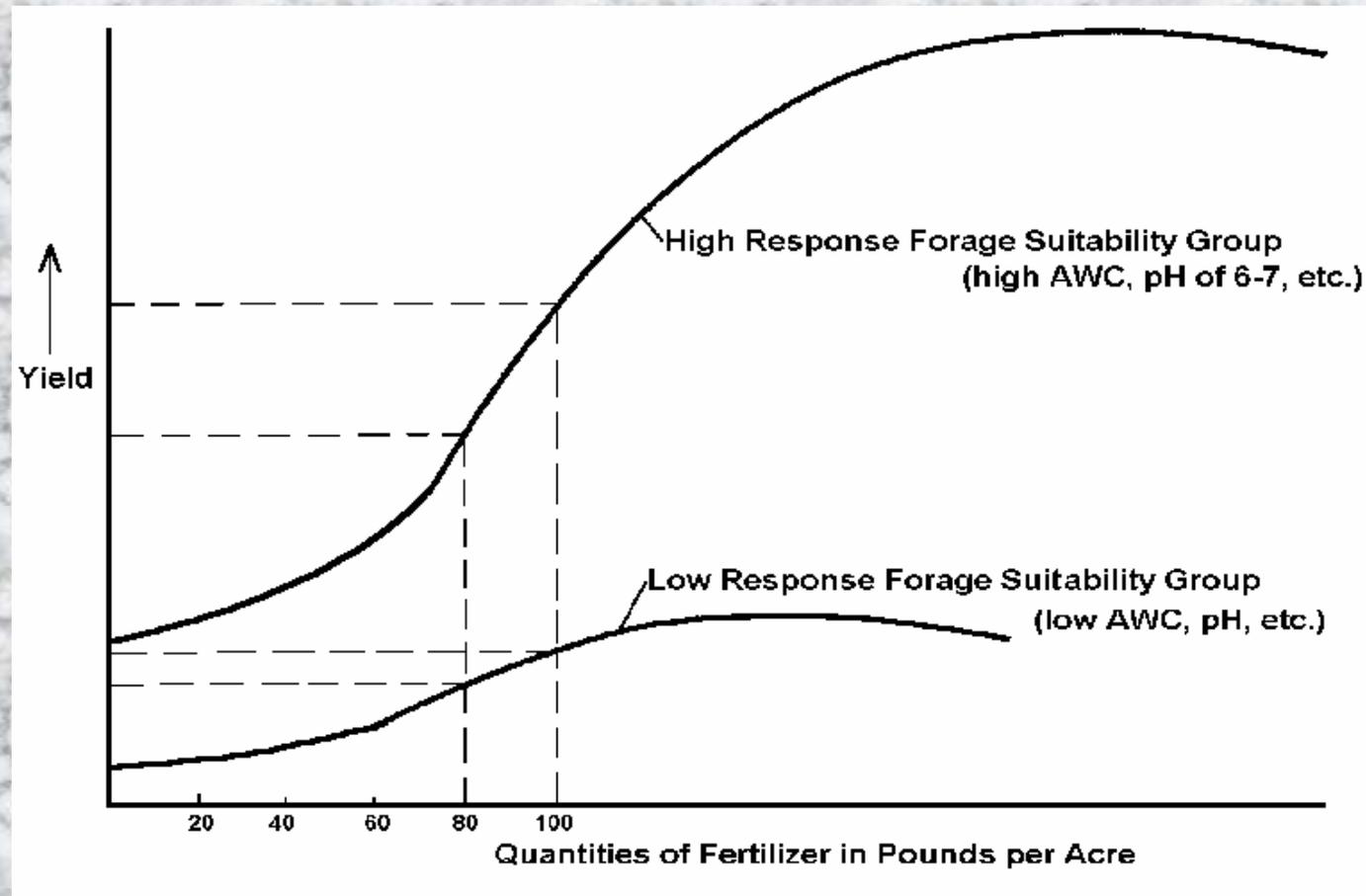
# PRODUCER'S USE OF FORAGE SUITABILITY GROUP NARRATIVES

- **Guide to species selection based on soil and climate conditions.**



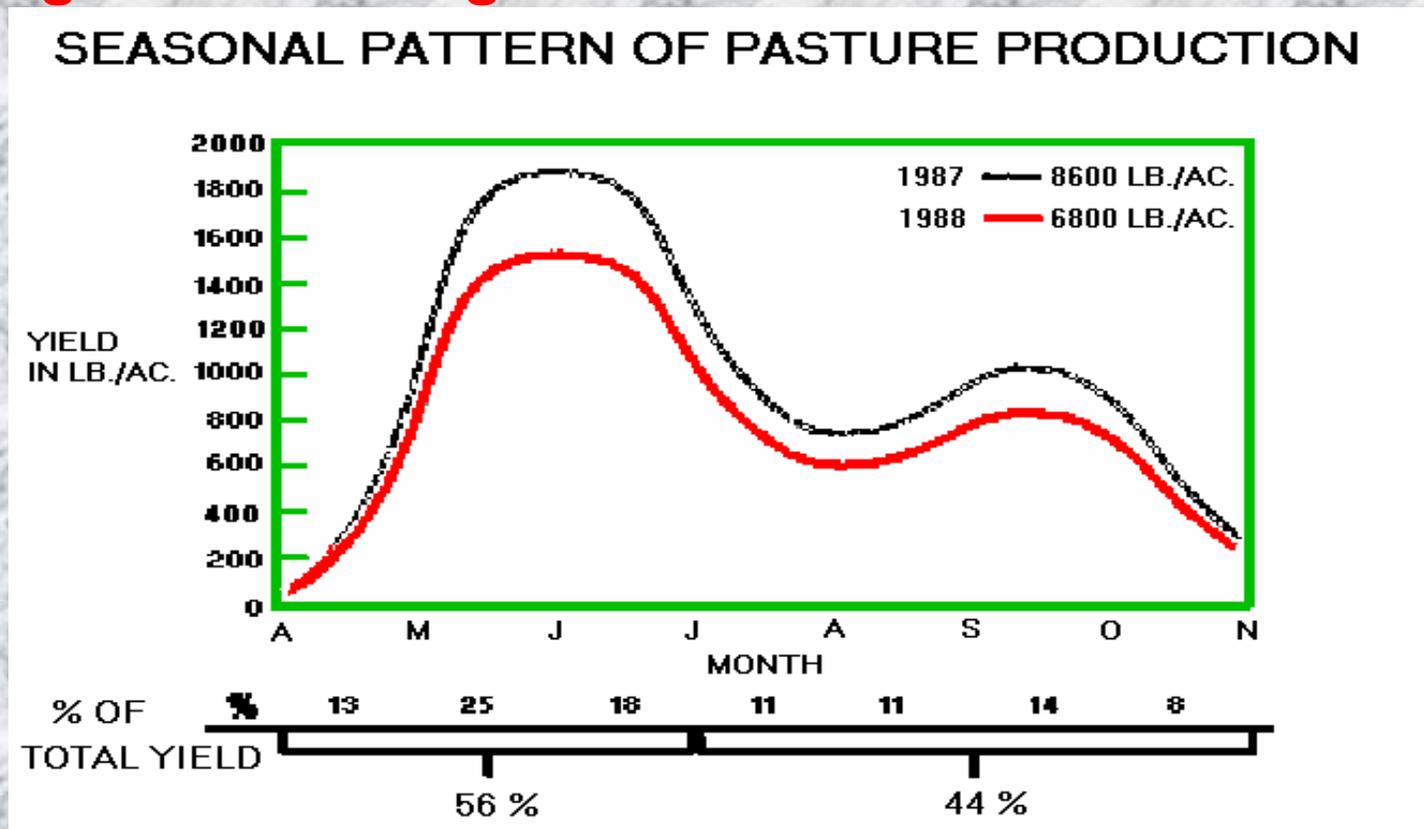
# PRODUCER'S USE OF FORAGE SUITABILITY GROUP NARRATIVES

- **Potential forage yields.**



# PRODUCER'S USE OF FORAGE SUITABILITY GROUP NARRATIVES

- Useful for pasture budgeting - strategic planning of pasture program around seasonal growth of forages.



# PRODUCER'S USE OF FORAGE SUITABILITY GROUP NARRATIVES

- **Specific management practices to maintain productivity.**

## Agronomic Management

### Grazing management

