

Rejuvenating Rundown Pastures: An Integrated Approach to Restoring Pasture Productivity

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Why do we lose stands?

- Too much or too little water
- Poor fertility-fertilizer and lime
- Poor grazing management
- Poor mowing management
- Poor choose of forage species
- Weeds infestations?
- Insects?
- Disease?



Why do we lose stands?

-
- Usually more than one factor!!!**
- Too much or too little water
 - Poor fertilization
 - Pesticides
 - Pests
 - Weeds
 - Insects
 - Disease?
-

**Usually more
than on factor!!!**



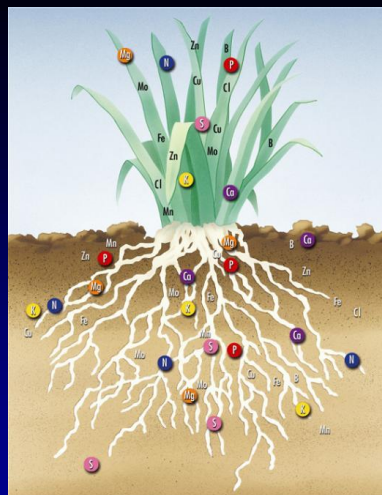


**Renovation does NOT
always mean reseeding!!!**

Integrated Approach to Pasture Renovation

- Soil fertility
- Forage species selection
- Grazing management
- Overseeding legumes
- Reseeding as a last resort





Soil Fertility



Soil Defined

- Soil: (1) A dynamic *natural body* composed of mineral and organic solids, gases, liquids and **living organisms** which can serve as a medium for plant growth.

Brady and Weil (2002) Elements of the Nature and Properties of Soils. Second Edition

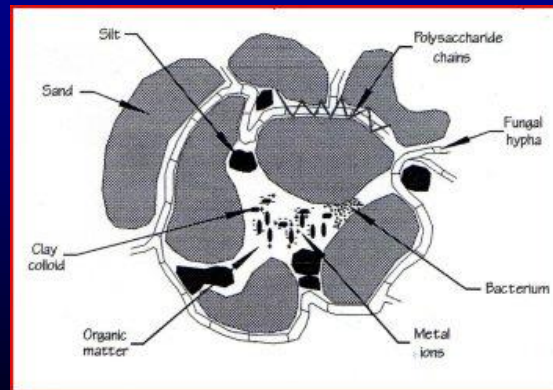


Table 1. Biomass of organisms above ground in the pasture and below ground within the pasture soil.

Organisms	Standing crop biomass lbs/a
Above ground	
1200 Dairy cow ¹ or	587
1200 Beef cow ²	450
Pasture ³	2500
Below ground	
Pasture roots ⁴	2500
Bacteria	2052
Actinomycetes	2052
Fungi	6244
Algae	219
Protozoa	80
Nematodes	62
Mites	65
Collembola	65
Earthworms	624
Other fauna	40

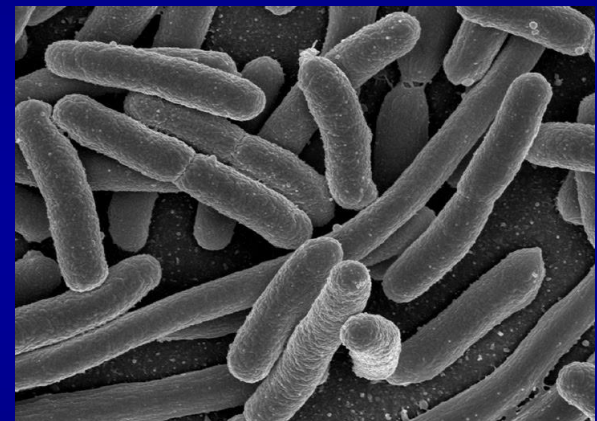
Adapted in part from Brady and Weil 2002.

1. Cow producing 40 lbs milk/day 180 days/acre, 50% of forage standing crop consumed, 5 rotations/year.

2. Cow weaning 600 lb calf 3 acres/year.

3. Cool-season grass-clover pasture, 10 inches tall at grazing.

4. Roots equal top growth at grazing.



Liebig's Law of the Minimum

Potassium

Acidity

Nitrogen

The level of plant production can be no greater than that allowed by the most limiting of essential plant growth factors.

Moisture

Phosphorus

Temperature

What makes a good soil for pastures and forages?

- Deep, fertile, and well drained
- High nutrient & water holding capacity
 - Medium texture
 - High organic matter
 - Loose and porous
 - High biological activity
- How do we assess?
 - Soil productivity grouping
 - Soil testing



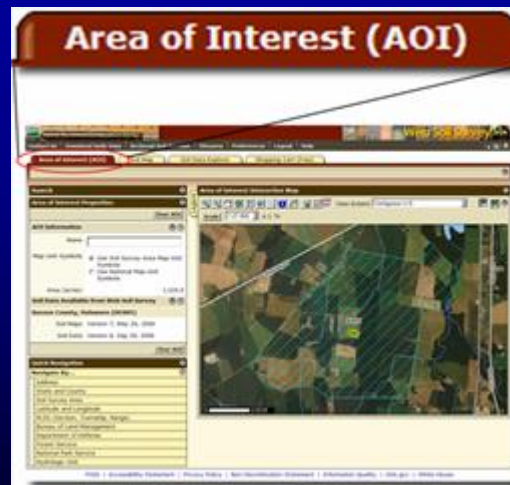
Soil Productivity and Potential Yield and Carrying Capacity

Productivity Group	Alfalfa or Alfalfa-Grass	Tall Grass-Clover Hay	Acres per animal unit
I	>6	>4	1.0
II	4-6	3.5-4.0	1.1-1.5
III	<4	3.0-3.5	1.6-3.0
IV	Not Suited	<3.0	3.1-6.5

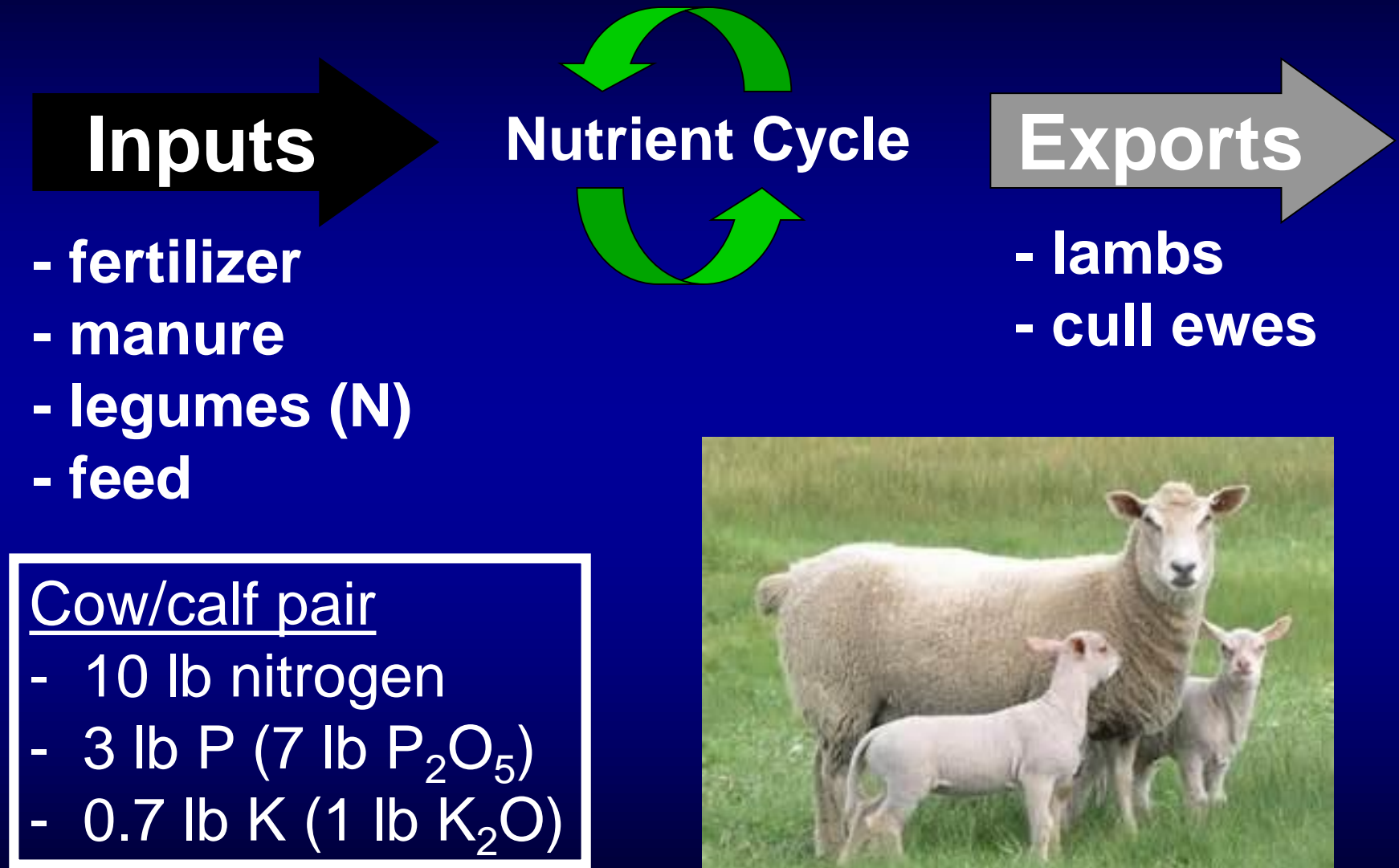
Virginia Nutrient Management Standards and Criteria. 2005. Virginia Department of Conservation and Recreation, Richmond.

What kind of soil do you have?

- Web soil survey
 - <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>
- Visit your local extension office
- Visit local soil and water conservation district

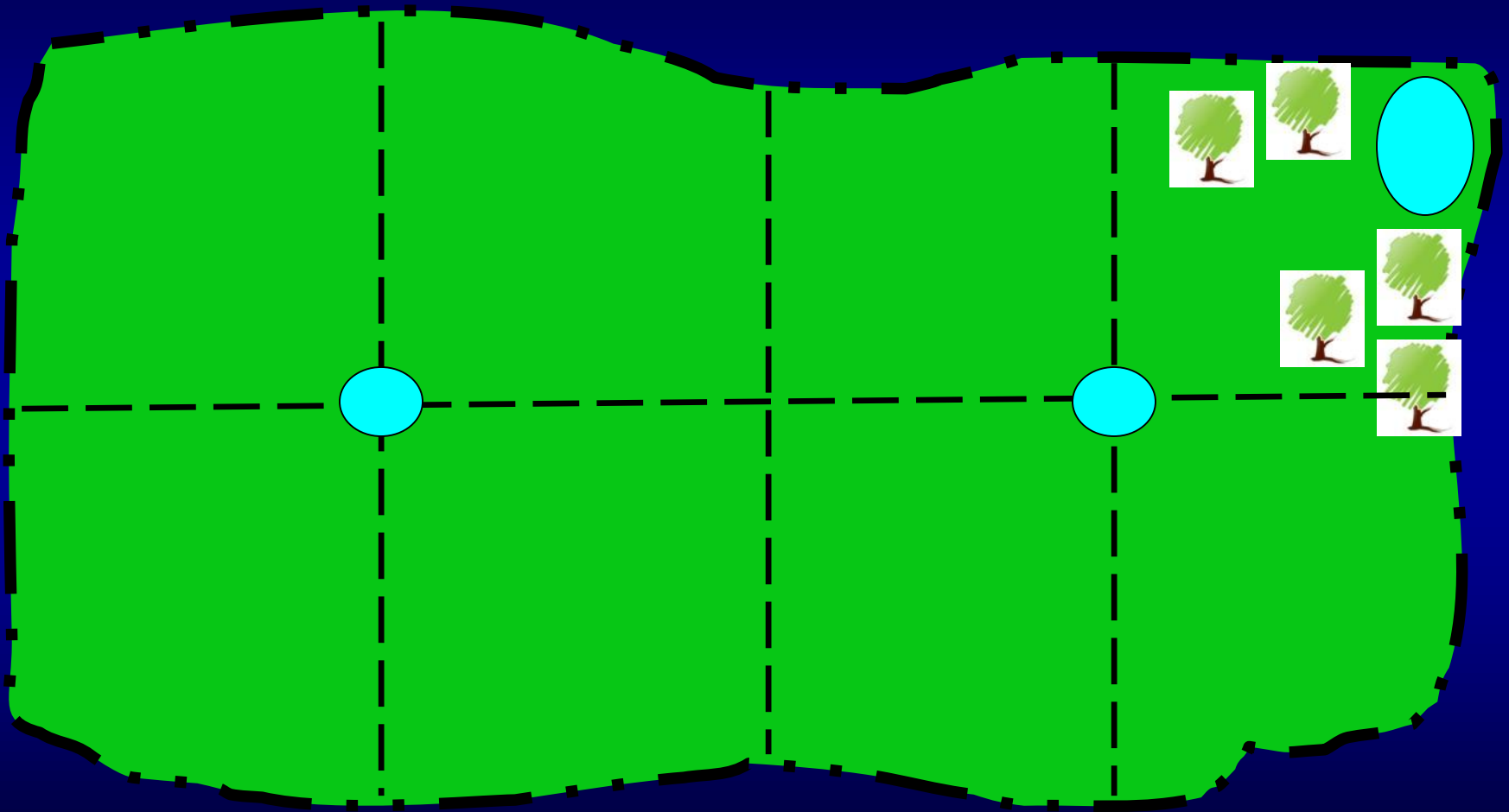


Nutrient Removal in Cow-Calf Systems



John Lory, Univ. Missouri

Grazing Redistribute Nutrients



Nutrient Removed by Hay

Crop	N	P ₂ O ₅	K ₂ O
	-----	lbs/ton	-----
Alfalfa	56	15	60
Tall Fescue	39	19	53
Orchardgrass	50	17	62
Bermudagrass	43	10	48
Sorghum-Sudan	40	15	58

Adapted from *Southern Forages, Fourth Edition*.

Value of Nutrients in Hay

- Assume one ton of hay contains:
 - 45 lb N, 15 lb P_2O_5 , 55 lb K_2O per ton
- Assume the cost of nutrients are:
 - \$0.35/lb N, 0.32/lb P_2O_5 , and 0.26/lb K_2O



=

\$35/ton

Hay Feeding and Nutrient Distribution

- Move nutrients within or from outside
- Feed on poorest pastures
- Move feeding points
 - Bale wagons, unroll hay, move rings



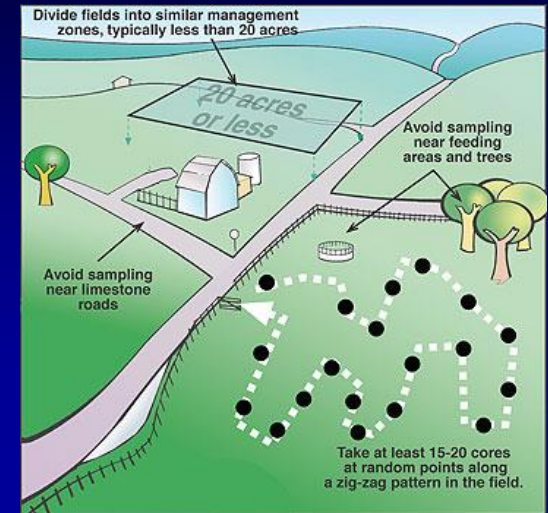
Soil Test Pastures

- Quantifies nutrients
 - Phosphorus and Potash
 - NOT nitrogen
- Provides baseline
 - Just guessing
- More important when prices are high
 - Target applications
- Sample every 2 to 3 years



Taking a Soil Sample

- Representative sample
 - At least 20 cores per sample
- Sample each pasture
 - 20 acres or less
- Sample at proper depth
 - 3 to 4" for pastures
- Avoid atypical areas
 - Watering, feeding, shade, dung
- Mix soil thoroughly and subsample
- Complete paperwork
 - Include crop



J. Lory and S. Cromley. 2005. Soil sampling pastures. MUE Publication G9215. University of MO, Columbia.

UNIVERSITY OF KENTUCKY

Department of Agronomy

College of Agriculture Cooperative Extension Service

Division of Regulatory Services

AGRICULTURAL SOIL SAMPLE INFORMATION SHEET

Section I. Farmer I.D. No.

--	--	--	--	--	--

Date Sample Received by County: _____

Section VI. Lab Use Only

Name _____

Address _____

City _____

State _____

Zip _____

Telephone Number _____

Acres: _____

Owner's Sample Identification

--	--	--	--	--

Section IIIa. Crop Codes

NOTE: Mark only one in each column. See additional crop lists for other codes.

	Primary Crop	Alternate Crop	Previous Crop
02			
04			
01			
03			
05			
18			
07			
22			
78			
76			
74			
28			
09			
38			
40			
11			
46			
13			
50			
15			
58			
60			
19			
72			
85			
86			
87			
98			

Section II. Test(s) to Be Made

(Mark only one group test)

☐ 1 Routine Soil Test (P, K, pH, buffer☐ pH, Ca, MG, Zn)

In Addition to Above Only

☐ OM (Org. Matter) ☐ BO (Boron)

or

☐ 15 Triazine, AZ (Atrazine)☐ and SZ (Simazine)

Section VII.

For County Use Only

--	--	--

County Code

--	--	--	--

County Sample #

Section IIIb.

Crop Management/Use

Part A. Management

Conventional Tillage

01

No Tillage

02

Hay or Pasture

03

less than 4 years

Hay or Pasture

04

5 years or longer

Doublecrop-Conventional

05

Doublecrop-No Till

06

New Seeding

07

Renovation

08

Annual Top Dressing

09

Part B. Use

x one x one x one

Grain

01

Silage

02

Tobacco

03

Hay

04

Pasture

10

Seed Production

05

Silage-Grain (double crop)

07

Grain-Grain (double crop)

08

Silage-Silage (double crop)

09

Cover Crop

11

Other

98

Section VIII.

Lab Use Only

Billing Code

Section IX.

FSA ☐

Check if copy is to be sent to FSA office.

Owner's Field Identifier
(Descriptive Name)

Soil Series Name:

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01				Canola
03				Canola — Soybeans
05				Cool Season Grass
18				Corn
07				Fallow
22				Fescue
78				Fescue/Lespedeza*
76				Forage Crops*
74				Grain Crops*
28				Lespedeza
09				Lespedeza — Grass
38				Red Clover
40				Red Clover — Grass
11				Small Grains
46				Small Grains — Corn
13				Small Grains — Soybeans
50				Soybeans
15				Tobacco Beds
58				Tobacco, Burley
60				Tobacco, Dark
19				Warm Season Grass
72				White Clover — Grass
85				Buffer or Filter Strip
86				Wildlife Food Plot
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Annual Top Dressing

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Silage

Tobacco

Hay

Pasture

Seed Production

Silage-Grain (double crop)

Grain-Grain (double crop)

Silage-Silage (double crop)

Cover Crop

Other

01

02

03

04

05

06

07

08

09

01

02

03

04

10

05

07

08

09

11

98

Primary Crop
x oneAlternate Crop
(if desired)
x onePrevious Crop
x one

x one

x one

x one

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Other _____

98

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Owner's Field Identifier
(Descriptive Name)

Soil Series Name:

**Crittenden County Cooperative
Extension Service**
1534 US Hwy 60 E
Marion, KY 42064-6102

UK **COOPERATIVE EXTENSION SERVICE**
University of Kentucky – College of Agriculture

Lexington 859-257-2785
Princeton 270-365-7541
www.rs.uky.edu/soils

COUNTY SAMPLE NO.: 0069

To:

REPORT FORM: A

Die Bräuer

Dee Brasher (270) 965-5236
Crittenden Co. Extension ANR Agent

[illegible]

2.25 T/A of 100% effective lime is required. This can be supplied with 3.5 T/A from Lafarge Three Rivers Quarry (69% RNV), OR 3 T/A from Lafarge West Fredonia Quarry (76% RNV), OR 3 T/A from Rogers Group Quarry (70% RNV)

COMMENTS:

Mehlich III used for P, K, Ca, Mg, and Zn (lbs/acre). Crop response is highly probable with Very Low or Low soil levels, slight with Medium, and not likely with High or Very High. N, P₂O₅, K₂O, Mg, and Zn recommendations are based on lbs of the nutrient.

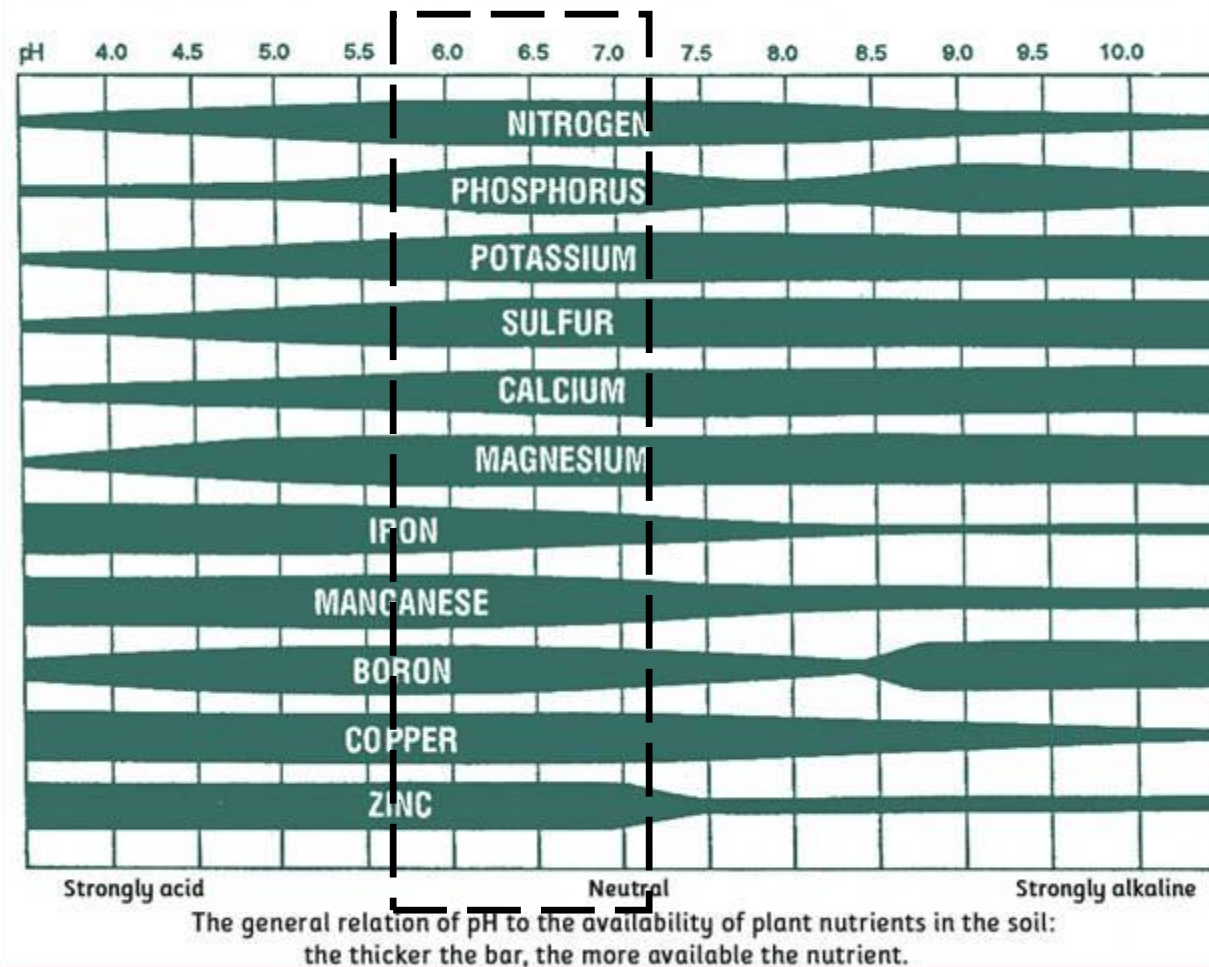
Soil Acidity and Liming

- Major limiting factor for forage production
 - Reduces nutrient availability
 - Reduces nitrogen fixation
- Liming
 - neutralizes soil acidity
 - supplies Ca & Mg
- General Guidelines
 - Grass: 5.8 to 6.0
 - Grass-clover: 6.0 to 6.4
 - Grass-alfalfa: 6.5 to 6.8



Soil pH and Nutrient Availability

Table 2. Effects of soil acidity/alkalinity on plant nutrient availability



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Date	Owner Sample ID	Owner ID	County Code	UK Lab NO.
9/18/2017	3	409	55	71412

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Relative Neutralizing Value

- **Dependent on**
 - **Purity (Calcium Carbonate Equivalent (CCE))**
 - **Grind size**

Quarry	CCE (%)	#10 Sieve	#50 Sieve	RNV (%)
1	98	90	40	64
2	84	63	17	33
3	94	99	89	88

Bulk Lime Application Rate (ton/A) = 100%
RNV Application Rate (ton/A) / (%RNV / 100)

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To:

Doc Brasher

Dee Brasher (270) 965-5236
Crittenden Co. Extension ANR Agent

UK Lab NO.
71412

Nutrient		Lab Results	Level of Adequacy					Calculated CEC Data	
			Very Low	Low	Medium	High	Very High		
Phosphorus (P)		9	>>>&						

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Soil Test Categories

- **Very low and low**
 - Nutrient is deficient
 - Expect yield response to fertilizer
 - Maintenance + buildup
- **Medium**
 - Nutrient maybe deficient
 - Yield may respond to fertilizer
 - Maintenance + buildup

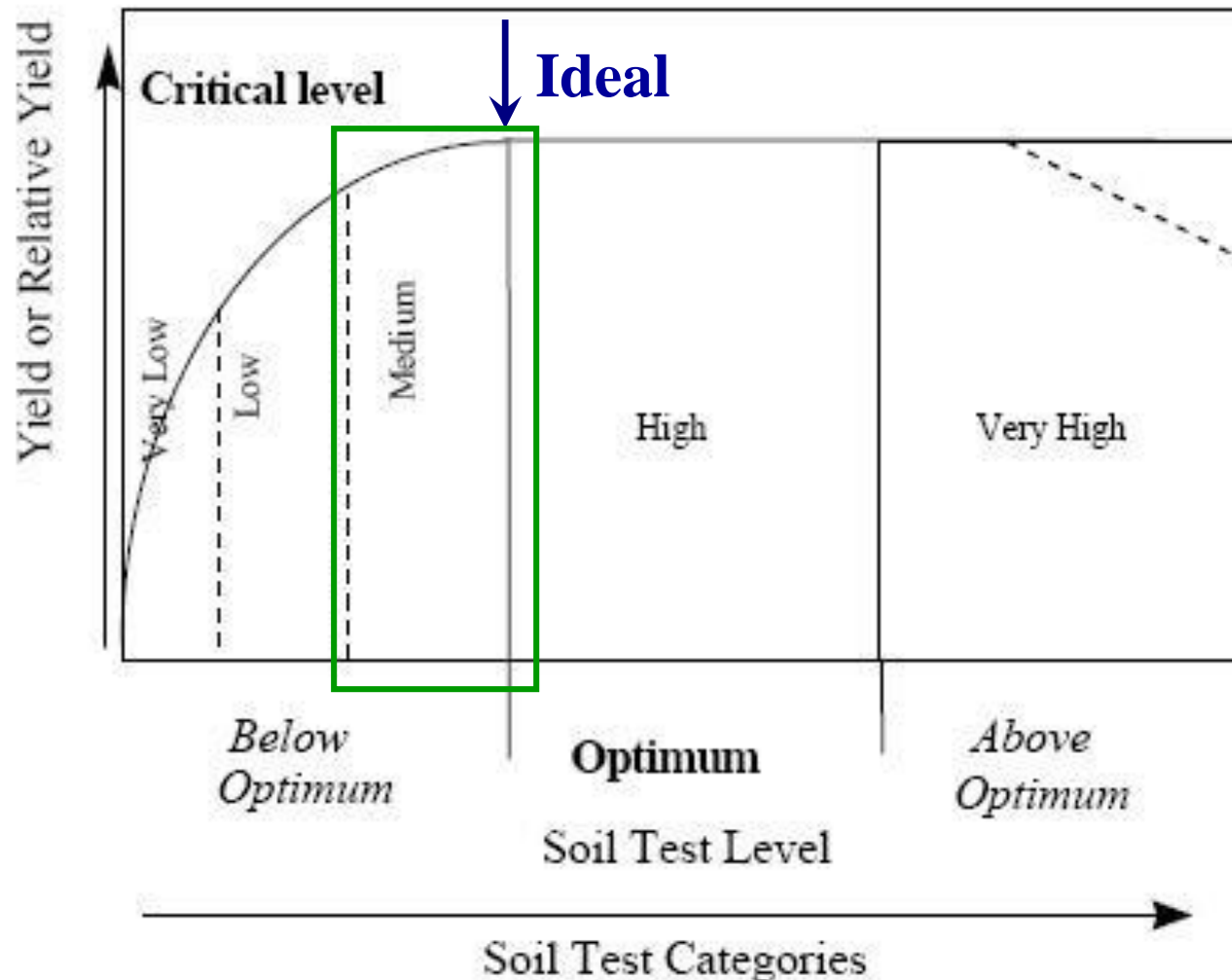


Soil Test Categories

- **High**
 - Nutrient is not deficient
 - Normally no yield response
 - Maintenance application
- **Very High**
 - Nutrient is more than sufficient
 - No yield response to fertilizer
 - No fertilizer applications
 - May negatively impact environment



Yield Response to Fertilization



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Legumes and Grazing Systems

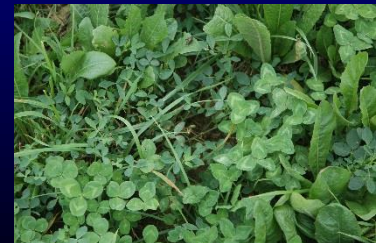
- Fixes nitrogen from air
- Increases yields
- Higher forage quality
 - animal performance
- Improved summer growth
 - Alfalfa and sericea lespedeza
- Dilutes endophyte in tall fescue



Nitrogen Fixation

Legume	N Fixed lb/A/yr	Value of Fixed N (\$/A/year)	
		N cost=\$0.35/lb	N cost=\$0.70/lb
Alfalfa	150-250	55-90	110-180
Red Clover	75-200	25-35	50-70
Ladino Clover	75-150	25-90	50-180
Annual Lespedeza	50-150	20-50	40-100

- **Nitrogen shared indirectly**
 - Ingestion and deposition of dung and urine
 - Death and decomposition of plant parts
 - Roots, shoots, nodules
- **Limited direct transfer**



Managing for Legumes

- Need to make up 20-30% of sward
- Lime and fertilize according to soil test
- Overseed legumes in late winter
 - 6 to 8 lb red clover + 1-2 lb white clover + 10 lb annual lespedeza = \$25 per acre
- Rotational stock pastures





**Use only adapted
forage species!!!**

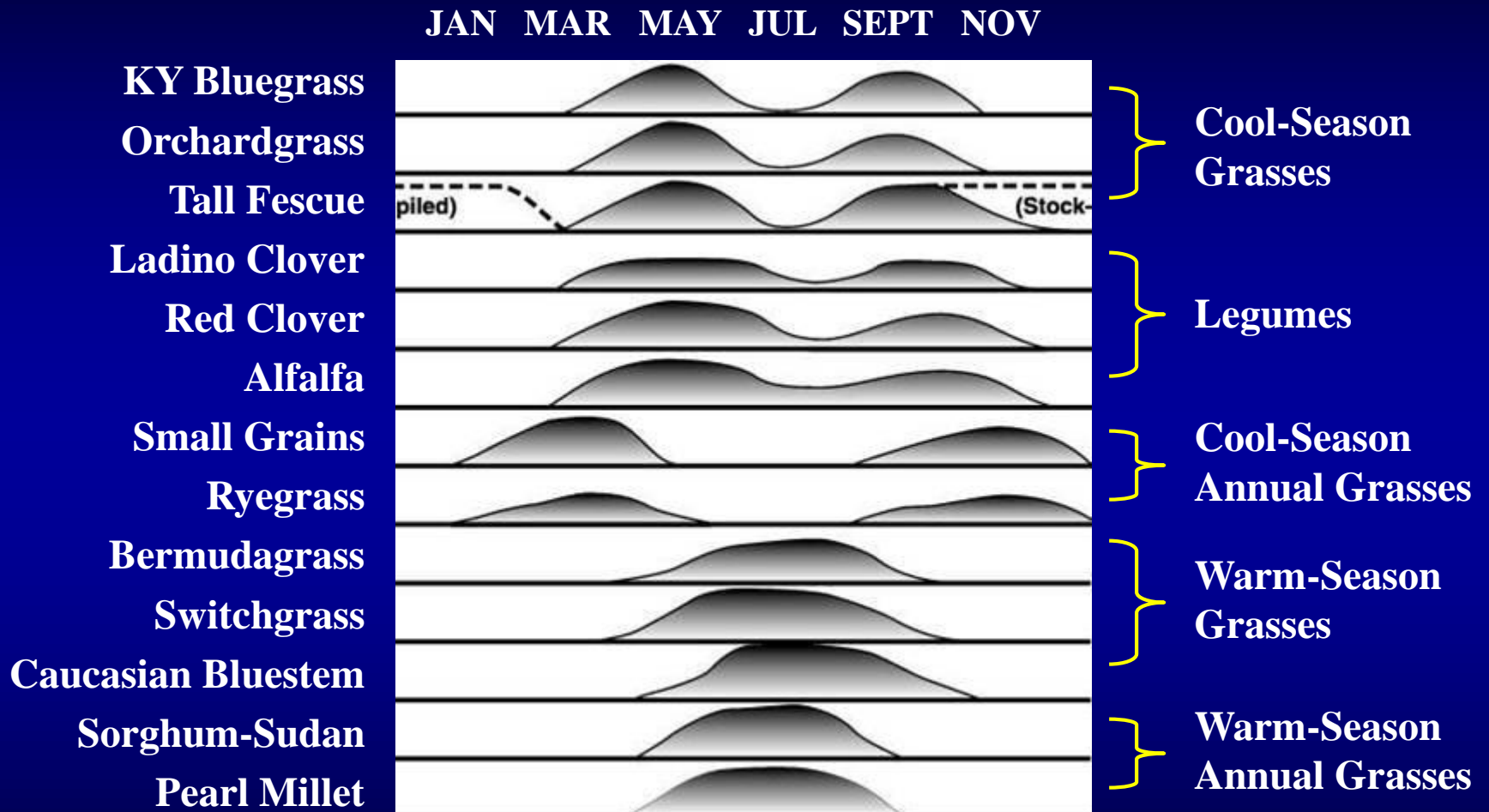


Selecting Forage Species

- Characteristics of forages species
 - regionally adapted
 - adapted to your soils
 - high yielding
 - high nutritive value
 - drought and heat tolerant
 - tolerant of close and frequent grazing
 - persistent
- What are the options?



Growth Curves for Common Forages



Adapted from *Controlled Grazing of Virginia's Pastures*, Publication 418-012

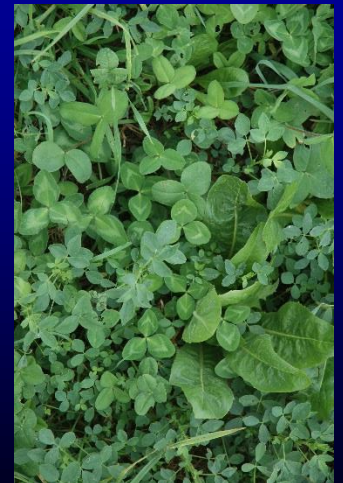
Grazing Management

Helping them make
the right choice!!!



Rotational Grazing

- Residual Leaf Area
 - Rotate when shortest grass is at proper stubble height
 - leave plenty of leaf area
- Carbohydrate Reserves
 - rest period allows for replenishment of carbohydrates after regrowth
- Maintain Botanical Composition
 - 30% legumes no N needed



Implement Rotational Stocking

- Right ATTITUDE - got to want to do it
- Controlled grazing
 - Water is key
 - Residual height and rest period
 - Productivity and drought tolerance
 - Stronger nutrient cycles
 - Improved distribution of dung and urine
 - Manage botanical composition
 - Intensity depends on wants and needs
 - Flexibility, flexibility, flexibility



Weed Control in Pastures



Kentucky Forage and
Grassland Council and
UK Cooperative
Extension present:

KENTUCKY GRAZING CONFERENCES



Pasture Management to Control Weeds and Improve Production

Two Locations:



October 17, 2017
Fayette County Ext. Office
1140 Harry Sykes Way
Lexington, KY 40504

October 18, 2017
Christlan County Ext. Office
2850 Pembroke Rd.
Hopkinsville, KY 42240

Registration

<https://2017KGC.eventbrite.com>

\$50 Registration + 2018 KFGC Membership

\$40 Event Registration only

Early registration ends Oct. 4th

Highlights

Company Exhibits

Silent Auction

Forage Spokesperson Contest

Sponsorship

Exhibit space is available for \$250 and

includes both locations/dates

Contact us for more details:

ukforageextension@uky.edu

 University of
Kentucky
College of Agriculture,
Food and Environment



Weed or Feed?

- Defining weeds
 - Plant that is not valued where it is growing
 - Plant that cattle will not readily consume
- Assume weeds low in nutritional value

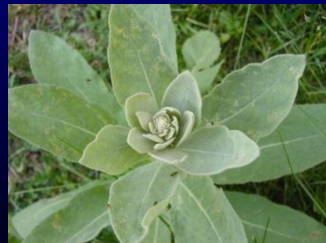
Plant Species	IVDMD	ADF	CP
	-----%-----		
Alfalfa	72	24	27
Redroot pigweed	73	21	25
Common ragweed	73	25	25
Giant foxtail	62	33	18
Barnyardgrass	70	33	18



Adapted from *The nutritive value of common pasture weeds and their relation to livestock nutrient requirements*, VCE Pub. 418-150.

Controlling Problem Weeds

- Weeds are species of opportunity
 - Symptom rather than the problem
 - The Good Lord's Band-Aid
- Integrated approach
 - Soil fertility
 - Forage species
 - Grazing management
 - Judicial use of herbicides



Herbicides

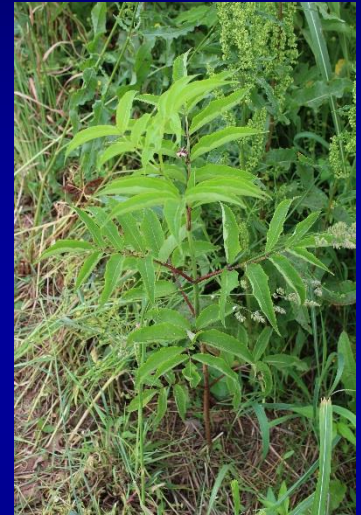


- Important tool for weed control
- No herbicides for grass-legume mixes
 - Control weeds prior to overseeding clover
- Consider reseeding restrictions

Herbicide	Legumes	Grasses
Chaparral	12 months + Bioassay	12 months + Bioassay
Cimmaron Plus	4 months	4 months
Grazon Next HL	24 months	12 months
Remedy Ultra	12 months	12 months

Keys to Successfully Using Herbicides in Pastures

- Identify weed and life cycle
 - Local extension agent
- Identify most effective herbicide
- Determine application timing
 - Annual weeds when they are small
 - Perennials reproductive
- Apply correct amount
 - Spray volume and adjuvants



Keys to Successfully Using Herbicides in Pastures

- Identify weed and life cycle

- Local extension agent

- Identify pest and its life cycle

- Detect

- Annual weeds

- Perennials reproductive

- Apply correct amount

- Spray volume and adjuvants

**Always follow the
HERBICIDE LABEL!!!**





Overseeding Legumes

Legumes and Grazing Systems

- Fixes nitrogen from air
- Increases yields
- Higher forage quality
 - animal performance
- Improved summer growth
 - Alfalfa and sericea lespedeza
- Dilutes endophyte in tall fescue



Getting Legumes into Pastures



Step 1: Suppress Existing Sod

- **MUST** reduce plant residue
 - allows for soil to seed contact
 - reduces shading of seedlings
 - Grazing hard, hay harvest, clipping



Step 1: Kill Existing Sod

- **Control sod with herbicide**
 - **Paraquat for control**
 - Graze sod hard and allow to regrow to 2 to 4”
 - Two applications of paraquat 10-21 days apart
 - **Glyphosate for control**
 - Clip or graze allow to regrow to 6-12 inches
 - Apply 3-4 weeks prior to seeding

Weed Management in Grass Pastures, Hayfields, and Other Farmstead Sites, UK CES, AGR-172.

*****Step 1: Kill Existing Sod*****

- **Novel Endophyte Tall Fescue**
 - **Spray-Smoother-Spray**
 - Do NOT allow tall fescue to produce seed
 - Glyphosate, summer annual, glyphosate
 - **Spray-Spray-Plant**
 - Do NOT allow tall fescue to produce seed
 - Clip pasture in spring prior to seed formation
 - Glyphosate 6 weeks prior to seeding, second application just prior to seeding

Residue Reduction and Sod Suppression



Closely Grazed Sod



Frost

Livestock

Step 2: Get Good Soil to Seed Contact

No-Till

Minimum-Till

**Regardless of seeding method, the goal is
to achieve good soil to seed contact**

Frost Seeding

- **Broadcasting seed on soil surface**
 - late winter or very early spring
 - freezing and thawing incorporates seed
- **Works best with red and white clover**
- **Does not work with grasses and alfalfa**
- **Preparation begins previous summer**
 - control broadleaf weeds
 - soil test and adjust fertility
 - reduce residue by grazing hard

Frost Seeding Success

- **Amount of plant residue**
 - seed must reach bare soil
- **Adequate freeze-thaw cycles**
 - get seed on early to ensure incorporation
- **Amount of competition after seeding**
 - graze or clip pasture to keep canopy open
- **Use high quality seed**
- **Use correct seeding rate**
- **Get even seed distribution**

Minimum Tillage

- Graze pasture hard to reduce residue
- Disturb 40-60% of the sod
 - light disking, field cultivator or other tillage implement
- Broadcast seed or use drill
- Cultipack or drag to get good soil-seed contact
- Control competition
 - grazing or clipping



No-Till Drill

- More effort and attention to detail
- More consistent results
 - putting seed in contact with soil
- Can be successful in spring or fall



- **Best method for interseeding alfalfa**
- **Suppress sod and reduce residue**
- **Calibrate drill prior to seeding**
- **Check and recheck seeding depth**
 - don't take somebody's word
 - seeding depth should never be deeper than 1/2"
 - general rule: if you can't see a little seed along slit, then you are going too deep
- **Control competition after seeding**

*****Step 4: Control Competition*****

- Often determines success or failure
- Seedlings do not tolerate competition
- Open canopy up
 - graze until seedlings start to get grazed
- ‘Flash Grazing’
 - large number of animals on a small area
 - graze until just above seedlings
- Clip to just above seedling
- Let seedlings reach a height of 4 to 6”

Pasture Renovation Checklist

- ✓ Rest pastures after stress
- ✓ Soil test and adjust fertility
- ✓ Choose an adapted forage species
- ✓ Implement rotational stocking
- ✓ Control broadleaf weeds
- ✓ Incorporate legumes into pastures
- ✓ Reseed pastures as necessary

Parting Thought

To bring about measurable change in a grazing system it takes three to five grazing seasons. So make your set your goals, make your changes, and remember that good things come to those who are patient.