Planning Forage Systems

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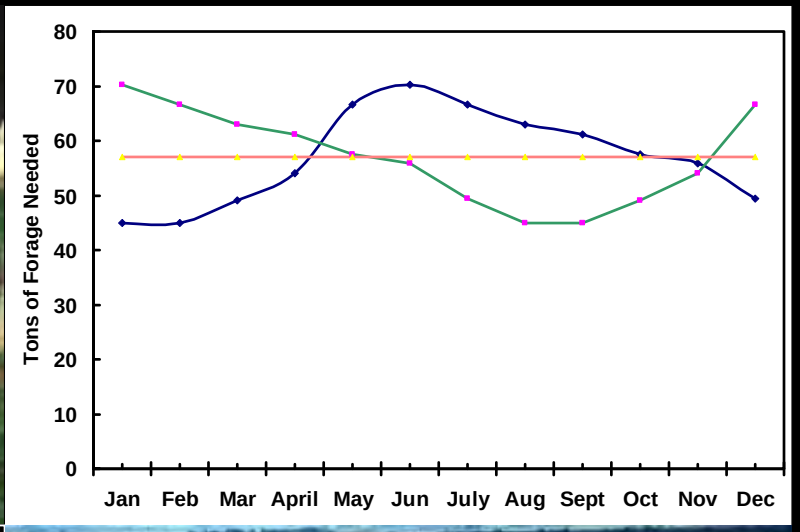
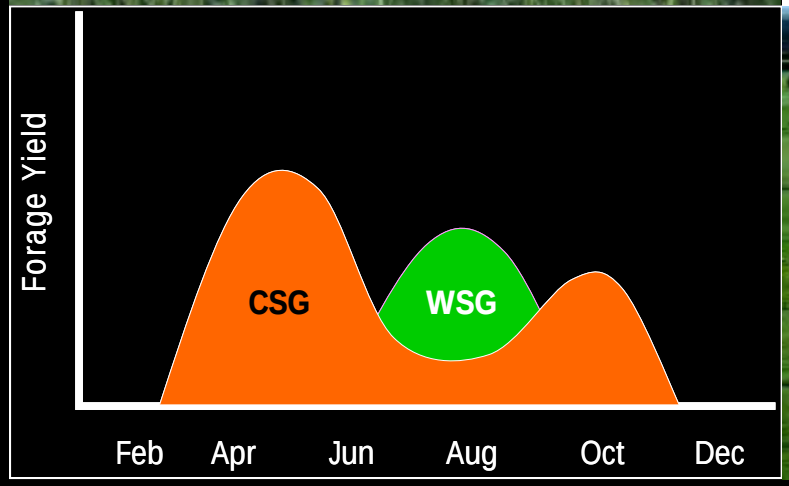
Pasture-based Systems often appear Complex





Concepts

- Simple...Allows owner to manage and grow scale
- Repeatable...Must work across a wide variety of conditions
- Profitable...Have to make $ to remain in business

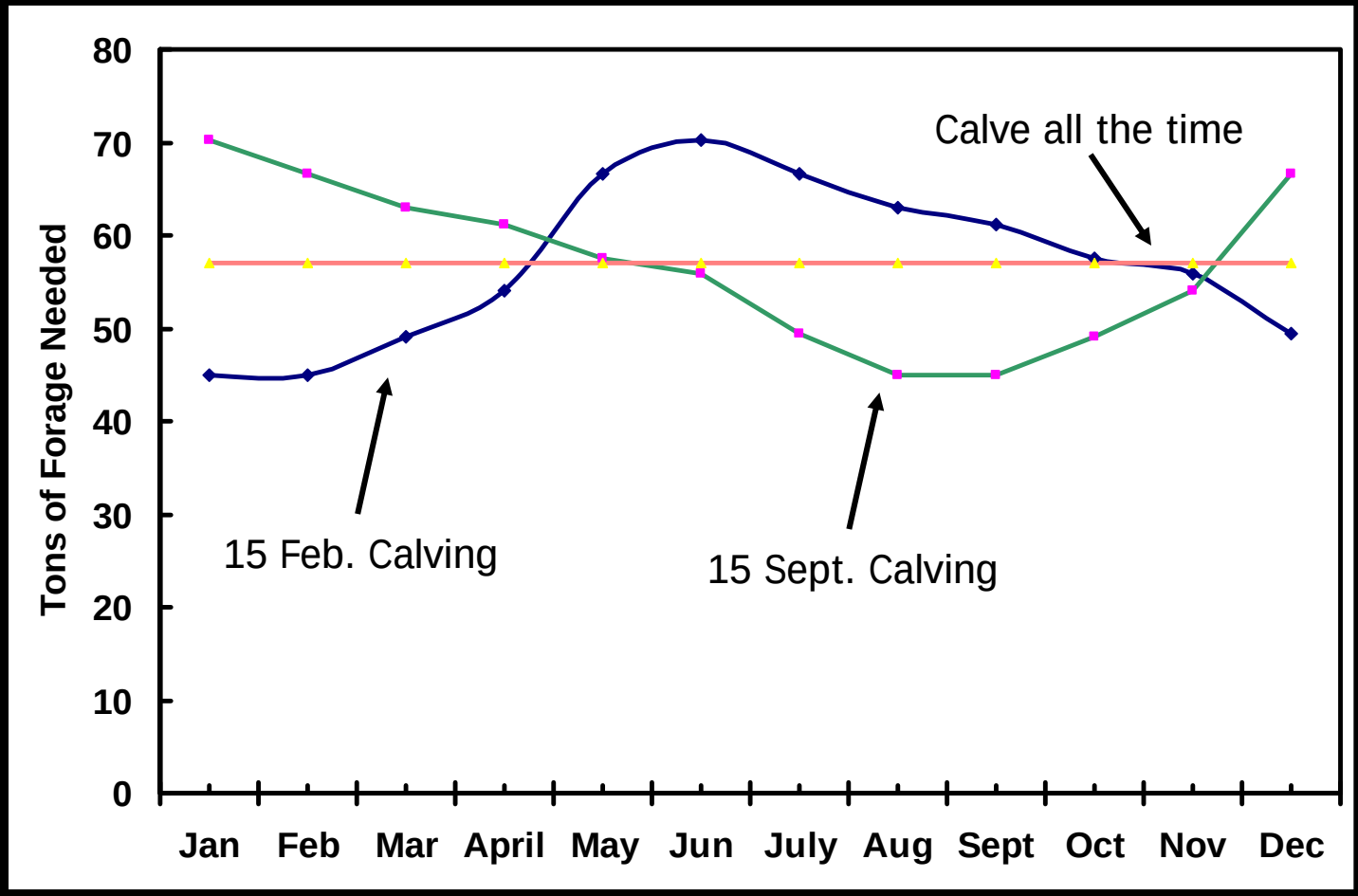
Production Planning

- A pretty ordinary thing in successful business models

Key Factors for Managing Forage Systems

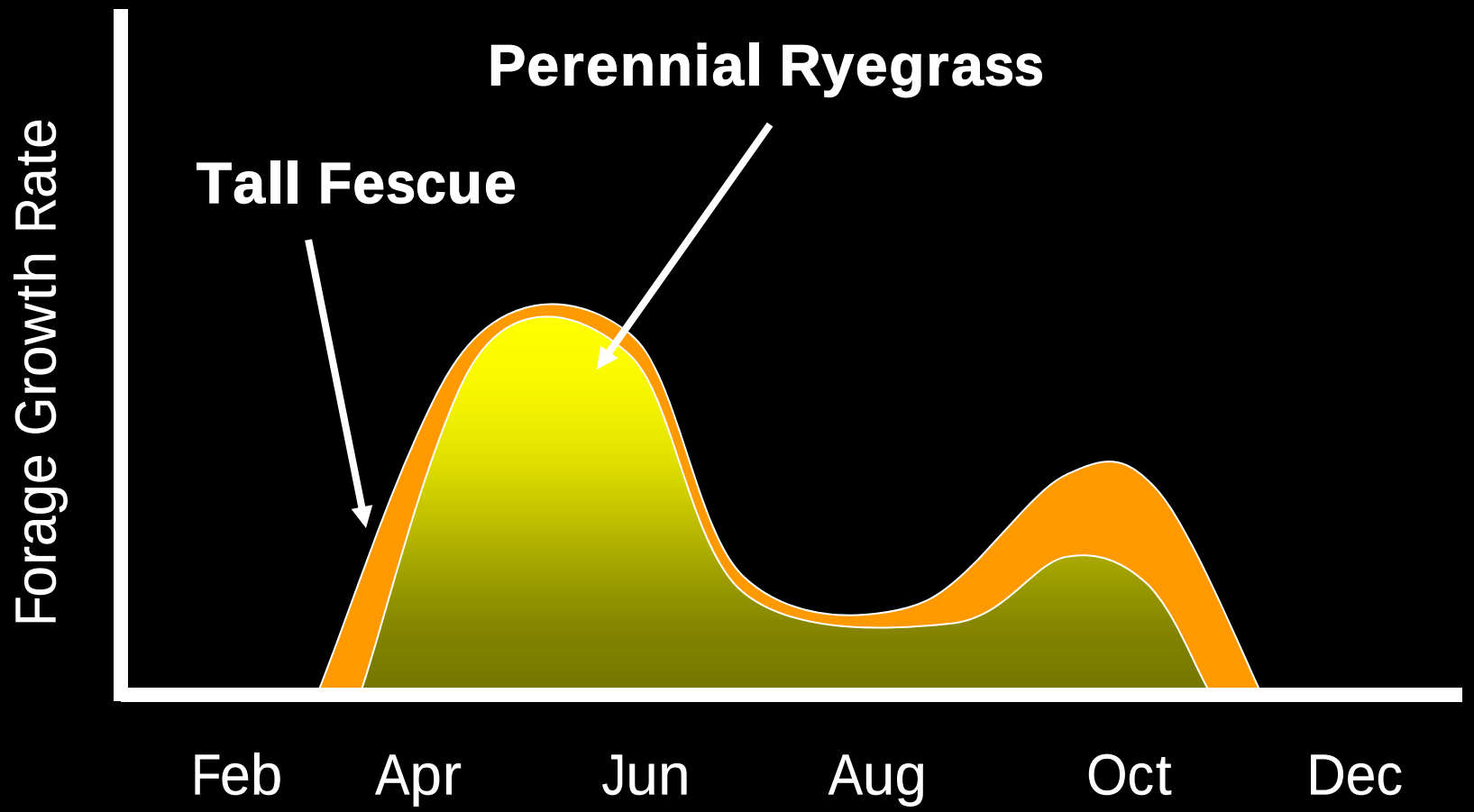
- Understand what nutrients your cows need and when they need them
  - Calving season of most importance
- Select forages that fit your climate, soils, calving season
  - Prepare a pasture growth budget
  - Develop plans for forage growth deficits and excesses
  - Monitor production frequently
- Optimize quality by grazing management
  - Turn in at ~2750 lb/acre for most species
  - Turn out at ~1150 lb/acre for most species

Monthly Dry Matter Demand



100 cow herd – 1,200 lb cows – 13,000 lb milk/cow/yr

Cool Season Grasses



Perennial Ryegrass

- Medium to high yield potential
- Fair to poor persistence (2 to 4 yrs.)
- Fair tolerance to:
  - poor drainage
  - low soil fertility
- Poor tolerance to:
  - drought
  - heat stress
  - cold temperatures
- Forage quality good to excellent if managed

Tall Fescue

- Medium to high yield potential
- Medium persistence
- Good tolerance to:
  - cold temperatures
  - poor drainage
- Fair tolerance to:
  - low soil fertility
  - drought
  - heat stress
- Good forage quality if using a cultivar with a beneficial endophyte or no endophyte

Milk Production from Tall Fescue

Type	Intake	Milk Yield
	lb/d	lb/d
KY 31 Infected	15.6	34.3
KY 31 Uninfected	20.0	43.1

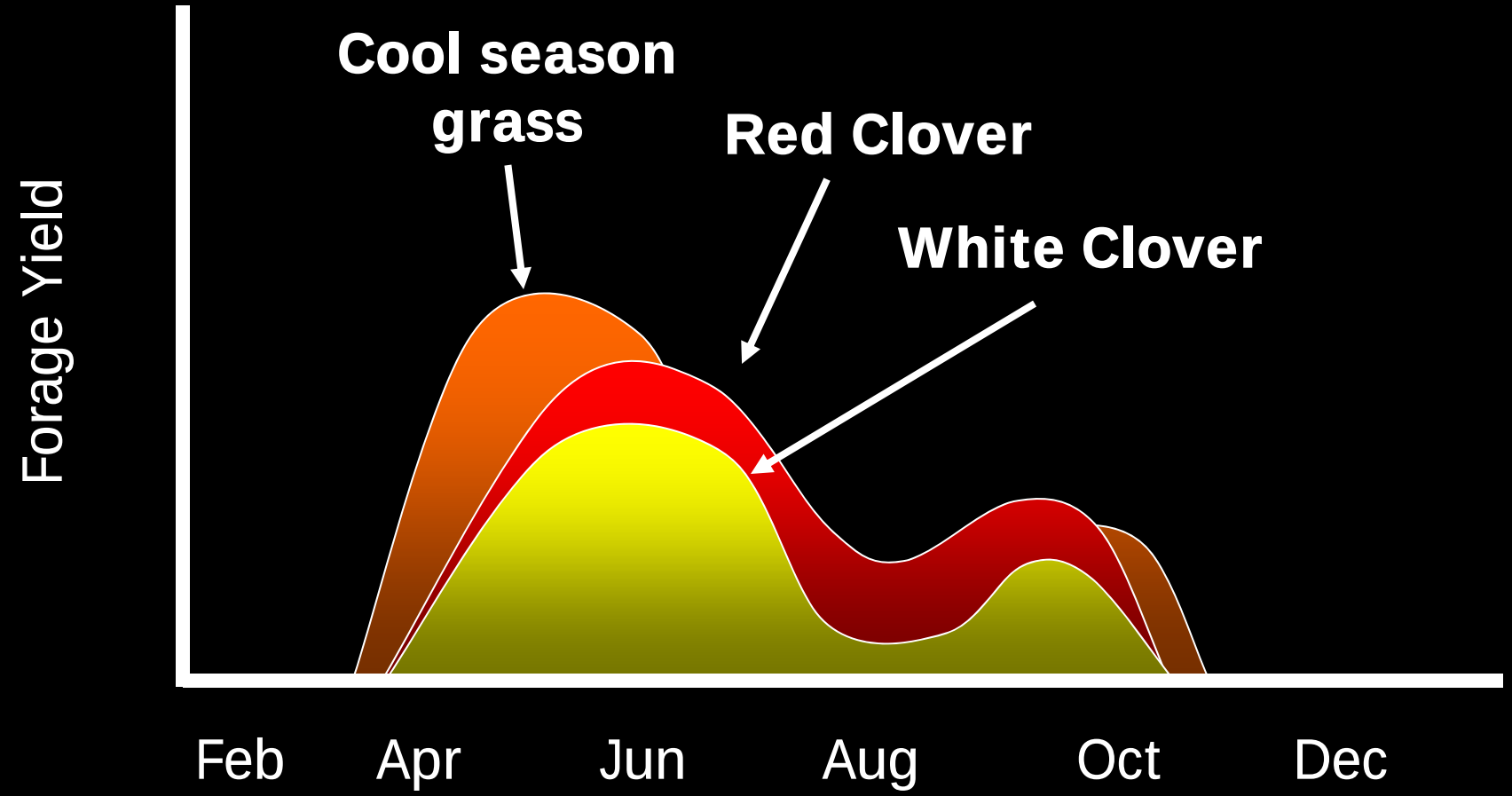
Strahan et al., 1987

Cool-Season Grasses:
Species or Management?

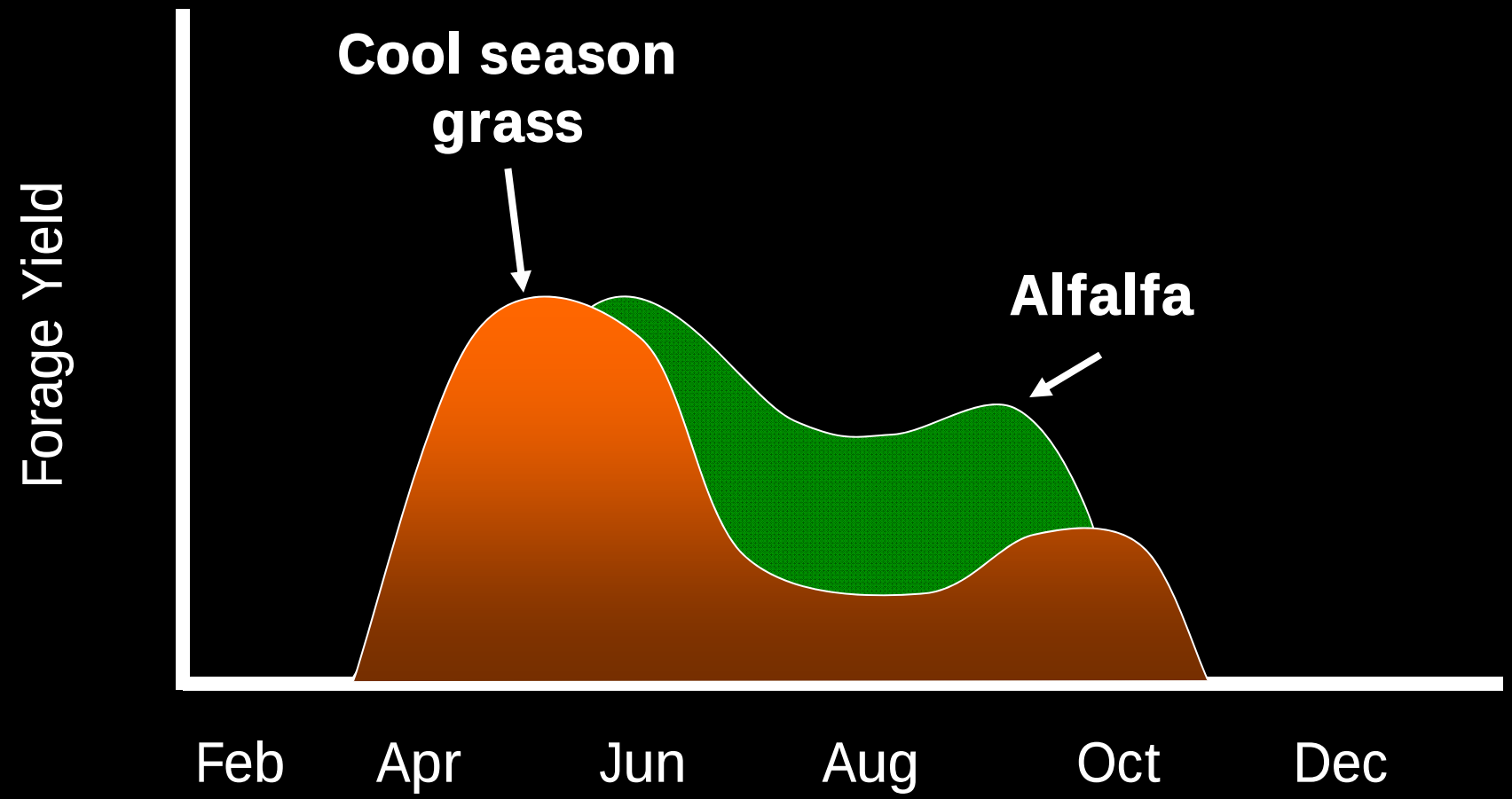
Type	-- Initial Height -- 6-10	12-14
	milk (lb/day)	
Tall Fescue (EF)	58.0	42.4
Orchardgrass	58.2	43.2
Perennial Ryegrass	59.2	44.5

Summary of five studies

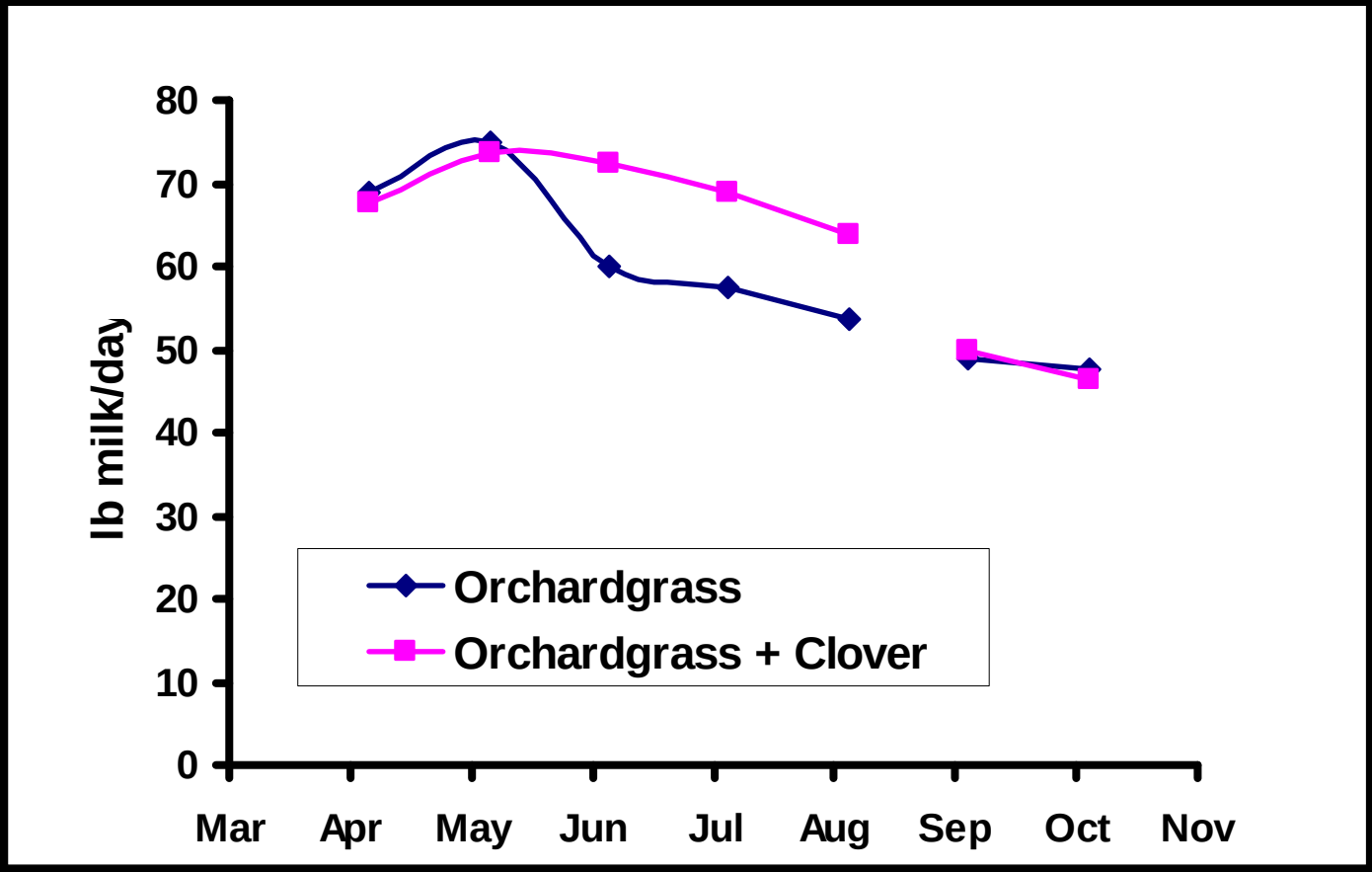
Cool Season Grass with Legumes



Cool Season Grass with Alfalfa

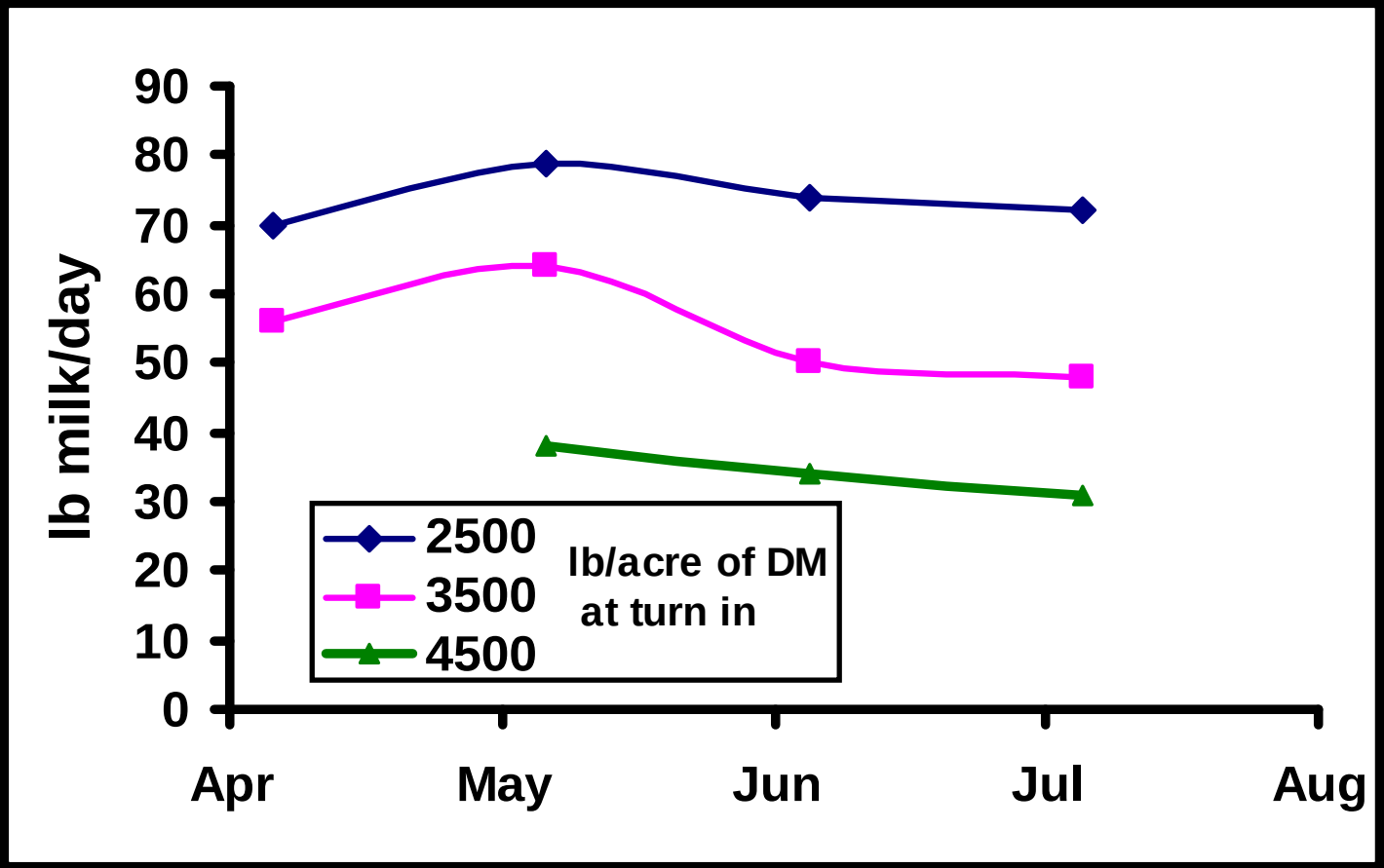


The Benefit of Legumes in Grass Pastures



Cool-season Grasses & Legumes:
Grazing Management

Allocation of Pasture for Dairy Cattle



Pasture Budgeting

- What do you expect from your pasture?
  - When do you expect to get it?
  - How do you plan to deal with deficits in forage production?
  - How are you going to deal with excess forage production?

Perennial Ryegrass/Clover

	Monthly Forage Balance							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	---------- tons ----------							
Perennial Ryegrass/Clover	4	97	168	86	39	11	51	33
Forage Needed by Herd	49	54	67	70	67	63	61	58
Forage Surplus/Deficit	-45	43	101	16	-28	-52	-10	-25

- Perennial ryegrass/clover – 100 acres – 5 t/a
- Stocking rate: 100 milking cows on 100 acres
- 15 Feb calving
- 10 lb grain/day
- 13,000 lb annual milk

Forage balance = 1 tons
Excess to be harvested = 160 tons
Excess to be fed back = 159 tons

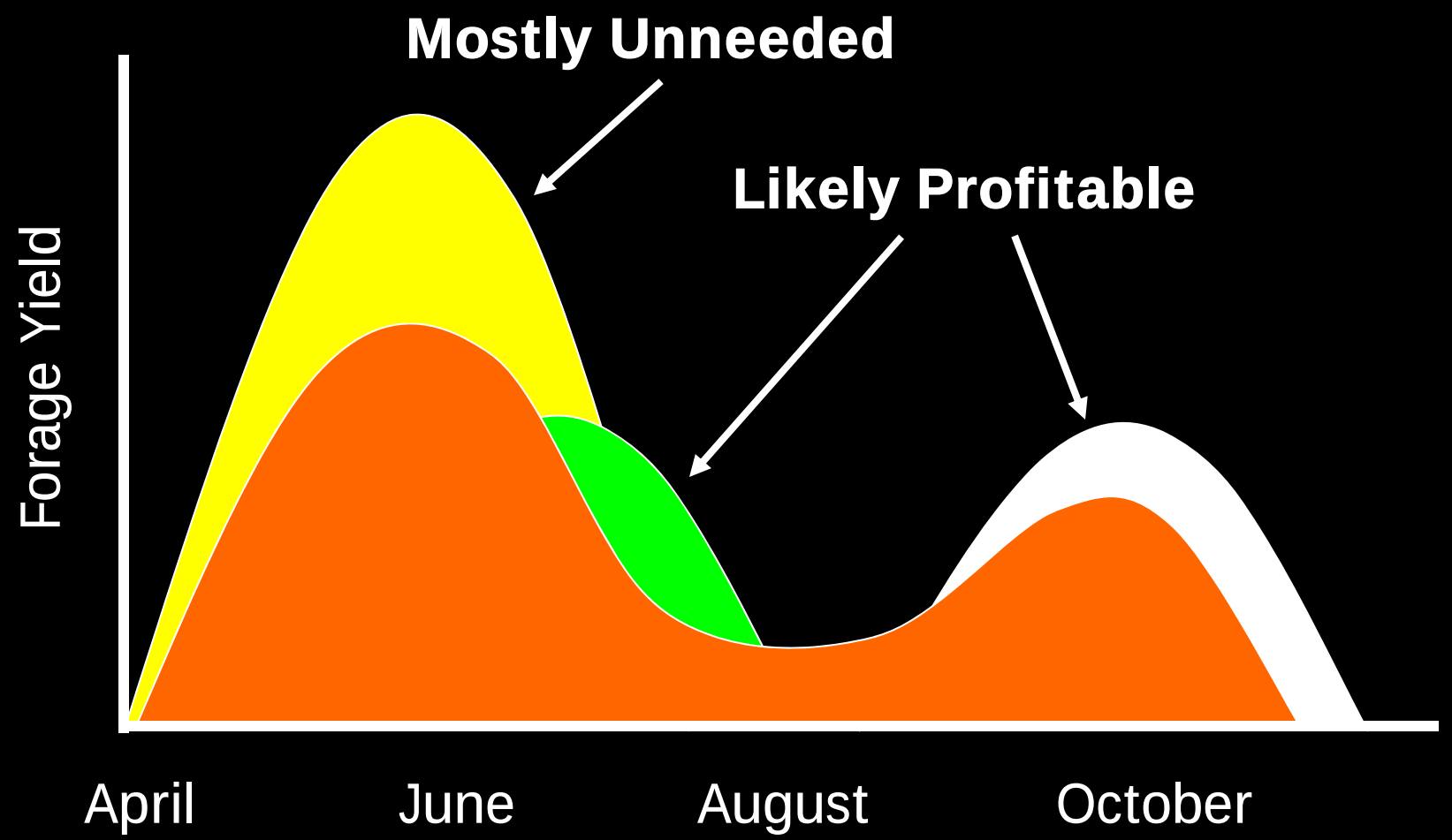
Tall fescue (non-toxic)/Clover

	Monthly Forage Balance							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	---------- tons ----------							
Tall fescue/clover	9	78	167	114	61	11	67	75
Forage Needed by Herd	49	54	67	70	67	63	61	58
Forage Surplus/Deficit	-40	24	100	44	-6	-52	6	17

- Tall fescue/clover – 100 acres – 6.0 t/a
- Stocking rate: 100 milking cows on 100 acres
- 15 Feb calving
- 10 lb grain/day
- 13,000 lb annual milk

Forage balance = 93 tons
Excess to be harvested = 191 tons
Excess to be fed back = 98 tons

Nitrogen for Cool-season grasses



Tall fescue (non-toxic)/Clover + 60 lb N/acre in Early Spring

	Monthly Forage Balance							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	---------- tons ----------							
Tall fescue/clover	15	128	194	138	68	11	67	75
Forage Needed by Herd	49	54	67	70	67	63	61	58
Forage Surplus/Deficit	-34	74	127	68	1	-52	6	17

- Tall fescue/clover – 100 acres – 7.0 t/a
- Stocking rate: 100 milking cows on 100 acres
- 15 Feb calving
- 10 lb grain/day
- 13,000 lb annual milk

Forage balance = 206 tons
Excess to be harvested = 292 tons
Excess to be fed back = 89 tons

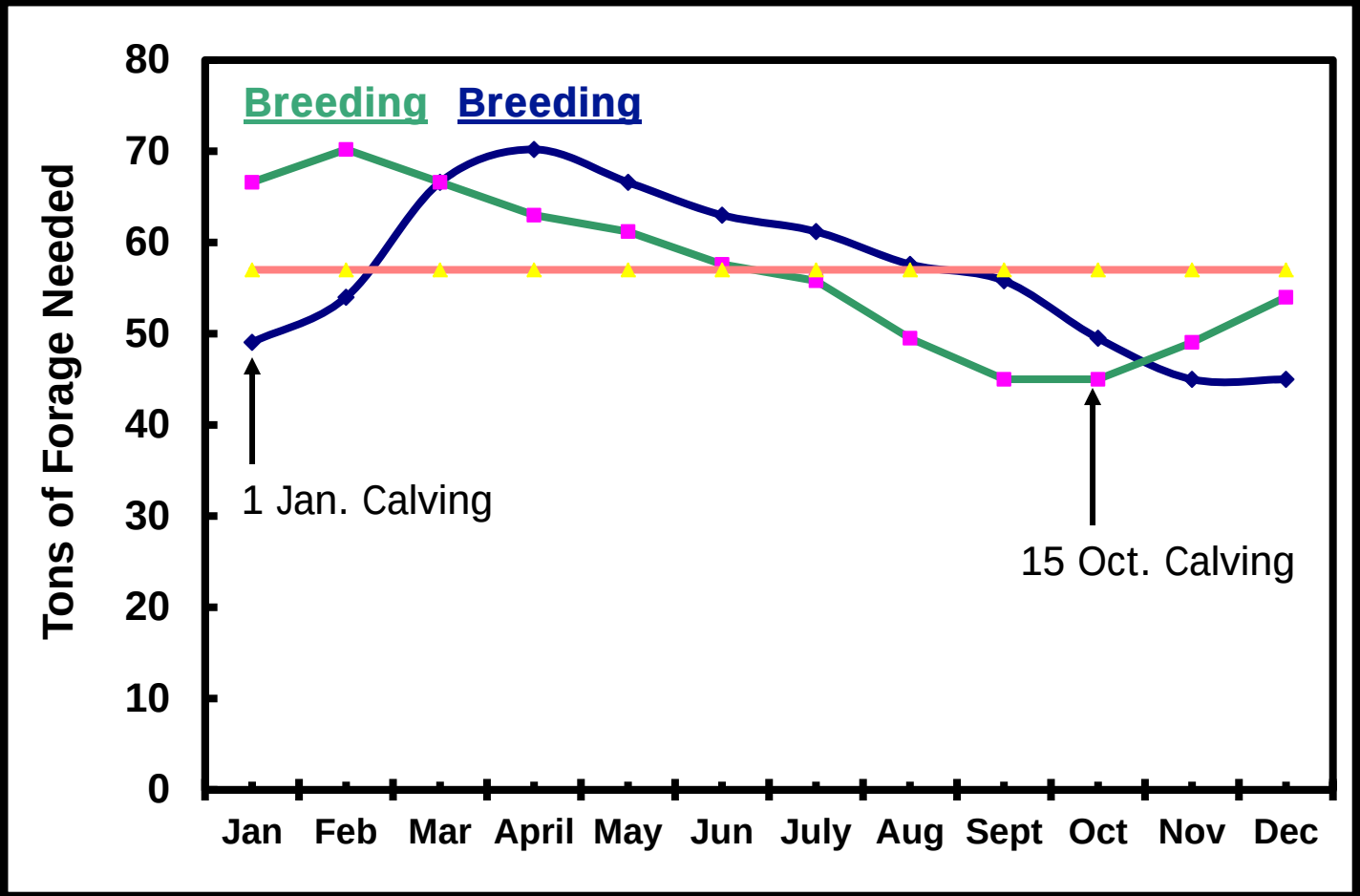
Tall fescue (non-toxic)/Clover + 60 lb N/acre in August

	Monthly Forage Balance							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	---------- tons ----------							
Tall fescue/clover	12	78	166	114	68	31	128	93
Forage Needed by Herd	49	54	67	70	67	63	61	58
Forage Surplus/Deficit	-37	24	99	44	1	-32	67	35

- Tall fescue/clover – 100 acres – 6.7 t/a
- Stocking rate: 100 milking cows on 100 acres
- 15 Feb calving
- 10 lb grain/day
- 13,000 lb annual milk

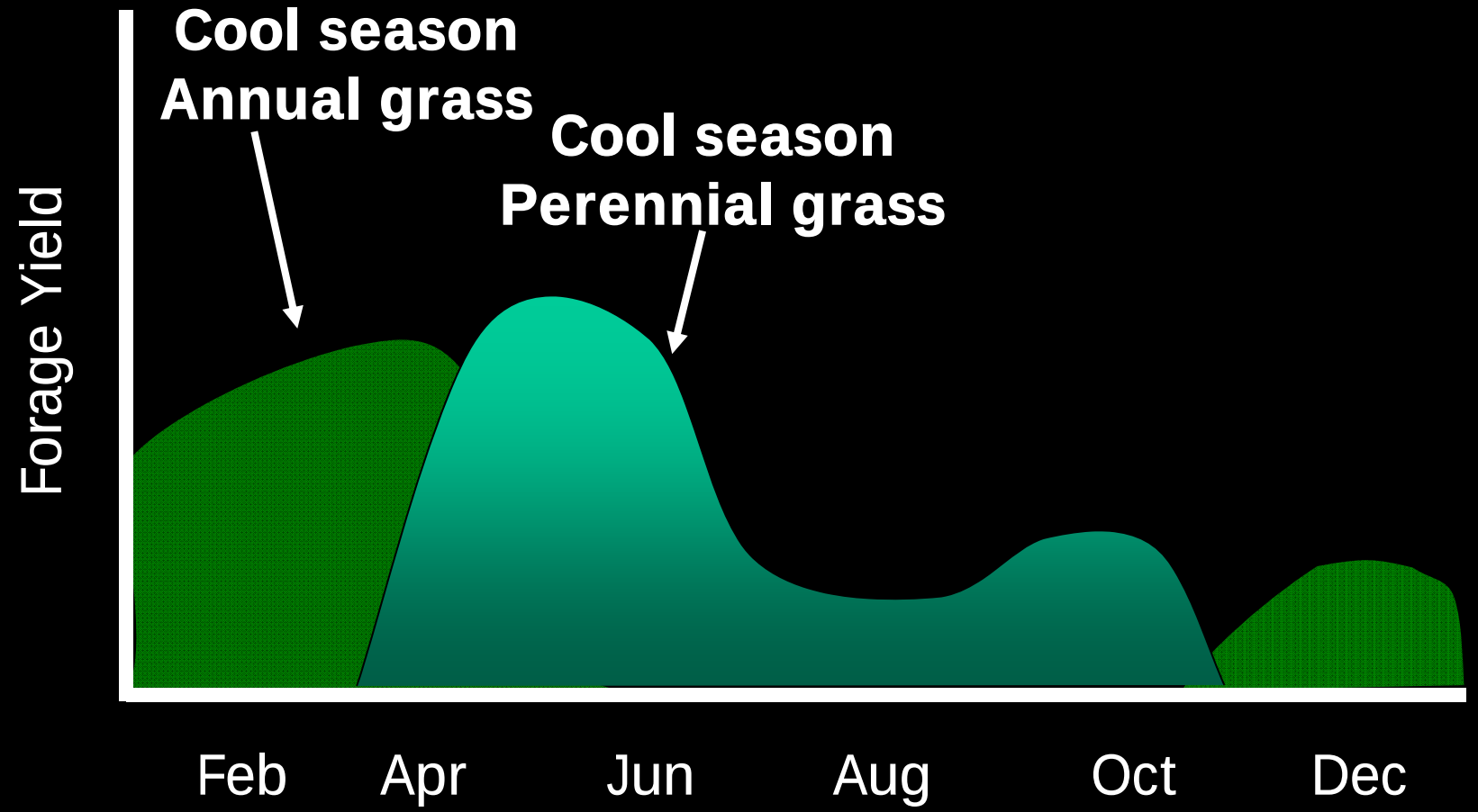
Forage balance = 201 tons
Excess to be harvested = 268 tons
Excess to be fed back = 69 tons

Monthly Dry Matter Demand



100 cow herd – 1,200 lb cows – 13,000 lb milk/cow/yr

Forage Distribution in the Southeast



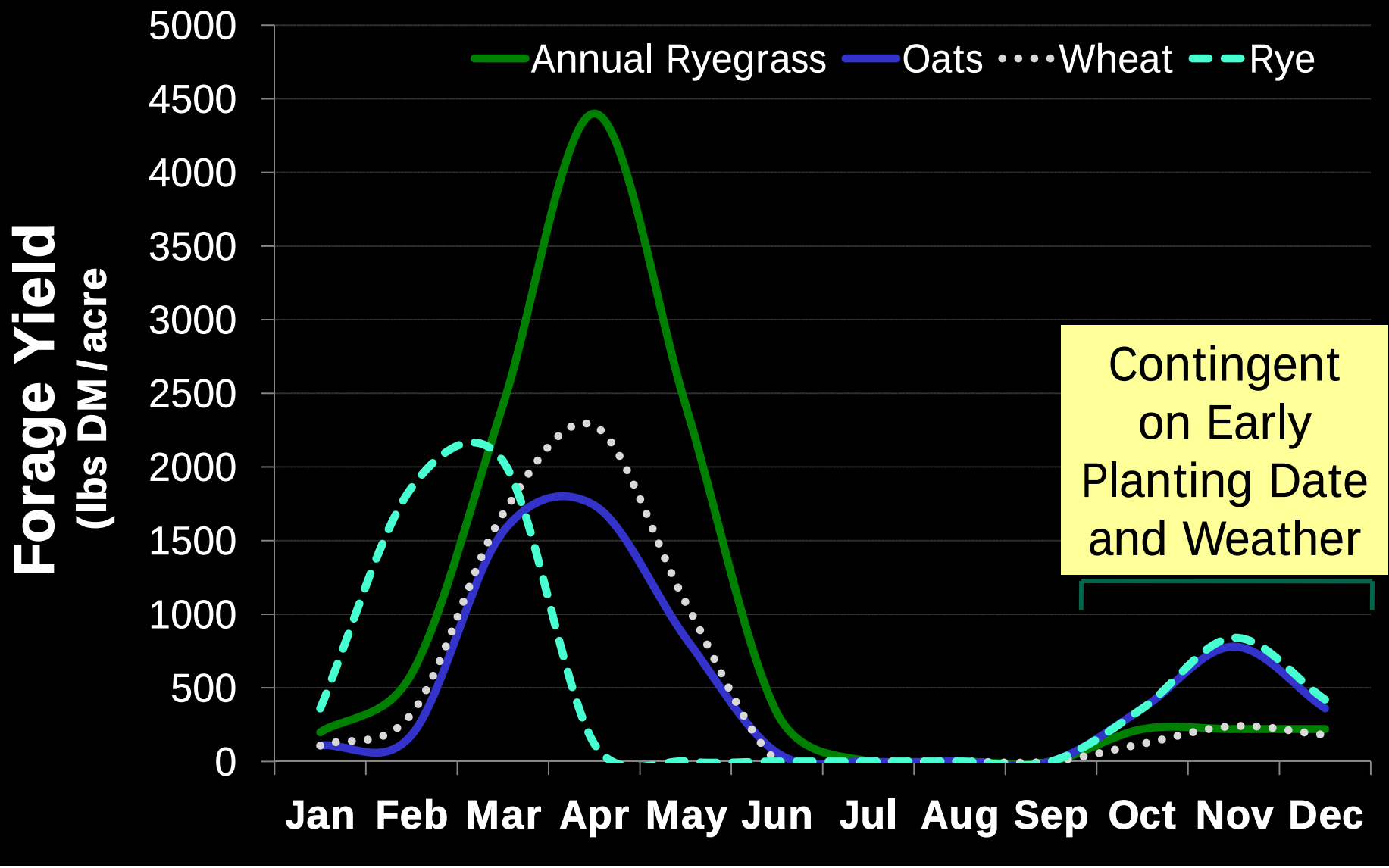
Winter Annual Forage Quality

Species	Crude Protein	NE_L	Annual Yield
	%	Mcal/lb	lbs DM/acre
Ryegrass	10-30	0.52-0.80	11,000
Oats	8-28	0.50-0.75	6,000
Wheat	8-28	0.50-0.75	6,000
Rye	8-28	0.48-0.72	6,500
Arrowleaf	12-30	0.60-0.80	3,500
Crimson	12-30	0.60-0.80	3,500

Quality ranges approximate the typical values and are highly dependant upon forage maturity at grazing/harvest. Yields are approximate based on 3-yr averages from GA (grasses and legumes) and AL (legumes).

GRASS

Winter Annual Grasses Differ in Forage Distribution

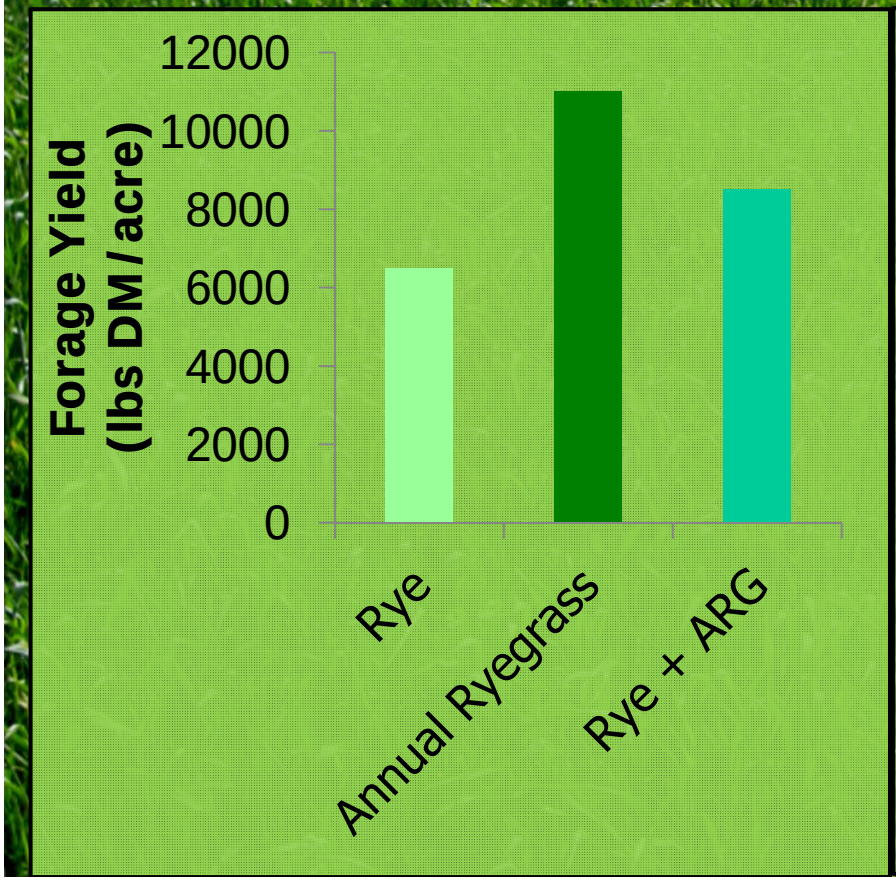


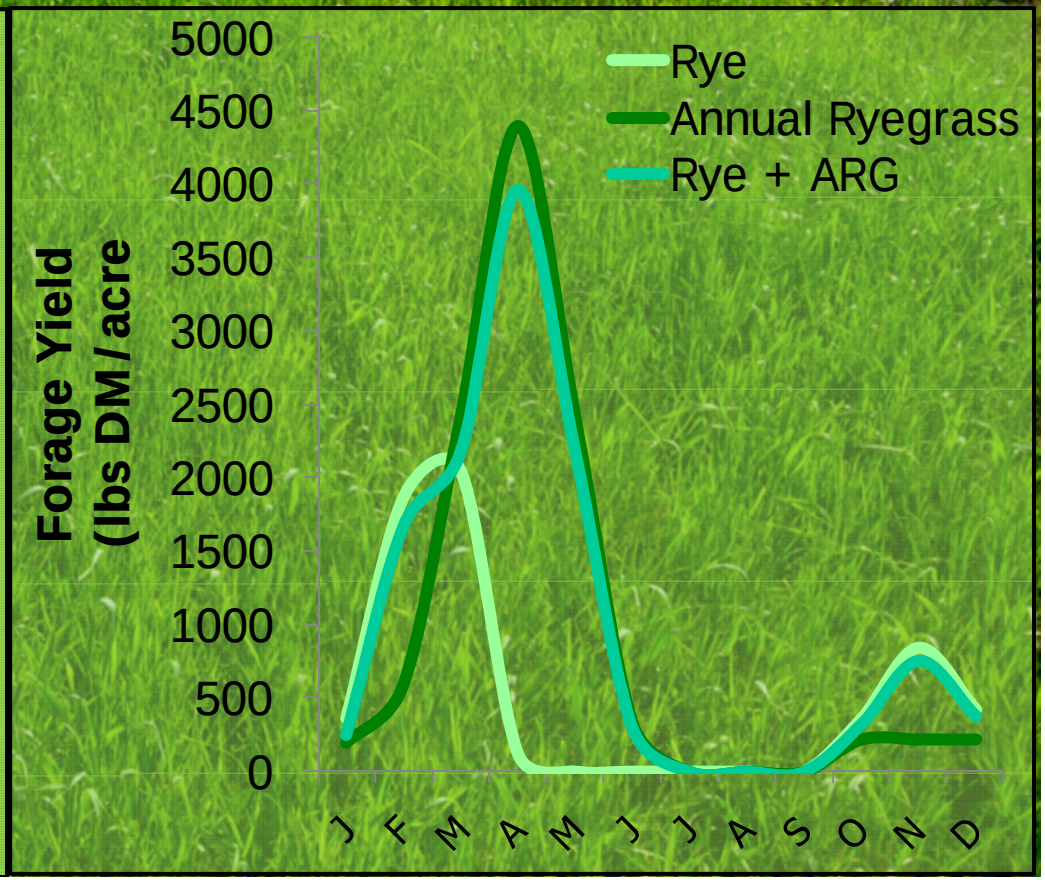
Winter Annual Mixtures

Lesson Learned on Mixing Grass Species:

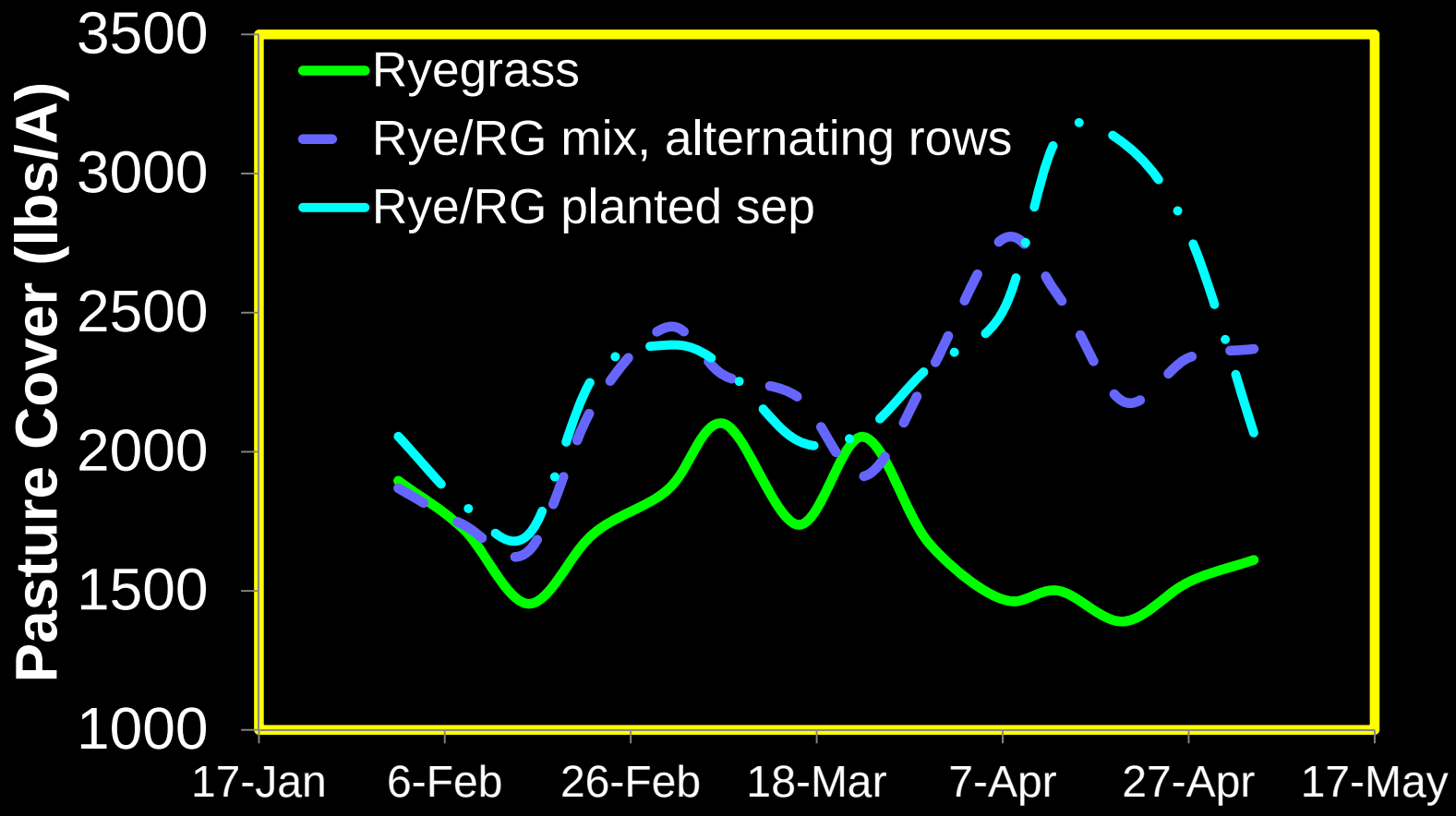
Yield is less than average of the two (not additive)

The distribution of growth is as wide as both.

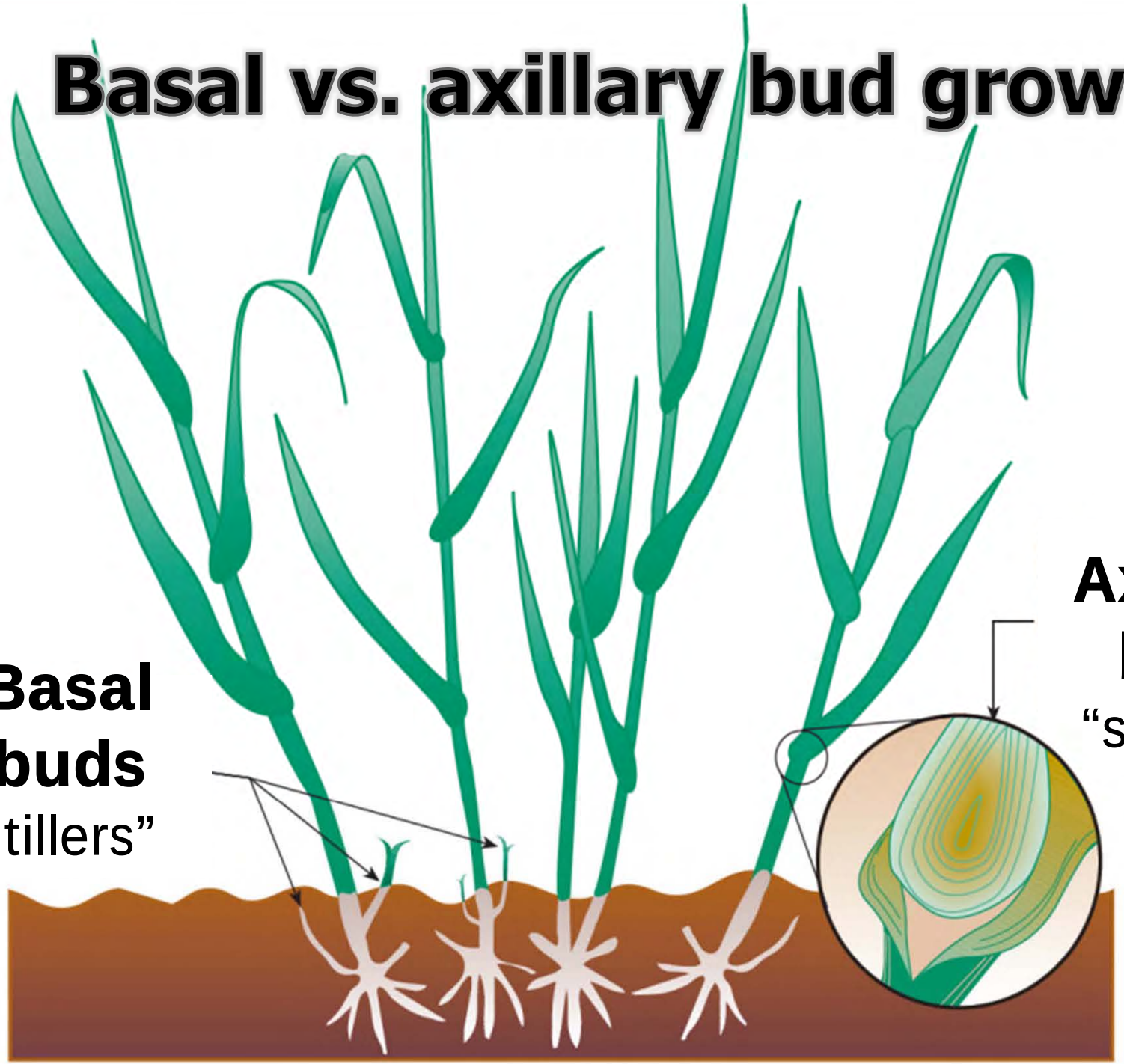




Different Planting Arrangements

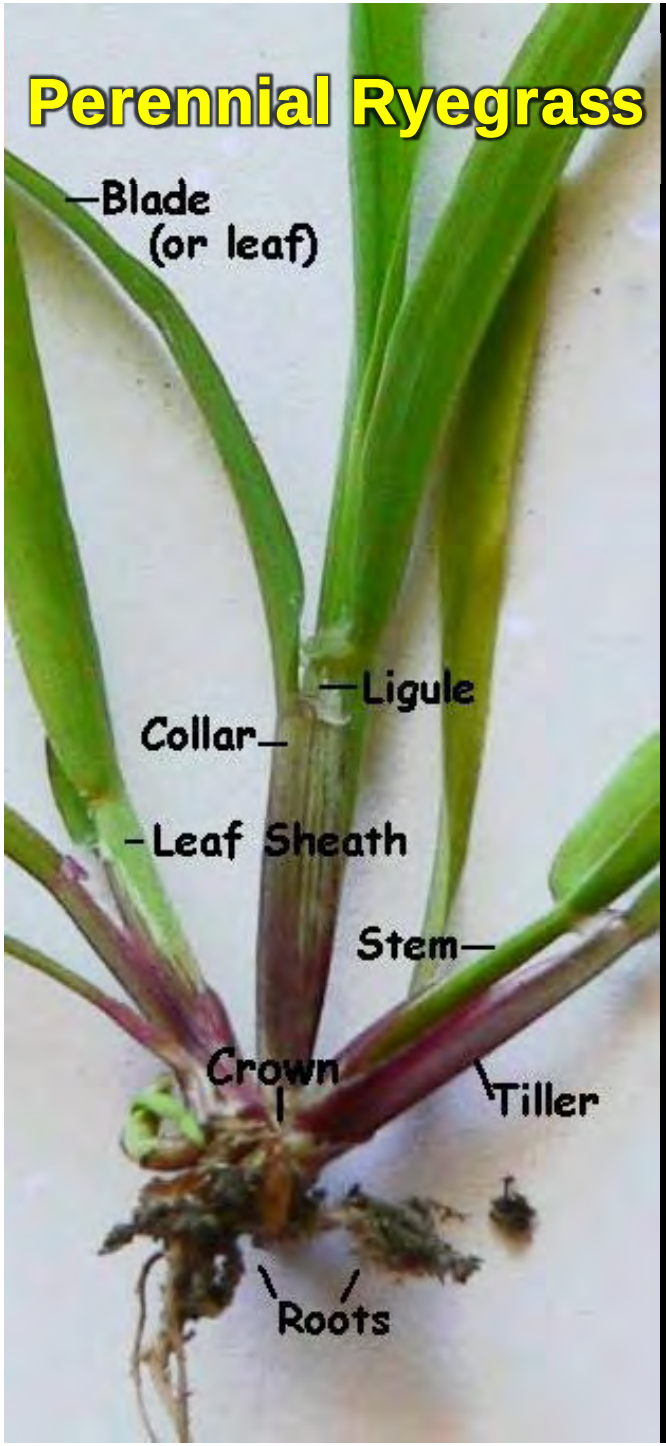


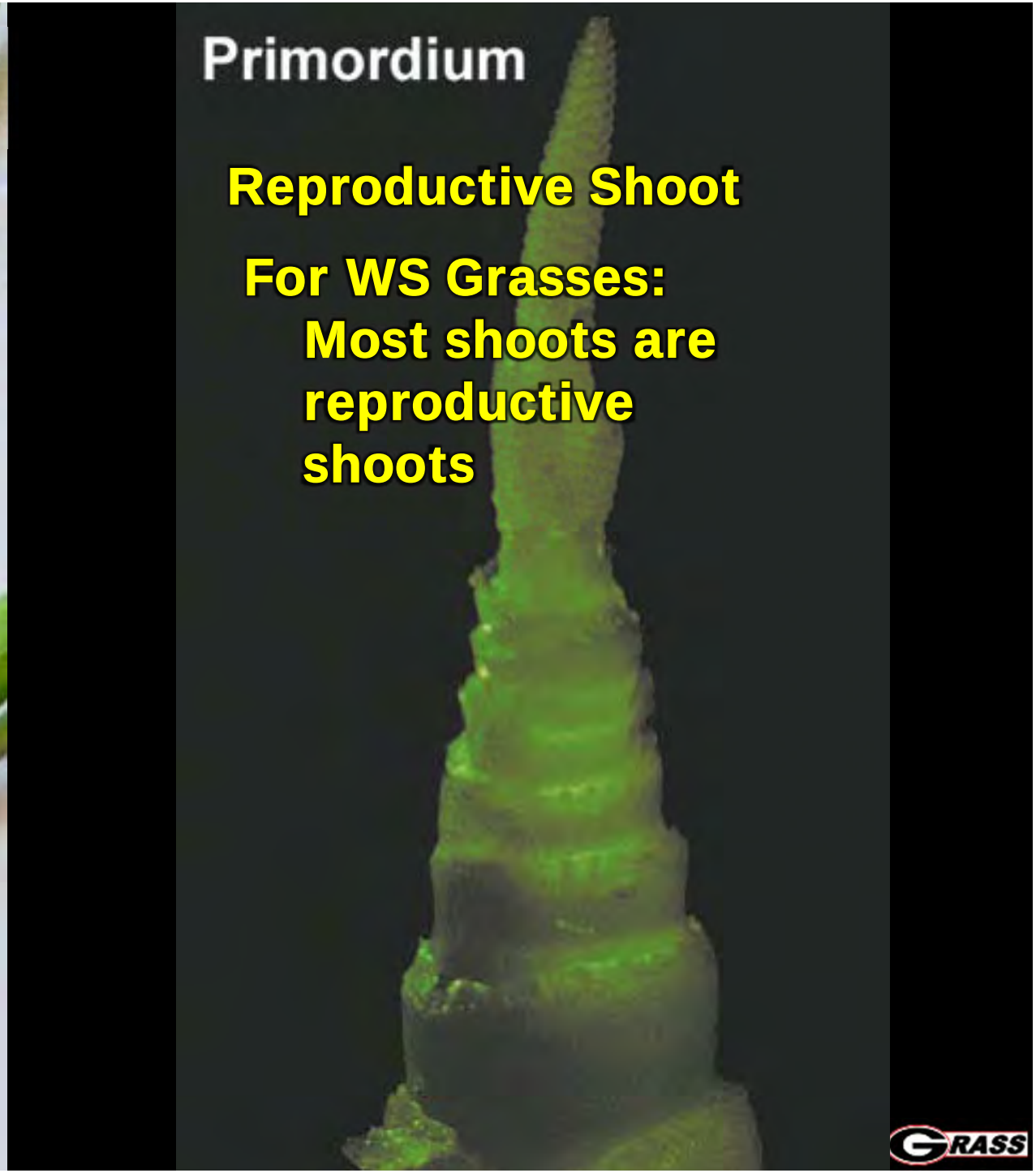
Basal vs. axillary bud growth



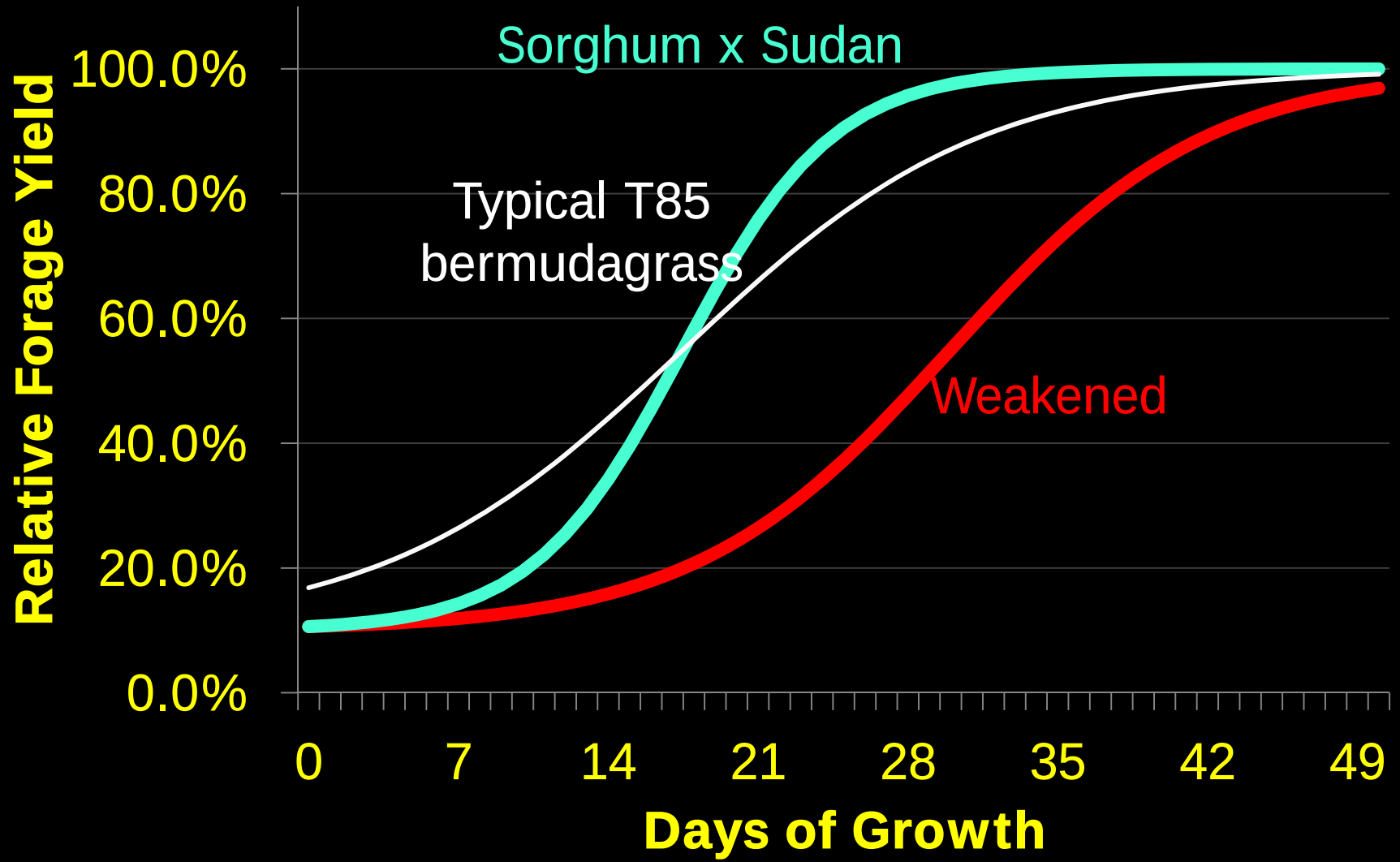
Basal buds
"tillers"

Axillary buds
"suckers"

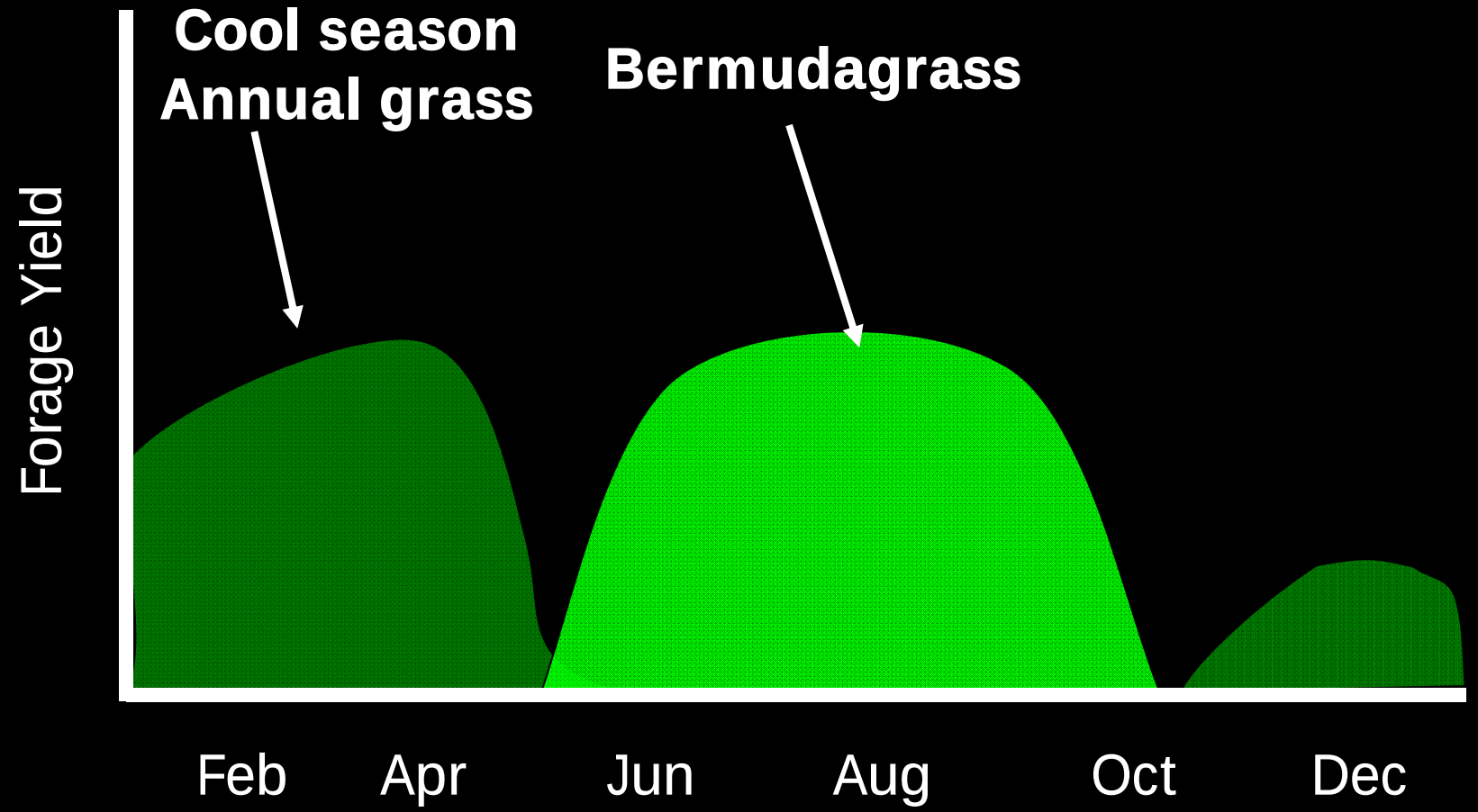

Perennial Ryegrass
Blade
(or leaf)
Ligule
Collar
Leaf Sheath
Stem
Crown
Tiller
Roots


Primordium
Reproductive Shoot
For WS Grasses:
Most shoots are reproductive shoots
GRASS

Differences in Growth



Forage Distribution in the Southeast



Differences in Forage Quality

	Forage	CP (%)	NE_L (Mcal/lb)	NE_L (Mcal/kg)
P	Alfalfa	25.6	0.73	1.61
P	Bermudagrass	18.2	0.66	1.46
P	Rye	24.4	0.80	1.76
P	Ryegrass	29.2	0.78	1.73
P	Sorghum-Sudan	19.2	0.64	1.40
	Alfalfa baleage	19.6	0.67	1.47
	Alfalfa haylage	20.9	0.59	1.31
	Corn silage	7.1	0.72	1.59

White et al., 2002 J. Dairy Sci. 85:95-104

Bermudagrass

- Common (seeded)
- Hybrids (sprigged)
  - Tifton (USDA-ARS & UGA)
- Typically very drought tolerant
- Aggressive and persistent
- Requires high fertility

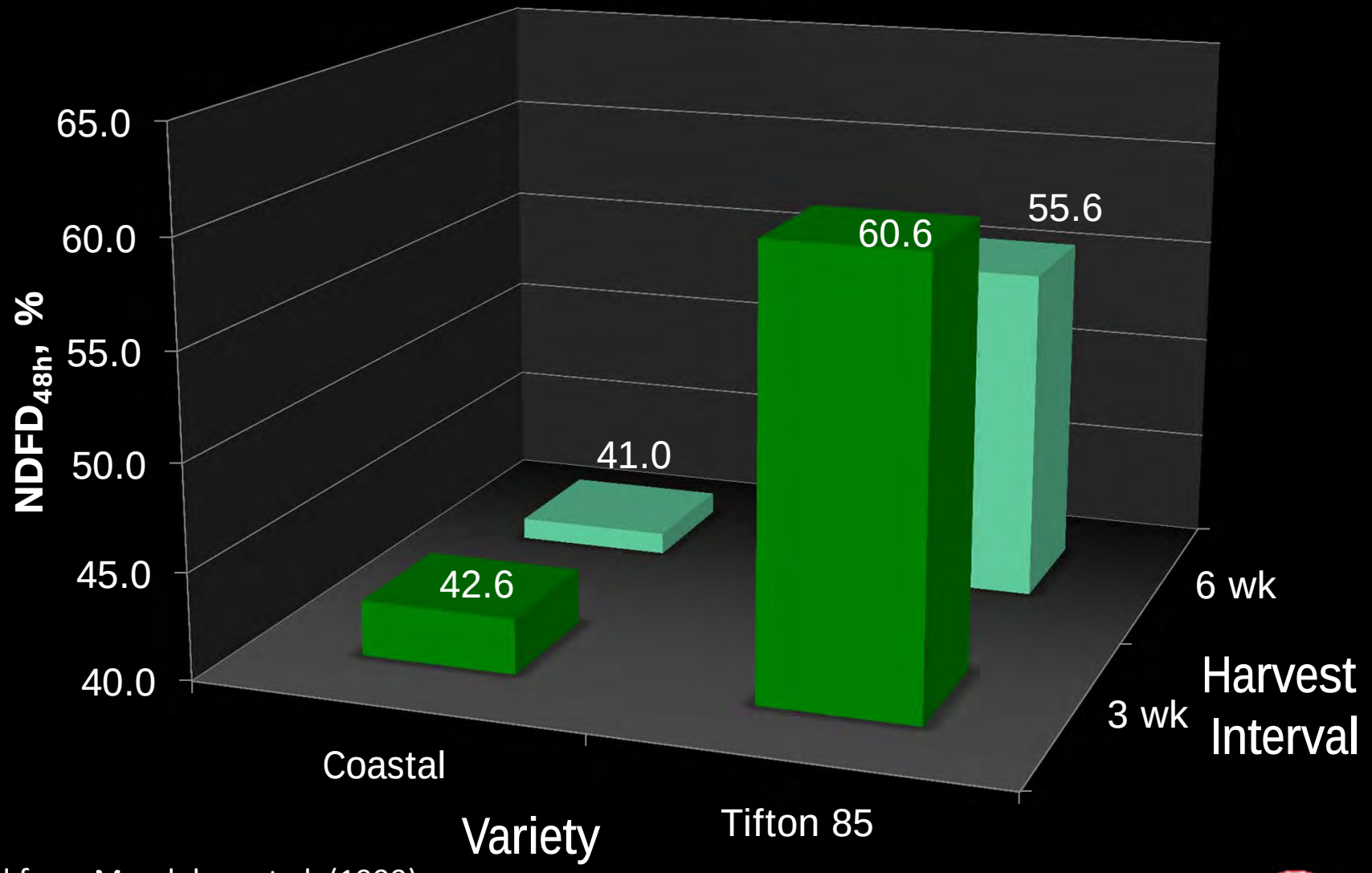
Bermudagrass

- Not tolerant of shade or poorly-drained soils.

- Varieties differ:
  - Yield
  - Digestibility
  - Vigor during establishment
  - Rest requirement (“length of round”)
  - Drying rate (hay)


Tifton 85
(hybrid of C. dactylon and C. nlemfuensis)

What is the difference in Coastal and Tifton 85?

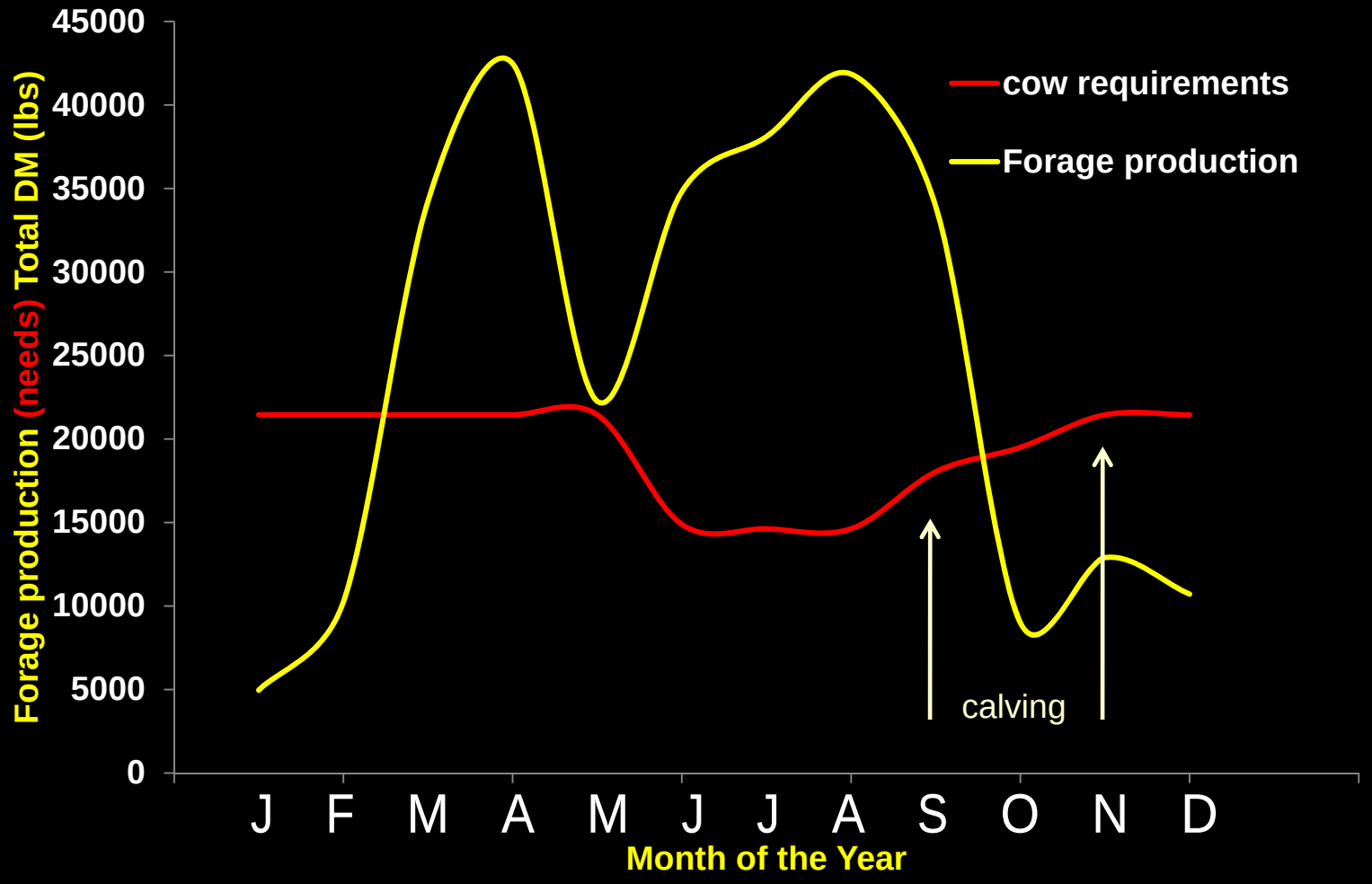


Adapted from Mandebvu et al. (1999).

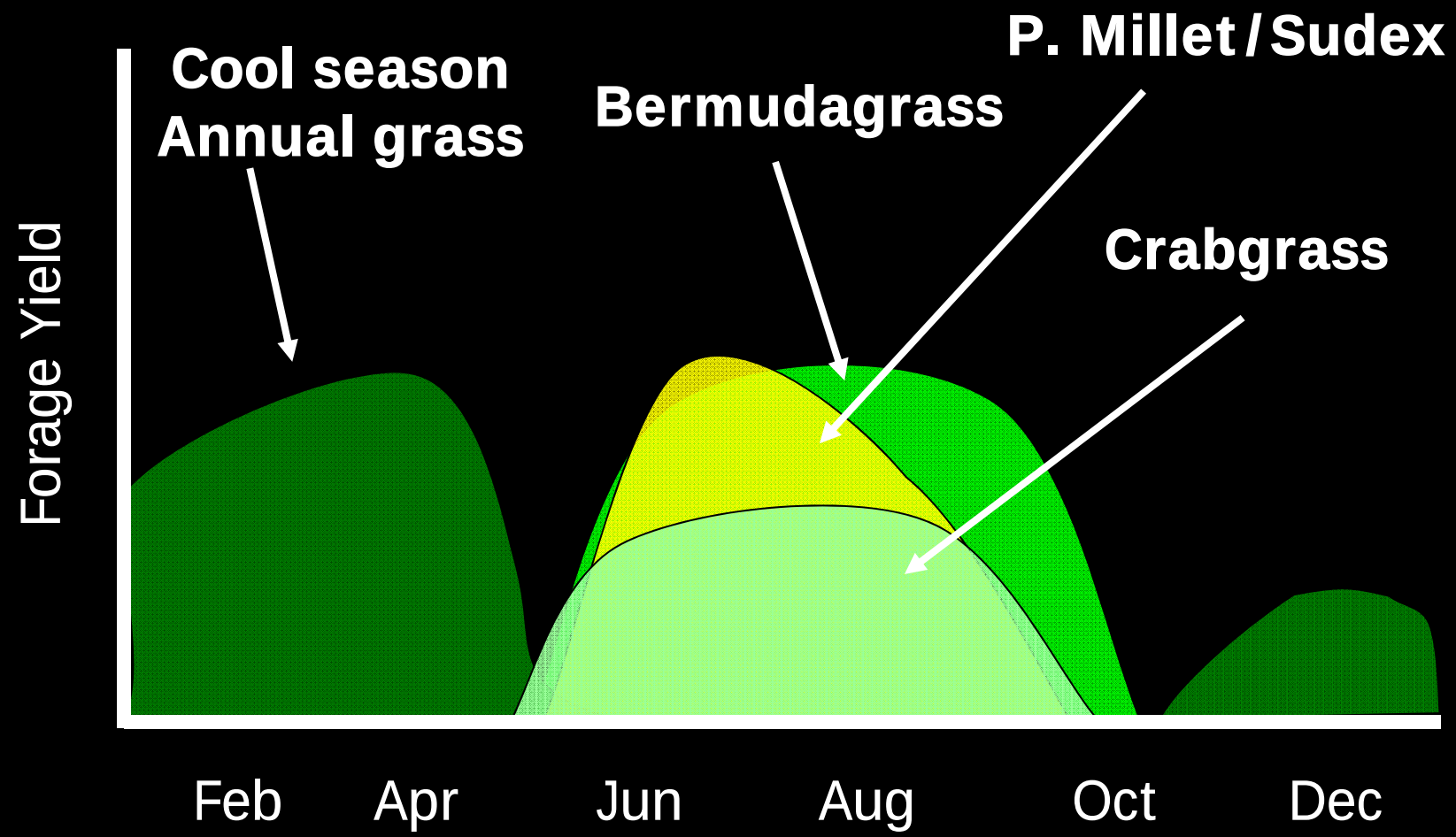
Season-long Yield Distribution and Energy Density of Forages Used in a Pasture-based Dairy System

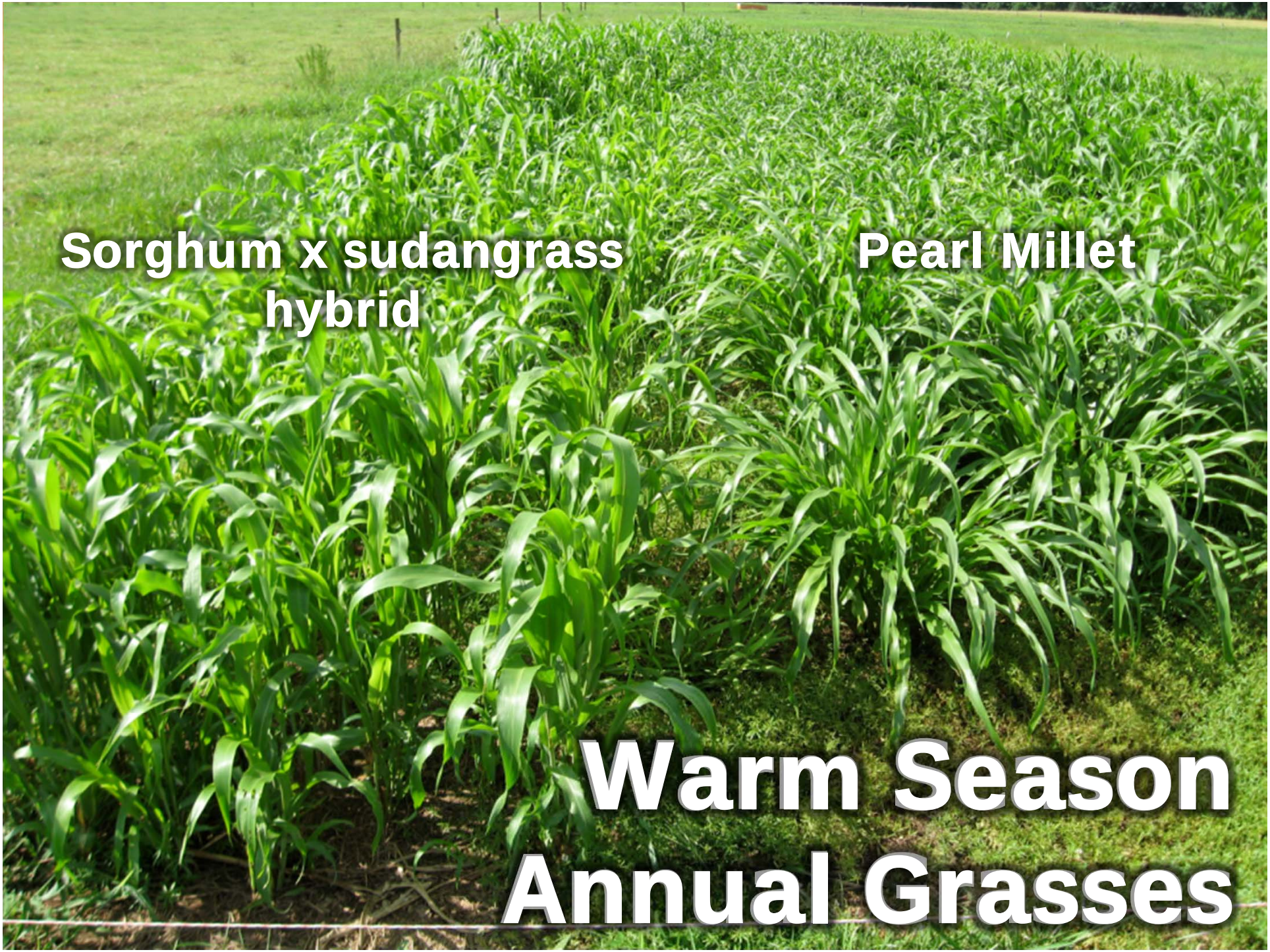
Month	Rye/Ryegrass mix		Tifton-85	
	DM (lb/A)	*ME (kcal/lb)*	*DM (lb/A)*	*ME (kcal/lb)*
Jan	463	1.19		
Feb	956	1.20		
Mar	2484	1.15		
Apr	3606	1.14		
May	1484	1.06	1400	0.94
June			2621	0.92
July			2740	0.92
Aug			3079	0.92
Sept			2263	0.92
Oct			1310	0.93
Nov	1203	1.24		
Dec	1000	1.20		

Forage Production and Demand Curves for a 650-Cow Dairy on 300 Acres



Forage Distribution in the Southeast




Sorghum x sudangrass hybrid
Pearl Millet
Warm Season Annual Grasses

Sorghum x sudan

- Highest yield potential
- High quality
  - Brown mid-rib (BMR) hybrids
- Harder to manage under grazing

Sorghum x sudan

Sorghum x sudangrass hybrid, second round.
Difficulties getting a wedge in front of them.


Axillary bud regrowth in sorghum x sudangrass.

Pearl Millet

- More productive in drought conditions
- Can develop toxic nitrate levels
- No prussic acid toxicity concerns
- Less palatable
- Easier to manage under grazing
  - Irrigated pasture


Basal bud "tillering" in pearl millet.

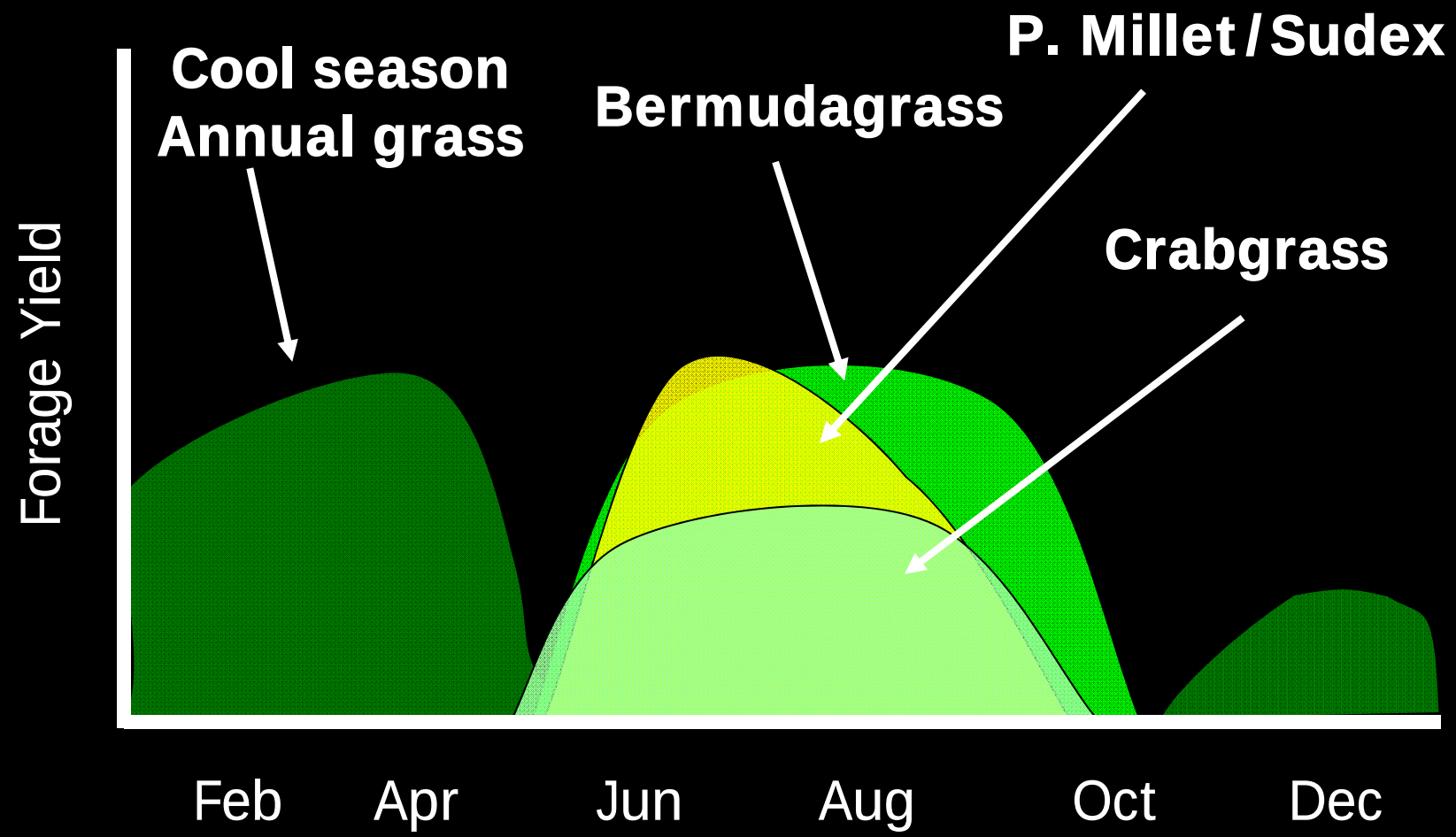

Crabgrass
Grazing School

Crabgrass

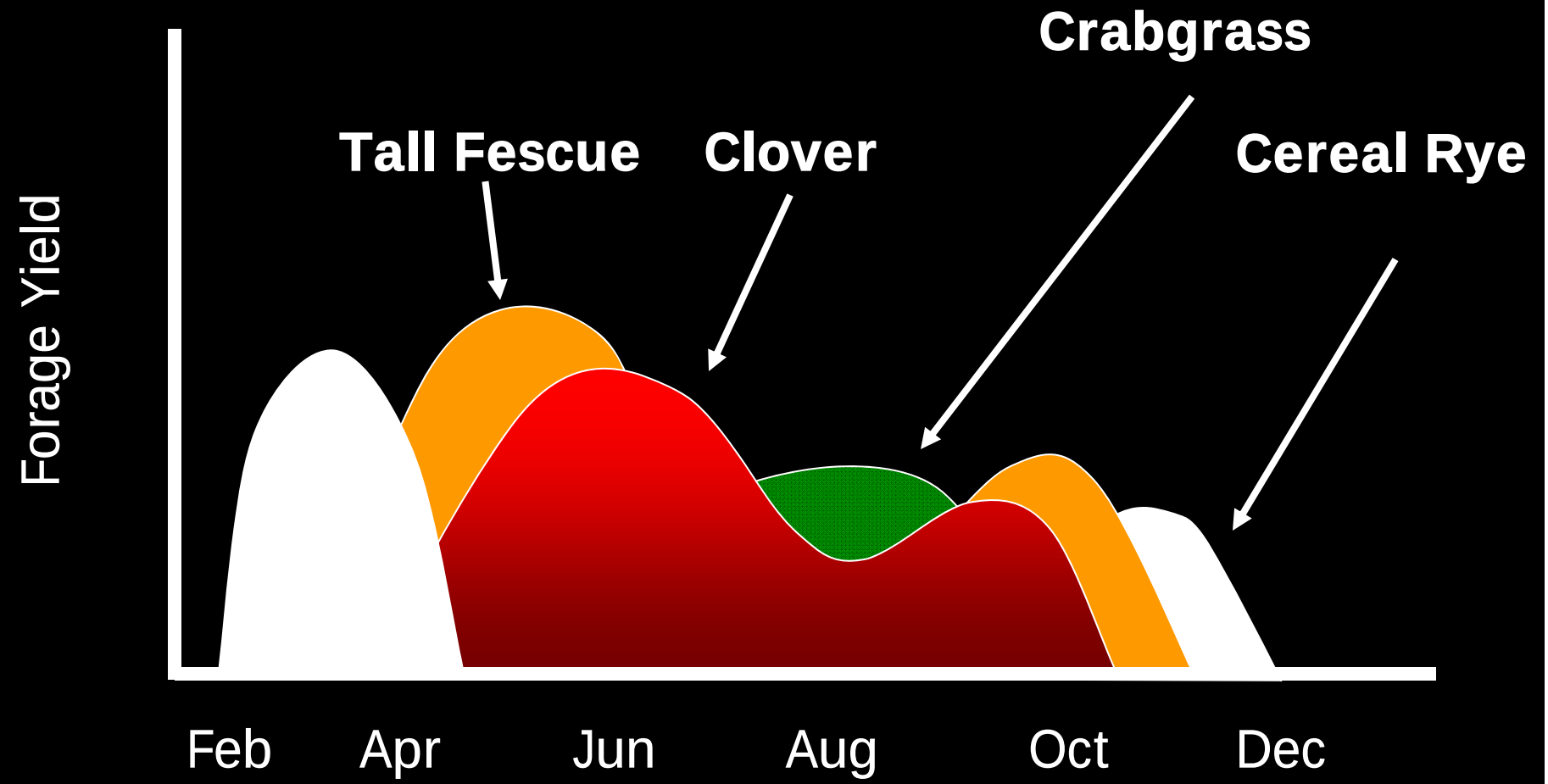
	Harvest interval, days		
Item	21	35	49
Yield, dry lbs/ac	2,610	6,668	8,898
		% DM	
CP	15.6	14.3	11.0
NDF	61.3	66.6	69.8
ADF	35.7	38.9	42.7
TDN	62.6	59.1	54.8

Beck et al., 2007 J. Anim. Sci.
Common crabgrass; Hay harvest residual height = ~2 inches; Regrowth after early July cutting.

Forage Distribution in the Southeast



A Simple System in the Transition Zone



50% Tall Fescue/clover
50% Crabgrass – Cereal Rye

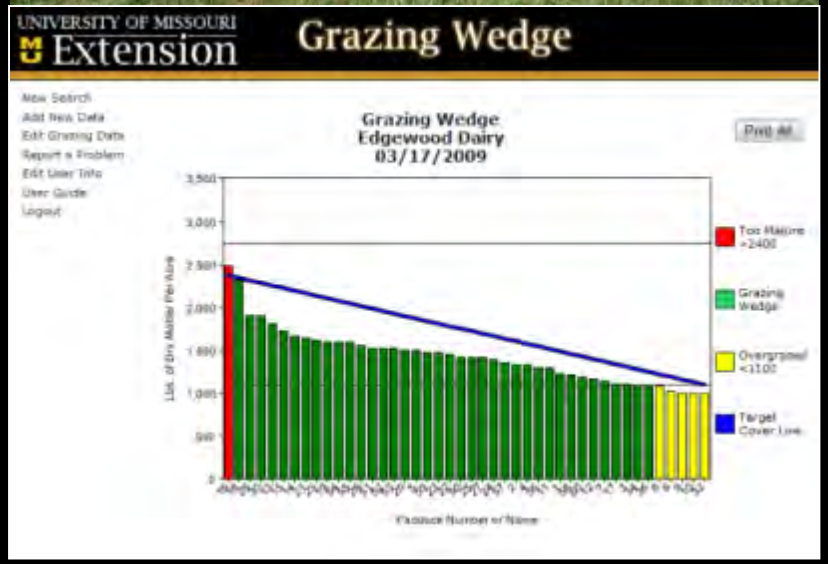
	Monthly Forage Balance							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
	---------- tons ----------							
Tall Fescue/clover	4	39	83	57	31	6	34	38
Crabgrass – Cereal rye	51	45	0	45	66	54	15	15
Forage Needed by Herd	49	54	67	70	67	63	61	58
Forage Surplus/Deficit	6	30	16	32	30	-3	-12	-6

- Tall fescue/clover – 50 acres – 6.0 t/a
- Crabgrass interseeded with rye in fall – 6.0 t/a
- Stocking rate: 100 milking cows on 100 acres
- 15 Feb calving
- 10 lb grain/day
- 13,000 lb annual milk

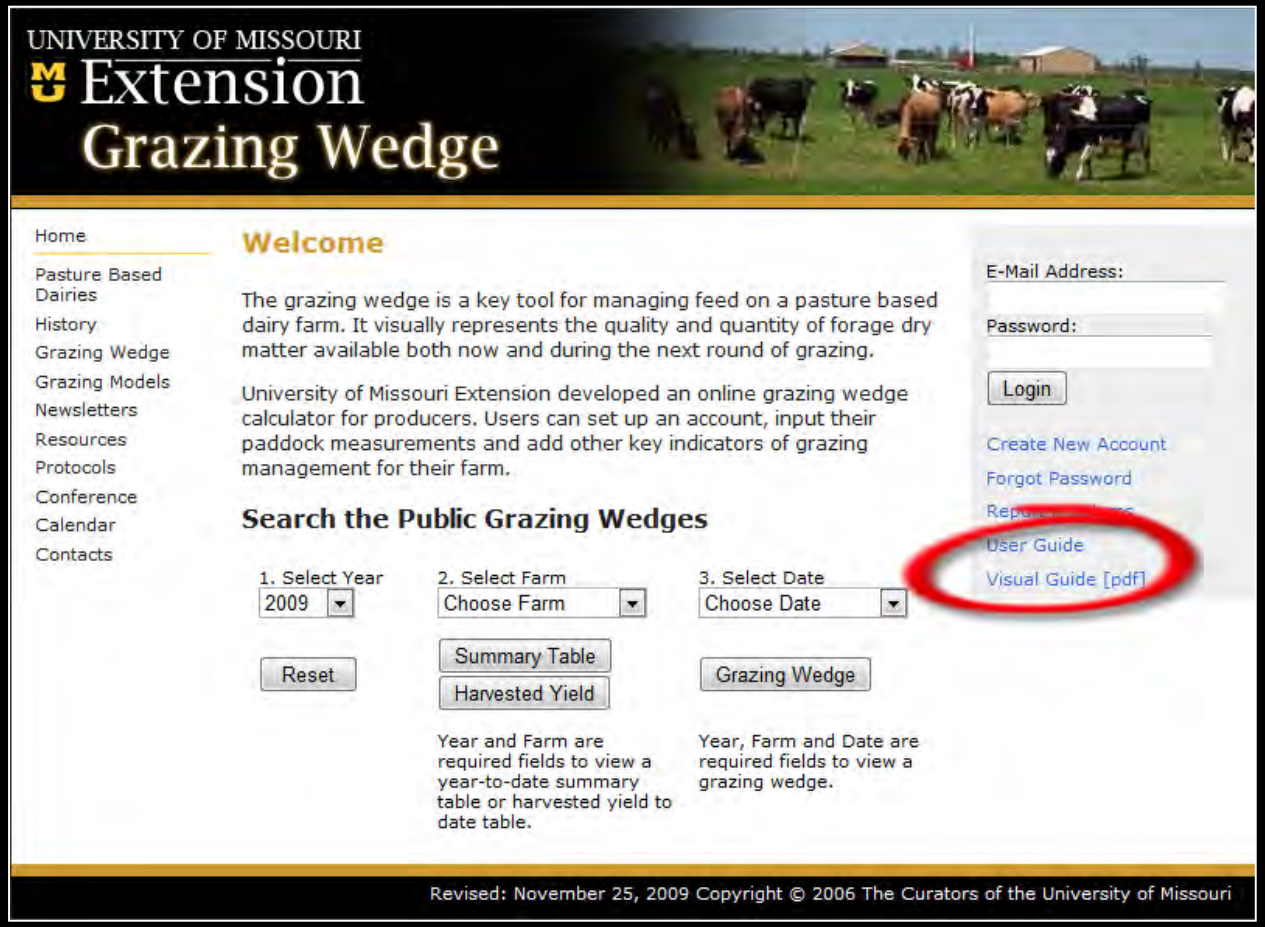
Forage balance = 93 tons
Excess to be harvested = 114 tons
Excess to be fed back = 21 tons

Monitoring pasture growth

- We often have little idea of how much feed we have or what might be coming
- Monitoring forage in the pasture can help us make better decisions about fertilizer, supplements, renovations and stocking rates



Pasture Monitoring Website



http://plantsci.missouri.edu/grazingwedge/

Report

Graph of current DM yield available in each paddock

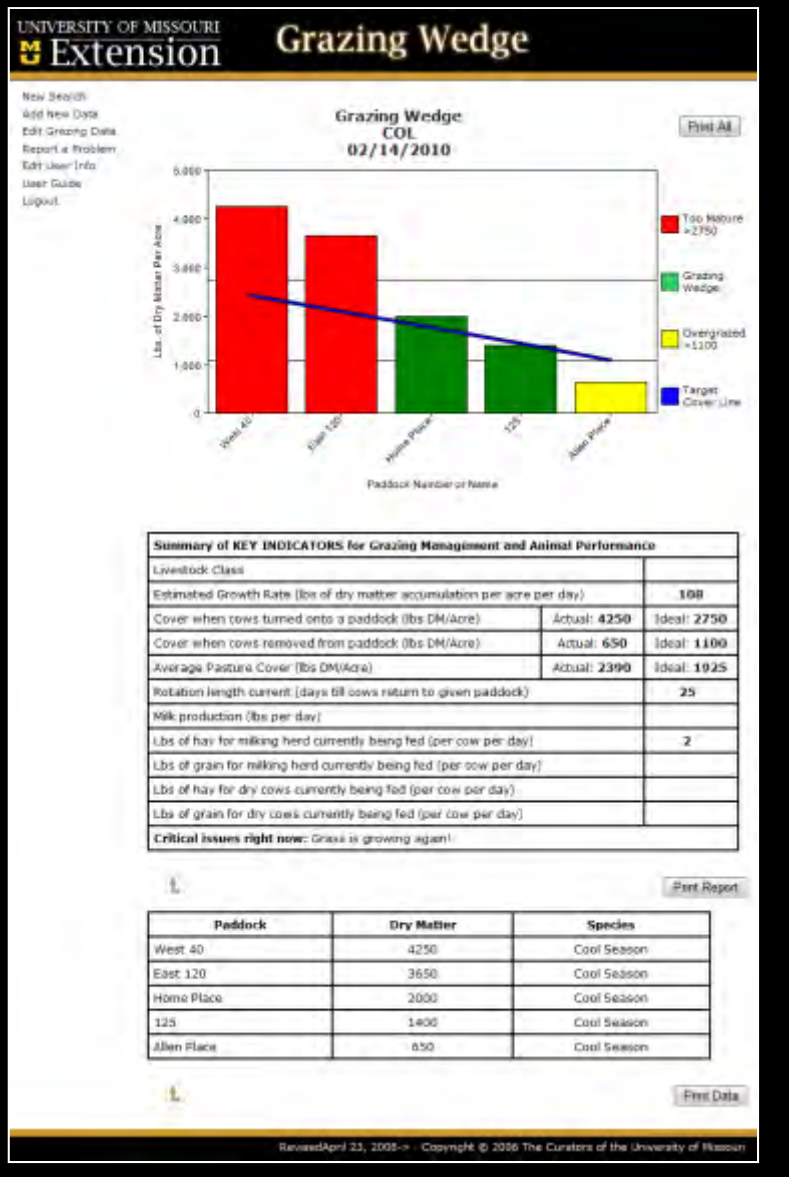
Paddocks in red bars indicate that forage is too mature
Paddocks in green are ideal for grazing
Yellow bars indicate paddocks that are overgrazed

Estimated growth rate

Estimated DM yield on offer when stock are turned into a paddock

Estimated DM yield left when stock leave a paddock

Table of DM yield for each paddock



UNIVERSITY OF MISSOURI Extension

Grazing Wedge

New Search
Add New Data
Edit Grazing Data
Report a Problem
Edit User Info
User Guide
Logout

Grazing Wedge
COL
02/14/2010

Print All

Too Mature >2750
Grazing Wedge
Overgrazed <1100
Target Cover Line

Lbs. of Dry Matter Per Acre

Paddock Number or Name

Summary of KEY INDICATORS for Grazing Management and Animal Performance		
Livestock Class		
Estimated Growth Rate (lbs of dry matter accumulation per acre per day)		108
Cover when cows turned onto a paddock (lbs DM/Acre)	Actual: 4250	Ideal: 2750
Cover when cows removed from paddock (lbs DM/Acre)	Actual: 650	Ideal: 1100
Average Pasture Cover (lbs DM/Acre)	Actual: 2390	Ideal: 1925
Rotation length current (days till cows return to given paddock)		25
Milk production (lbs per day)		
Lbs of hay for milking herd currently being fed (per cow per day)		2
Lbs of grain for milking herd currently being fed (per cow per day)		
Lbs of hay for dry cows currently being fed (per cow per day)		
Lbs of grain for dry cows currently being fed (per cow per day)		
Critical issues right now: Grass is growing again!		

Print Report

Paddock	Dry Matter	Species
West 40	4250	Cool Season
East 120	3650	Cool Season
Home Place	2000	Cool Season
125	1400	Cool Season
Allen Place	650	Cool Season

Print Data

How I use it

If possible, I would mechanically harvest those paddocks in red

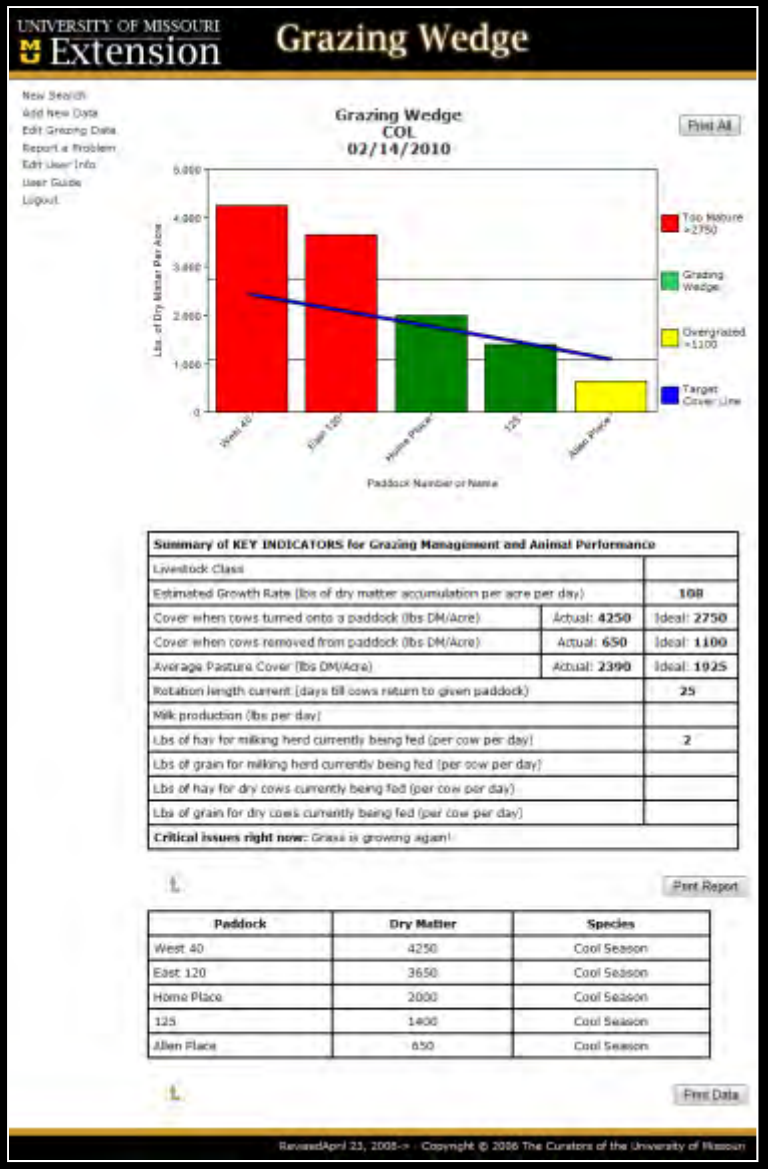
I would move stock to the paddock with the tallest green bar for grazing

I would shorten my rotation to avoid "yellow" paddocks

I use the "growth rate" calculation to roughly predict the future.

At growth rates over 75 lb/acre/day, I would not fertilize or encourage growth.

If I have a lot of green bars almost ready for grazing this week, I can bet that next week I'll have too much forage



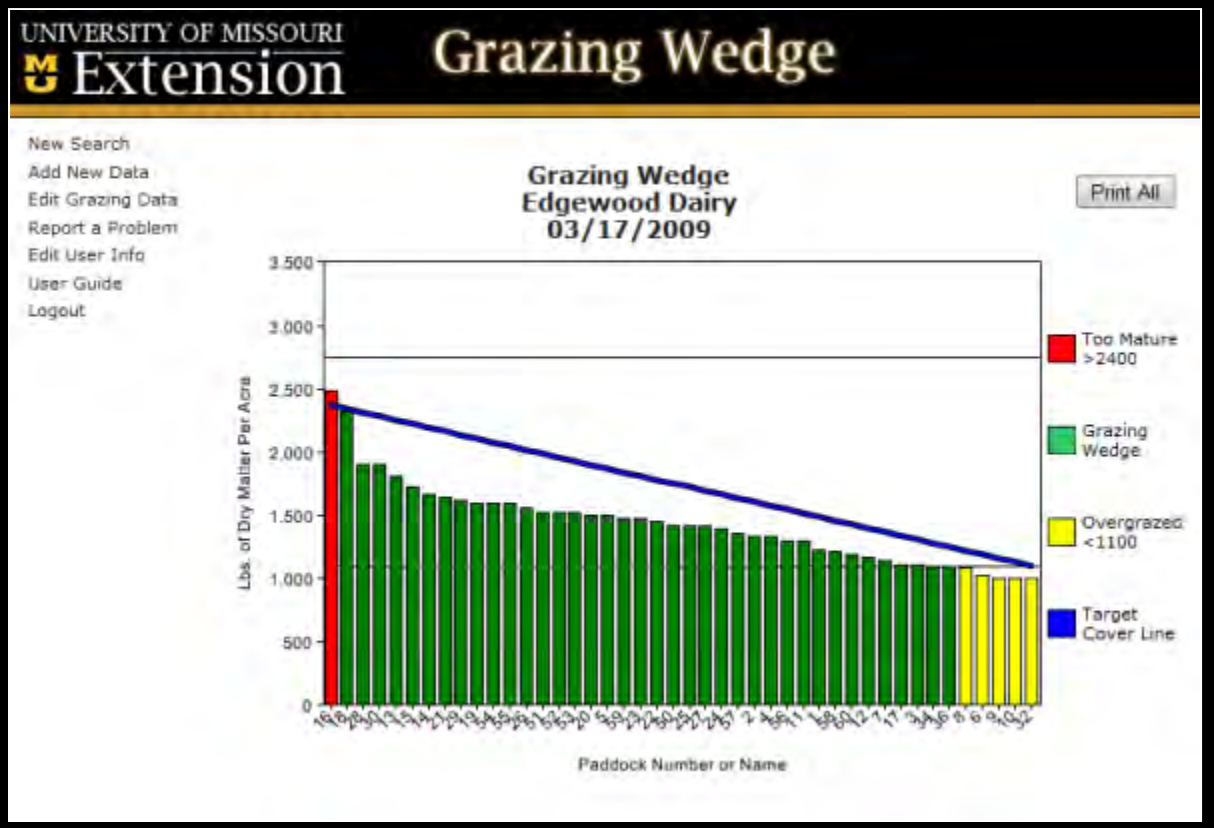
Examining “Wedges”

Growth rate is limiting factor here

At current usage, forage will run out if growth rate does not improve

Options:

- Feed more supplements
- Decrease stocking rate
- Fertilize to improve growth rate



Growth rate is 33 lb/a/day

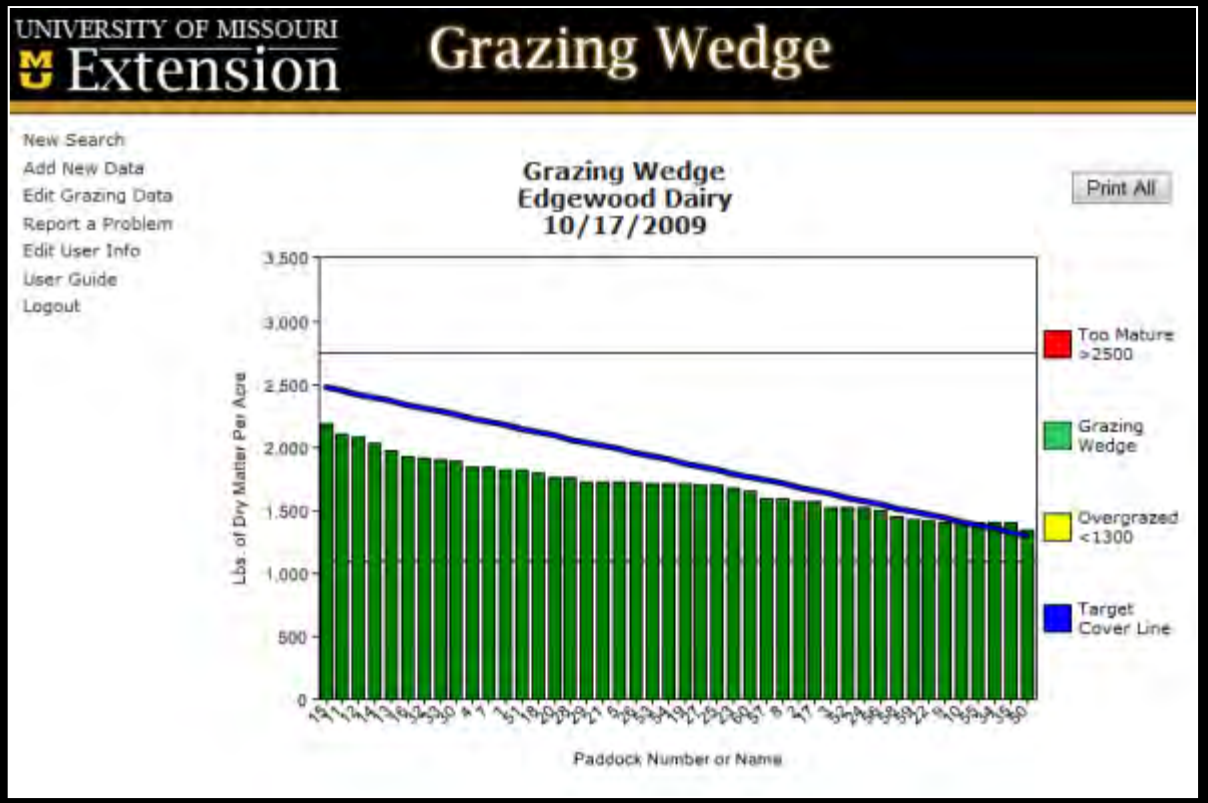
Autumn growth

Many paddocks available for grazing but rotation length will be short

Growth rate low, but unlikely to improve much due to time of year

Options:

- Graze what you can but it won't last long
- Consider giving lactating livestock priority access to pasture
- Could increase supplements if you want to continue on pasture



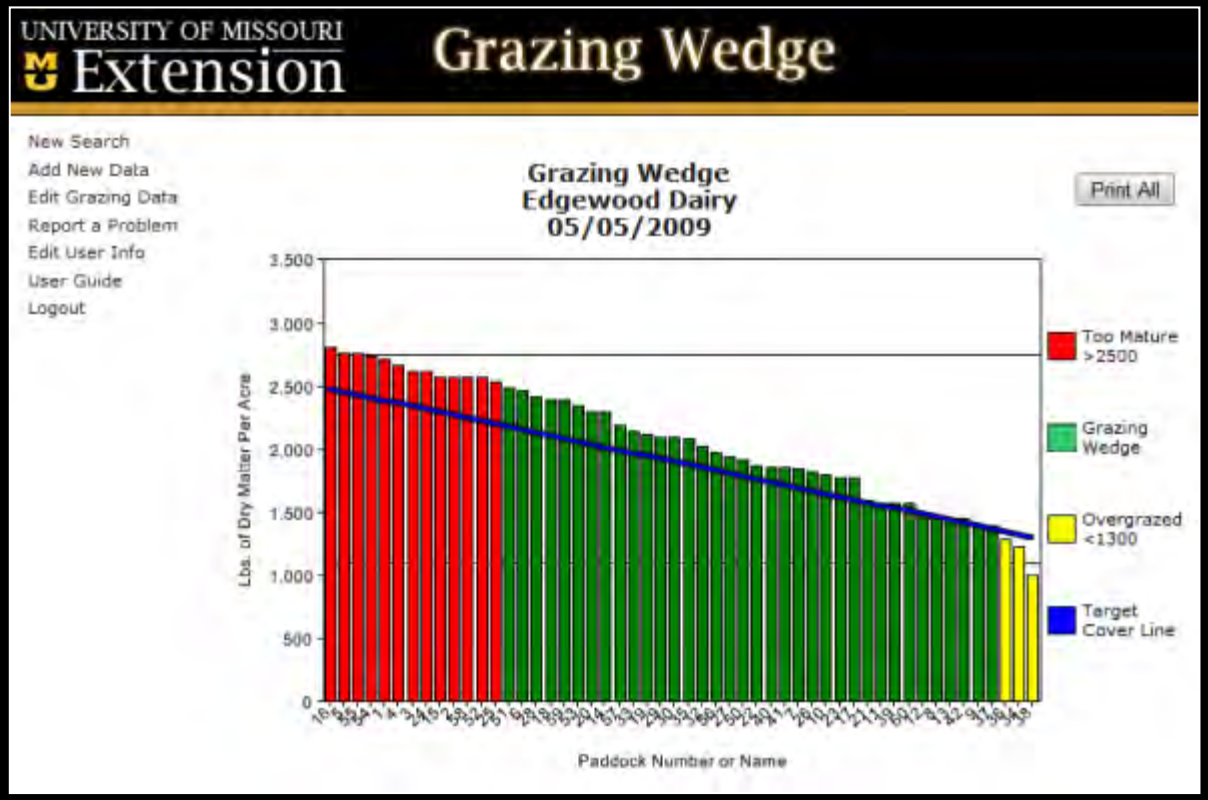
Growth rate is 16 lb/a/day

What do you do about this?

Too much forage – If some paddocks are not harvested then all of the forage in the system will be of low quality

Options:

- Harvest paddocks in red
- Graze the paddock with the tallest green bar
- Reduce or eliminate supplements so that stock will harvest forage



Growth rate is 63 lb/a/day

Monitor Pasture Growth

- Look at the entire system weekly
  - Does pasture growth meet your expectations?
  - How do current weather forecasts alter growth for the next week to two weeks?
  - How has your system responded historically at this time of year?

Key Factors for Managing Forage Systems

- Understand what nutrients your cows need and when they need them
  - Calving season of most importance
- Select forages that fit your climate, soils, calving season
  - Prepare a pasture growth budget
  - Develop plans for forage growth deficits and excesses
  - Monitor production frequently
- Optimize quality by grazing management
  - Turn in at ~2750 lb/acre for most species
  - Turn out at ~1150 lb/acre for most species