# *Integrating Warm Season Annuals into Cool Season Perennial Grazing Systems*

## NRCS Webinar

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**King's Agriseeds Inc.**

# Environmental factors influencing plant growth – Which can we manage?

1. Temperature
2. Moisture Supply – Rainfall **(irrigation –perhaps)**
3. Radiant Energy (Sunlight: quality, intensity & duration)
4. Composition of the atmosphere
5. Gas content of the soil
6. **Soil reaction (Soil pH) Degree of acidity or alkalinity**
7. Biotic factors (**Plant variety type- genetics**, soil biology)
8. **Supply of mineral nutrient elements (fertility)**

# Plant Nutrients (mineral elements)

**Major Nutrients**

**(Primary- Need in Large Quantities)**

- Nitrogen (N)
- Phosphorous (P)
- Potassium (K)

(Secondary – Need in Intermediate Quantities

- Calcium (Ca)
- Magnesium (Mg)
- Sulfur (S)

**Micronutrients**

- Boron (B) **
- Iron (Fe)
- Maganese (Mn)
- Copper (Cu)
- Zinc (Zn) **
- Molybdenum (Mo)
- Chlorine (Cl)
- Cobalt (Co)
- Vandium (V)
- Sodium (Na)
- Silicon (Si)

** May be deficient in some soils

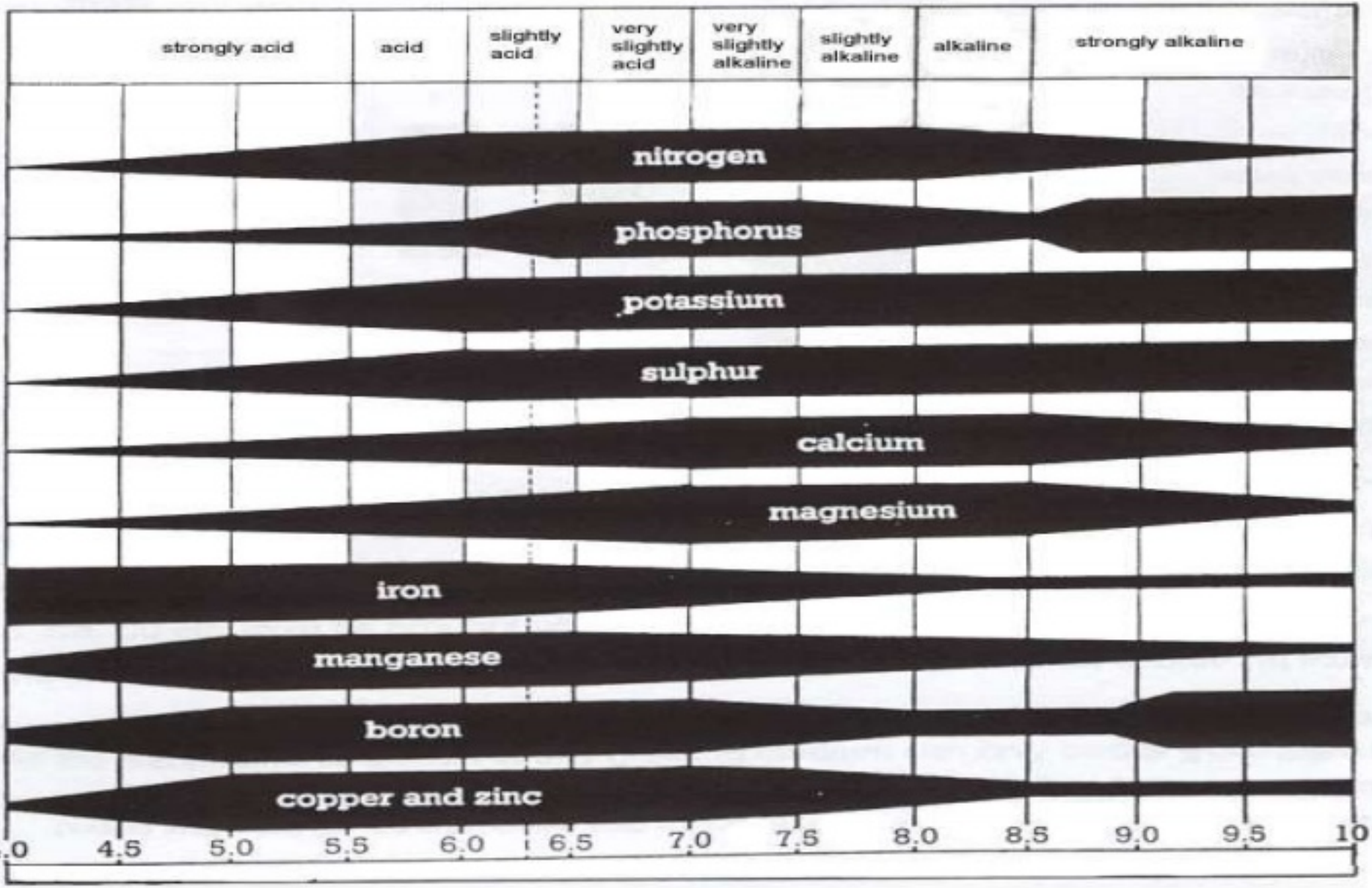
# Soil Test Recommendations

- Basic Cation Saturation Ratios

- Conceptually ok
- Ideal ratios (Bear, et al., 1947)
  - 65 % Ca
  - 10% Mg
  - 5 % K
  - 20 % Acidity
- Still used by some labs but has some problems
  - Doesn't work very well
  - Results in some unreasonable recommendations

- General range of cation balance
  - 60 - 90 % Ca
  - 5 - 40 % Mg
  - 2 - 5 % K
  - 0 - 20 % Acidity
- If cation levels and pH are in the optimum range the ratios will usually be ok and no further adjustment is necessary.
- Only worry about the ratios in the extreme
  - Mg ≥ Ca
  - K ≥ Mg

# pH & Nutrient Availability

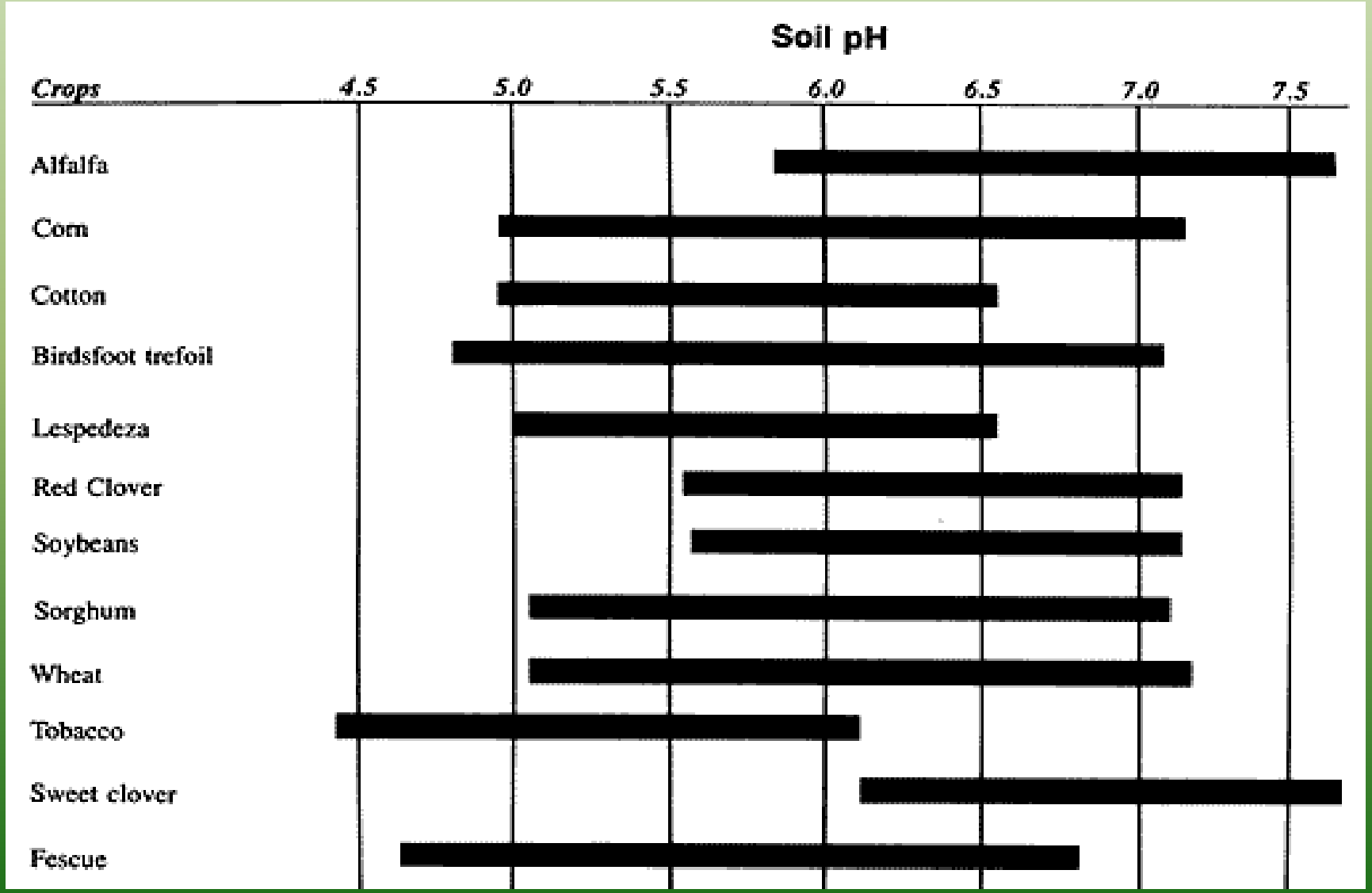


# Additional Tips

- Lime before you fertilize

| pH | N | P | K |
|---|---|---|---|
| 5.0 | 53% | 34% | 52% |
| 6.0 | 89% | 52% | 100% |
| 7.0 | 100% | 100% | 100% |

# Soil pH Range for Crops



# Maintain Correct Soil pH for soil biology

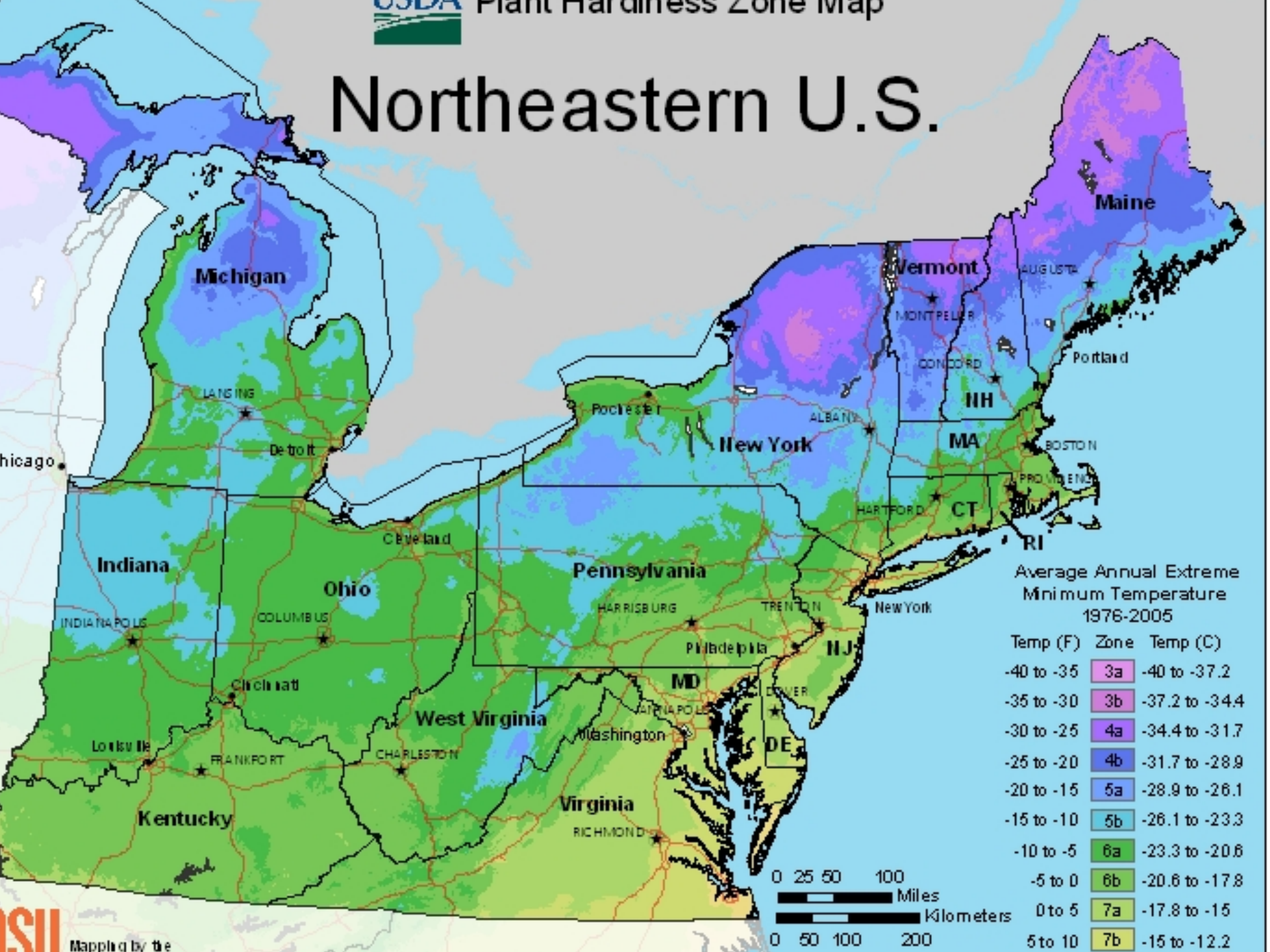
Rhizobium (Living Bacteria) housed in root nodules need proper pH to function optimally and fix Nitrogen.

# Fertility

- Treat your grass like a crop
  - Like 200 bushel corn
- PSU recommends 50 lbs actual N per ton of forage expected split at least three times during the year
- Timing is everything!
  - N after each harvest or as close to that as feasible
  - P especially important in the fall
  - Early Spring may be the least effective time to fertilize for shoot growth

USDA Plant Hardiness Zone Map

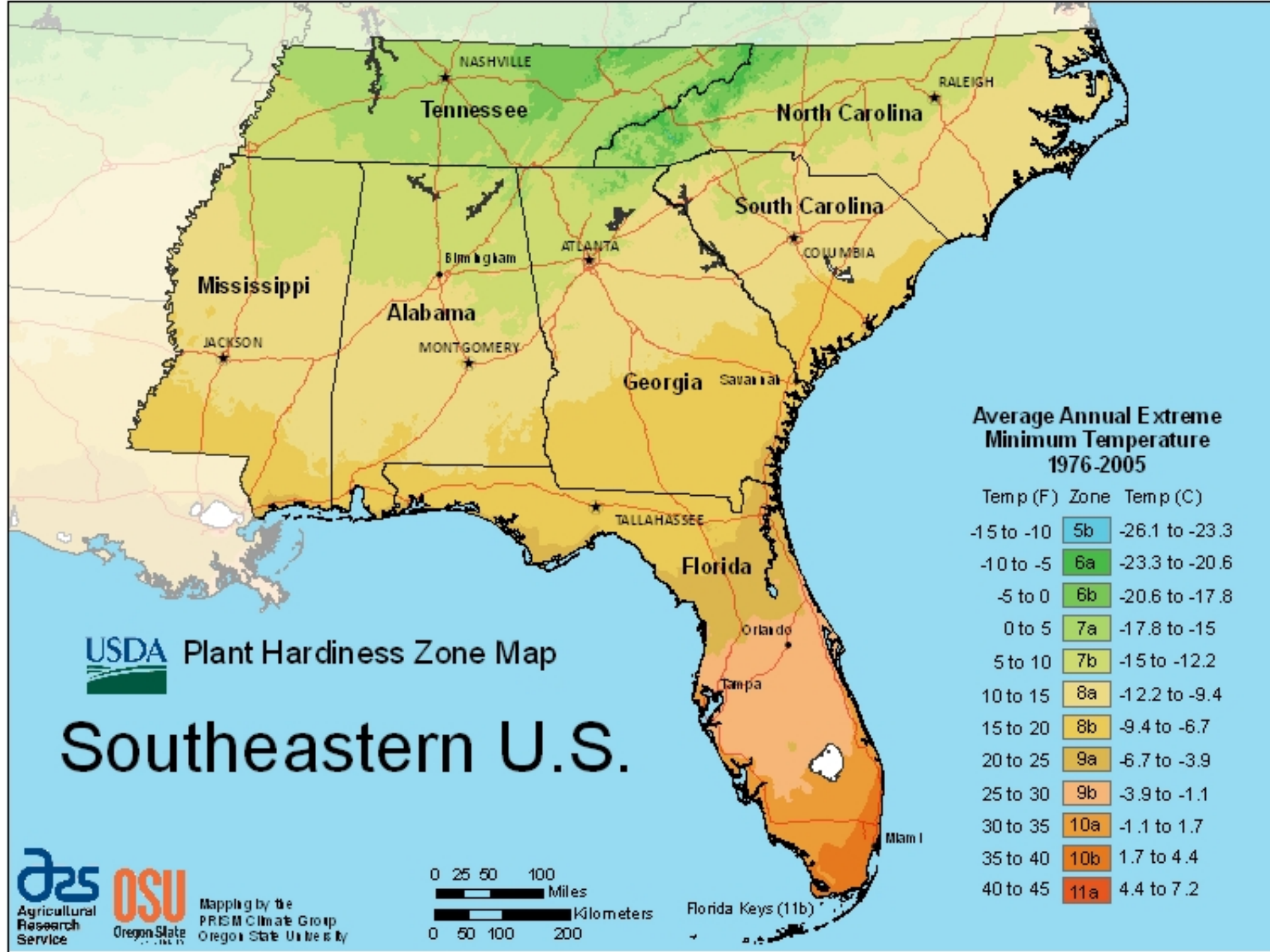
# Northeastern U.S.



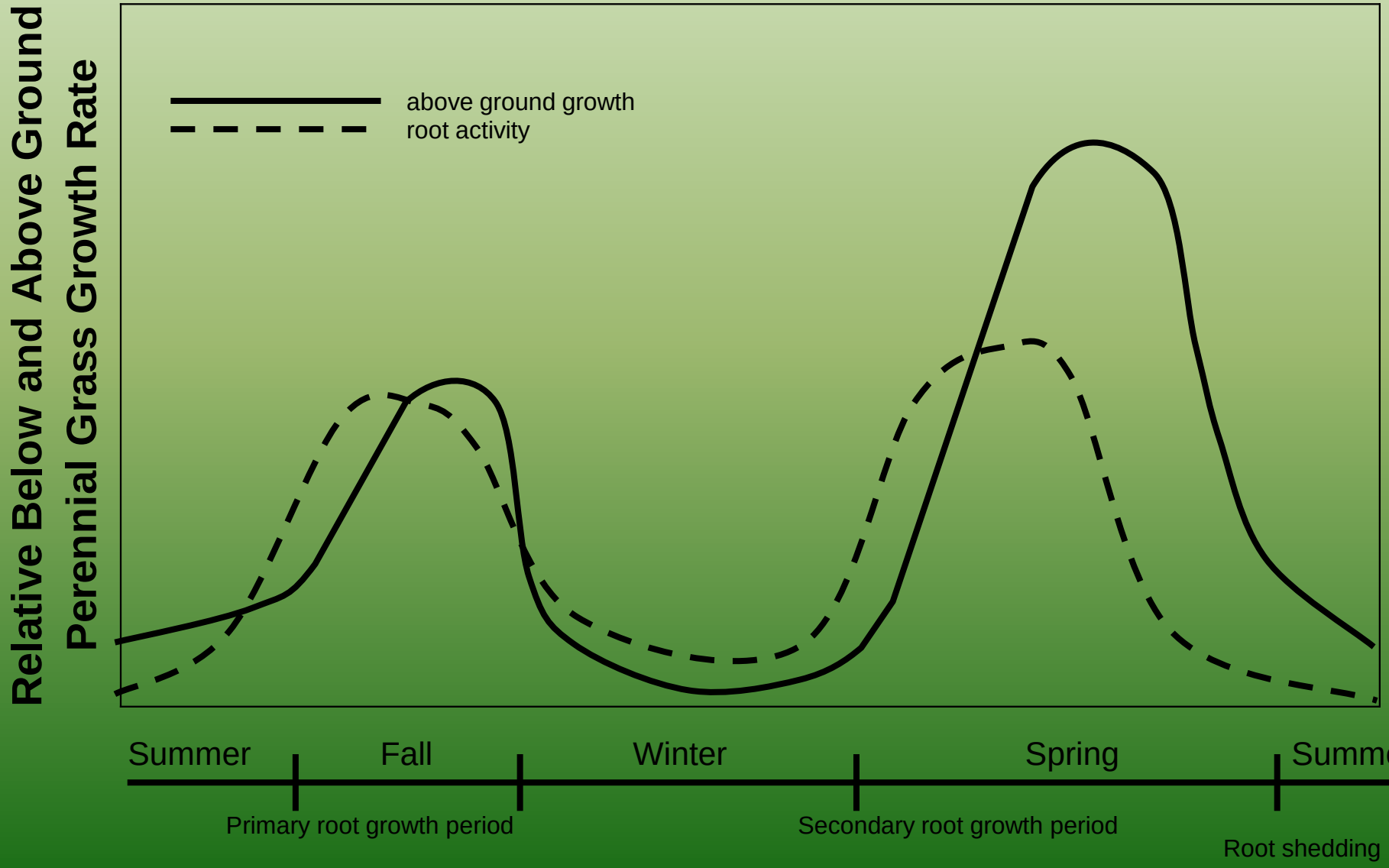

Average Annual Extreme Minimum Temperature 1976-2005

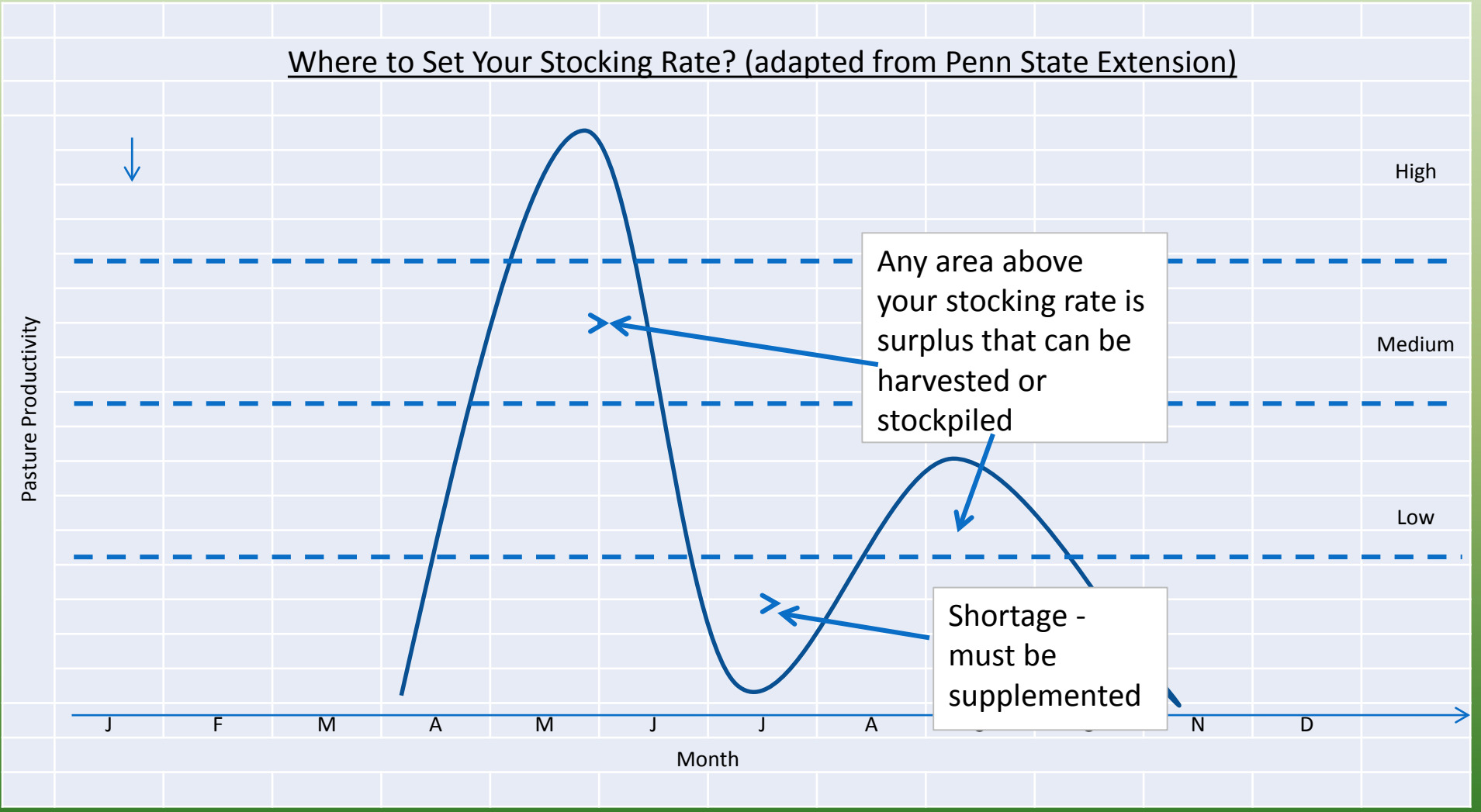
| Temp (F) | Zone | Temp (C) |
|---|---|---|
| -40 to -35 | 3a | -40 to -37.2 |
| -35 to -30 | 3b | -37.2 to -34.4 |
| -30 to -25 | 4a | -34.4 to -31.7 |
| -25 to -20 | 4b | -31.7 to -28.9 |
| -20 to -15 | 5a | -28.9 to -26.1 |
| -15 to -10 | 5b | -26.1 to -23.3 |
| -10 to -5 | 6a | -23.3 to -20.6 |
| -5 to 0 | 6b | -20.6 to -17.8 |
| 0 to 5 | 7a | -17.8 to -15 |
| 5 to 10 | 7b | -15 to -12.2 |

Mapping by the


NASHVILLE
Tennessee
RALEIGH
North Carolina
South Carolina
COLUMBIA
ATLANTA
Birmingham
Mississippi
Alabama
JACKSON
MONTGOMERY
Georgia
Savannah
TALLAHASSEE
Florida
Orlando
Tampa
Miami
Florida Keys (11b)
Average Annual Extreme Minimum Temperature 1976-2005
Temp (F) Zone Temp (C)
-15 to -10 5b -26.1 to -23.3
-10 to -5 6a -23.3 to -20.6
-5 to 0 6b -20.6 to -17.8
0 to 5 7a -17.8 to -15
5 to 10 7b -15 to -12.2
10 to 15 8a -12.2 to -9.4
15 to 20 8b -9.4 to -6.7
20 to 25 9a -6.7 to -3.9
25 to 30 9b -3.9 to -1.1
30 to 35 10a -1.1 to 1.7
35 to 40 10b 1.7 to 4.4
40 to 45 11a 4.4 to 7.2
USDA Plant Hardiness Zone Map
Southeastern U.S.
Agricultural Research Service
OSU Oregon State
Mapping by the PRISM Climate Group Oregon State University
0 25 50 100 Miles
0 50 100 200 Kilometers

# Typical Growth Cycle of Perennial Cool Season Pastures

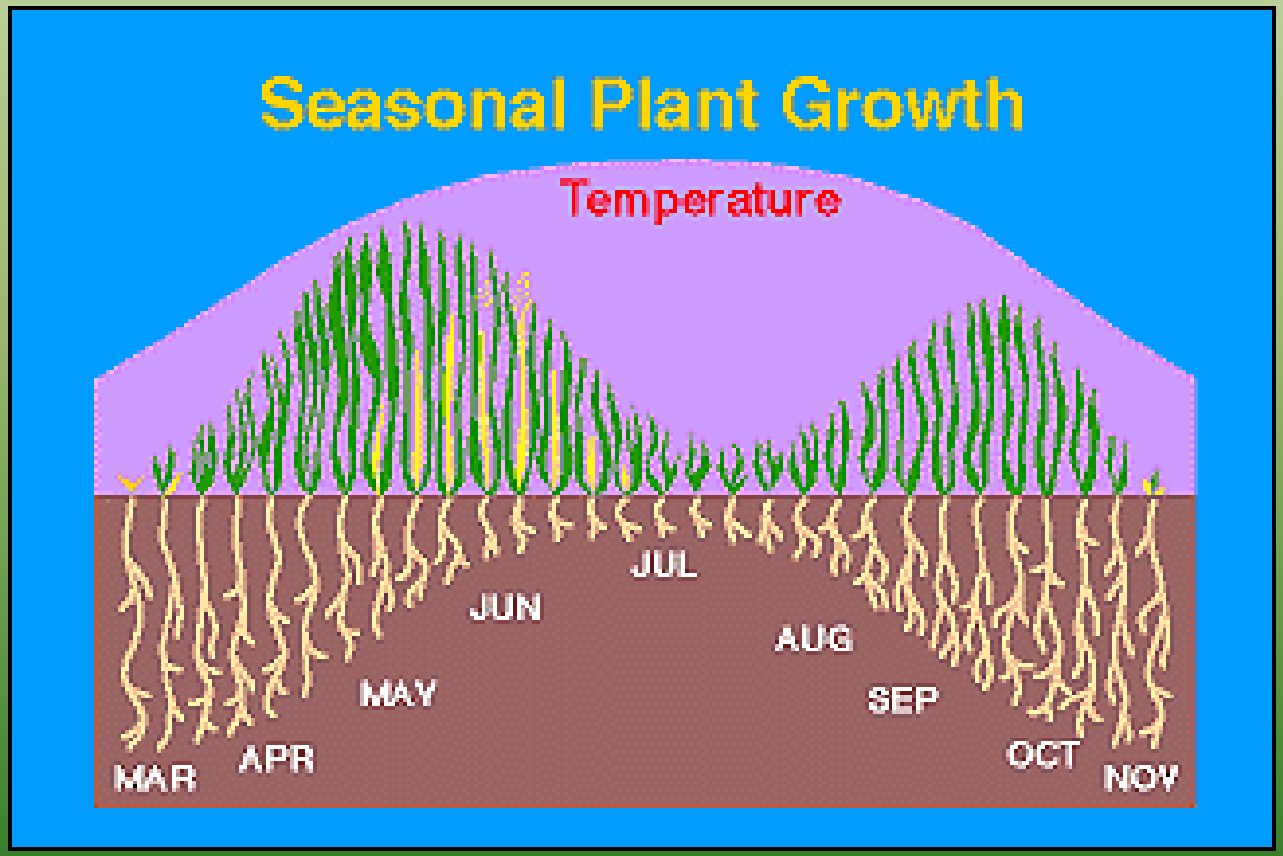




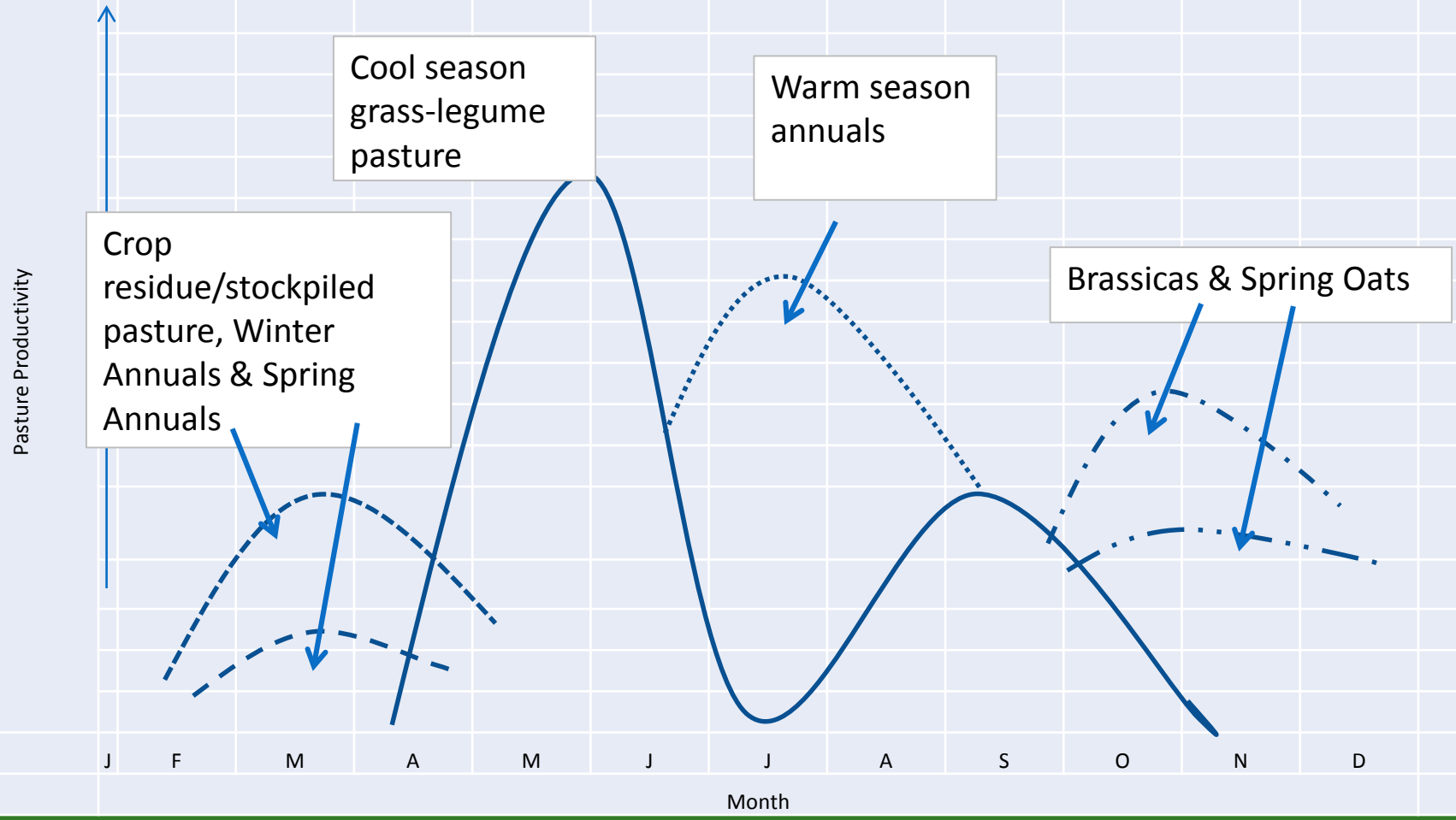

# Cool Season Perennial Grass Pasture Seasonal Growing Cycle

# How plants use stored energy

- Plants use energy stores to grow roots in late winter early spring
- Plants use energy stores to regrow leaves in times of root shedding



# Managing Shortage: Diversified Cropping System (adapted from Penn State Extension)

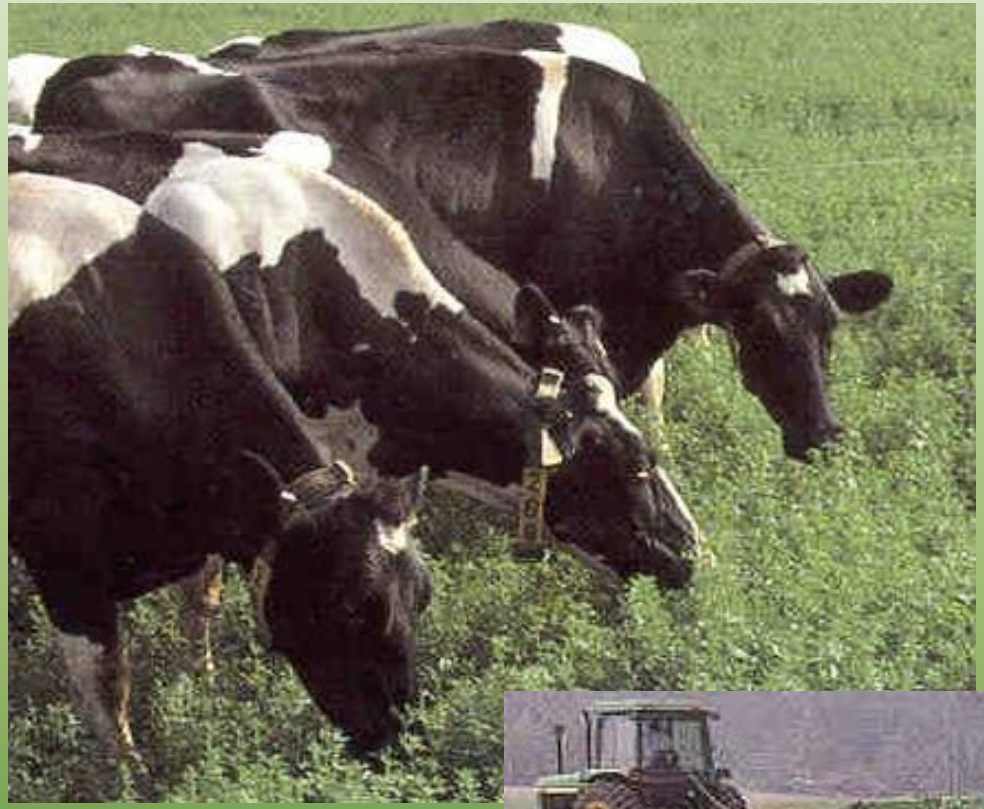



**Cool Season Perennial Grass Cycle supplemented with Winter annuals, Spring Annuals and Summer annuals**

# Grazing Alfalfa

***“ To realize its [alfalfa] potential and maintain stands in a pasture, grazing management must mimic hay cutting”***

***- Carl Hoveland***



# Spring grazing of triticale plus (triticale & annual ryegrass mix)

# Spring Small Grain Forages for Grazing

- Badger Oats
- AC Kings Barley
- Bay Organic Oats
- Reeves
- CDC Haymaker Oats
- Forage Maker 50 Oats
- Proleaf 234 Oats
- Everleaf Oats

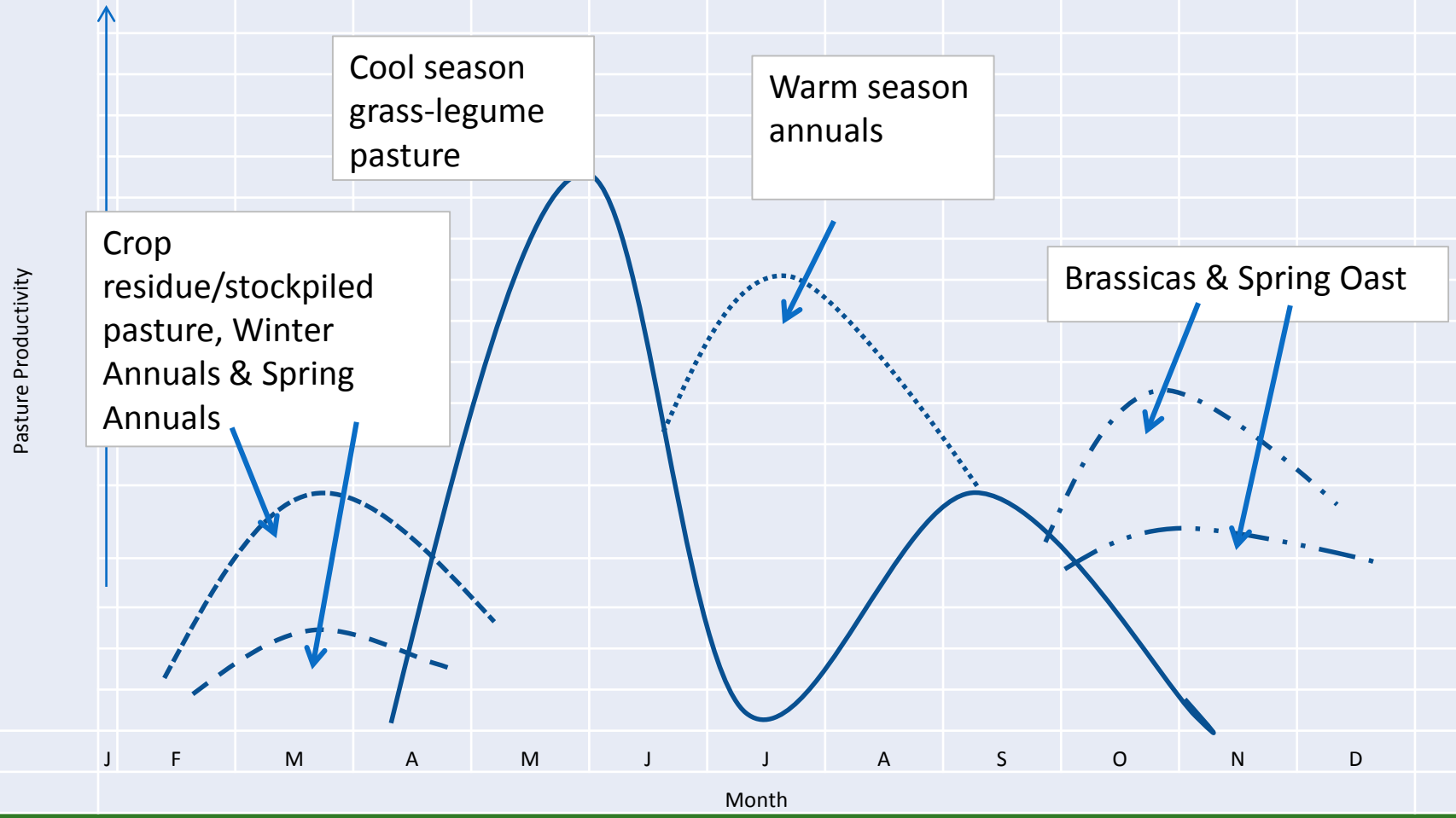
- 1.5 to 3.5 Tons/A Dry Matter (Some years 4 tons/A or above)
- Get oats planted as early as possibly for your zone.
- 50 to 80 Units of N/Acre, recommend AMS
- Beginning Grazing at 8 tom 10 inches tall maximum quality biomass is at Flagleaf Stage (Pre-Boot to Boot stage) before heading for optimal quality.
- Typically the varieties that head later experience higher yields due to longer growing period.

- **HEADING ORDER - Early to Late: Badger,  Reeves, (AC King's Spring Barley), Bay Organic Oats, Jerry, Proleaf, Forage Maker  50, Everleaf.  (~48 to 70 Days)**

- **LEAFYNESS RATING - Most to Least Leafy: Everleaf, AC King's Barley, Pronghorn Triticale, Forage Maker 50, CDC Haymaker, Jerry, (Proleaf, Reeves), Bay, Badger**

# 3 rows of Oats with 1 row of Radish

# Managing Shortage: Diversified Cropping System (adapted from Penn State Extension)

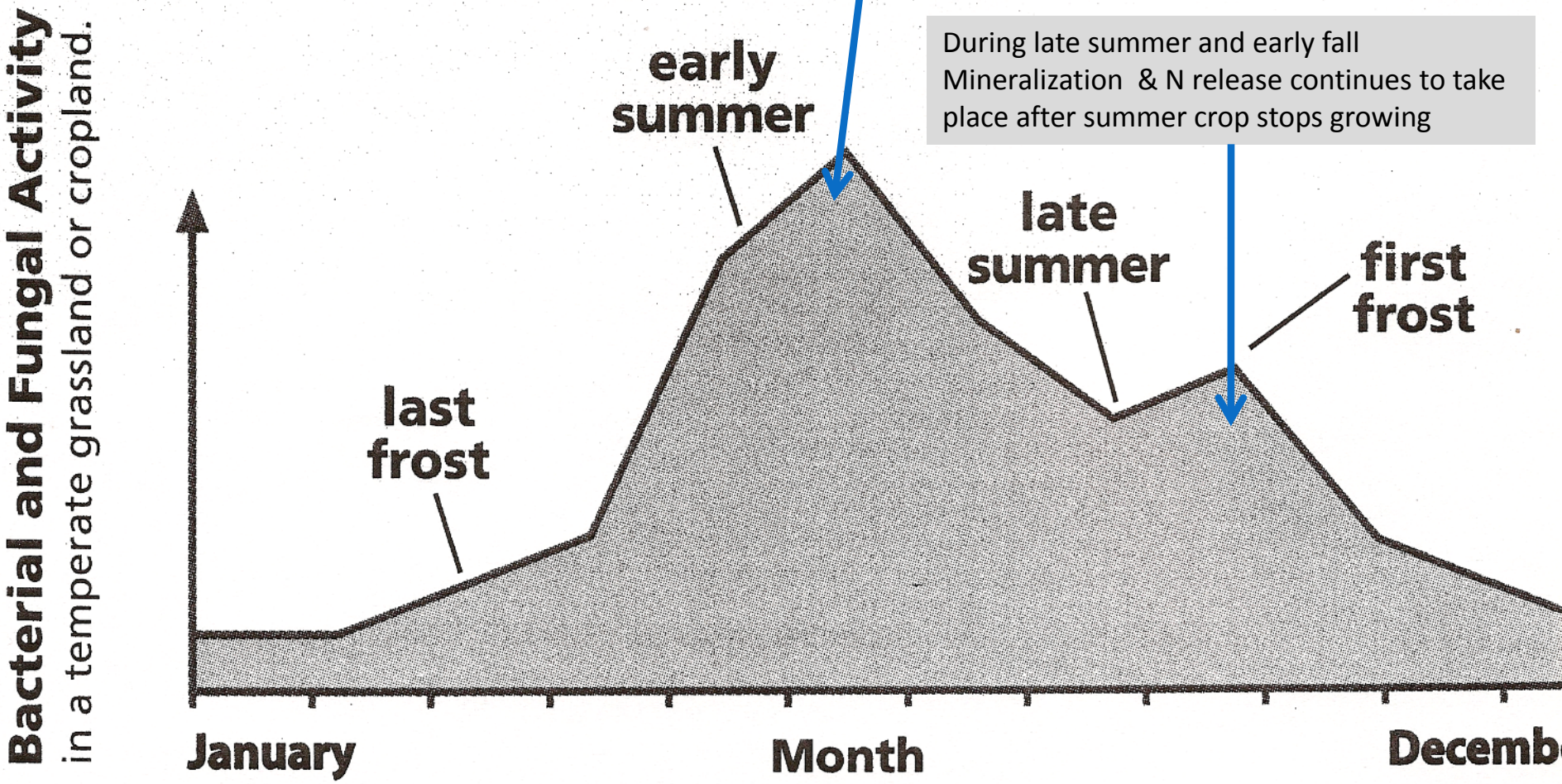



**Cool Season Perennial Grass Cycle supplemented with Winter annuals, Spring Annuals and Summer annuals**

# Seasonal Microbial Activity

Maximum Mineralization & Release of N during summer

During late summer and early fall Mineralization & N release continues to take place after summer crop stops growing



| Cool Season Perennial Pasture Grasses | Warm Season Annual Grasses | Forage Brassicas that can be grown in Summer |
|---|---|---|
| Orchardgrass | Forage Sorghum | Appin Turnips |
| Perennial Ryegrass | SudanGrass | Barkant Turnips |
| Tall Fescue | Sorghum SudanGrass | Purple Top Turnip |
| Meadow Fescue | Pearl Millet | Barsica Rape |
| Kentucky bluegrass | Teff Grass (Lovegrass) | T-Raptor hybrid Rape |
| Timothy | Crabgrass (Selected Varieties) | Bonar Rape |
| | | Pasja Hybrid Brassica |

# Horses and Summer Annual Grasses

- Horses should not graze sorghum, sudangrass, and sorghum-sudangrass hybrids.
- In some cases, *Sorghum* species can cause cystitis, an inflammation of the bladder. This can lead to urinary disorders, lack of coordination, and paralysis in severe cases.
- Although pearl millet is generally safe for equines, foxtail millet should be used sparingly since it may cause a laxative effect, excessive urination, and kidney and bone problems.
- Crabgrass has not been shown to cause any disorders in horses and may therefore be a good alternative for summer annual pastures. Properly cured and stored hay from any of these species is safe to feed to horses and ponies
- Info: Virginia Cooperative Extension, Publication 418-0044 Chris Teutsch, Extension Agronomist

# Photperiod sensitive variety 6501 (no-head) & AF 7101

Happy Hollow Farm, Juniata County, Central PA on Shaley soils

# AF7401
## Forage Sorghum

- Full season:
  - harvest (110-115) days after emergence
- Superior forage quality
- Heavy tillering for high yields
- Stout stalks for excellent standability

# BMR- Digestible Fiber of Forage Sorghum

# SORGHUM TYPES for FORAGE

- SORGHUM X SUDANGRASS – A multiple cut system for silage, balage and grazing.
  - AS6201 –Medium Maturity -60 days to boot stage
  - AS6402 – Late Maturity (Brachytic dwarf) 70 days to boot stage
  - AS6401 – Late Maturiyty-100 days to boot stage
  - AS6501 – Photoperiod sensitive

- SUDANGRASS - A multiple cut system for silage, balage, dry hay and grazing.
  - AS9301 – Dry Stalk , Medium Maturity, 60 days to boot stage
  - AS9302 – Dwarf version of AS9301, a little earlier, Medium maturity 55-65 days to boot stage.

# Sorghum-Sudangrass

# Grazing Sorghum Sudan


134

# Cows grazing AS 6402 Sorghum-Sudangrass and T-Raptor brassica

# Sudangrass

# MasterGraze Tillering Corn

# MasterGraze Corn Tillering

# MasterGraze Tillering corn

# MasterGraze Tillering Corn

# Cowpeas

# Cowpeas

# MasterGraze tillering corn & Cowpeas

# Pearl Millet on Left, Sudangrass on right

# Pearl Millet on Left Sudangrass on right


King's
AgriSeeds LLC
Elite 2
Pearl Millet

# Pearl Millet

# Pearl Millet

# Pearl Millet

# Wonderleaf pearl millet

# Wonderleaf Pearl Millet

# Exceed BMR Hybrid Pearl Millet

- A flexible and highly digestible forage hybrid for grazing, hay or silage

Agronomic Traits

- Dwarfing gene increases leaf to stem ratios, improves standability, and
- adapts to heavier grazing pressure
- Excellent disease resistance package
- Rapid growth and regrowth
- Drought stress tolerant
- Extensive tillering capacity
- Extreme leafiness allows for faster dry-down for hay
- Flexible to various soil pH ranges; handles lower pH acidic soils
- Works well as part of a summer annual mix or in a straight stand for
- renovating pastures, before a new seeding of perennials.

# Brassicas & Sudangrass

# Brassicas & Sudangrass

# Brassica & Sudangrass with lead wire

# Brassica & Sudangrass with lead wire

# Brassica & Sudangrass residue after grazing

# Purple Top turnips Roots

# Purple Top Turnip and Radish Roots

# Forage Radish Roots

# Forage Radish & Purple Top Turnip Leaves

# Forage Radish leaves

# Daikon radish and triticale after corn

# Seeding triticale in corn 9-30-09

# Seeding triticale in corn  9-30-09

# Seeding triticale in corn  9-30-09


Seeding triticale in corn 9-30-09


11-17-09 (48)days after seeding

# Inspirational Wisdom

- “A nation that destroys its soil destroys itself.”

  Franklin Delano Roosevelt

- “Despite all our pretensions,

  we still are totally dependent on 6 inches of top soil and the fact that it rained.”

  Confucius