

Forage Nutrition for Horses

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COOPERATIVE EXTENSION

Putting knowledge to work for SC

Introduction

- Horses evolved as grazing animals, well adapted to eating quality grasses and hay (forages).
- Forages should be the major component in a cost-effective feeding program no matter the stage of growth.



Introduction

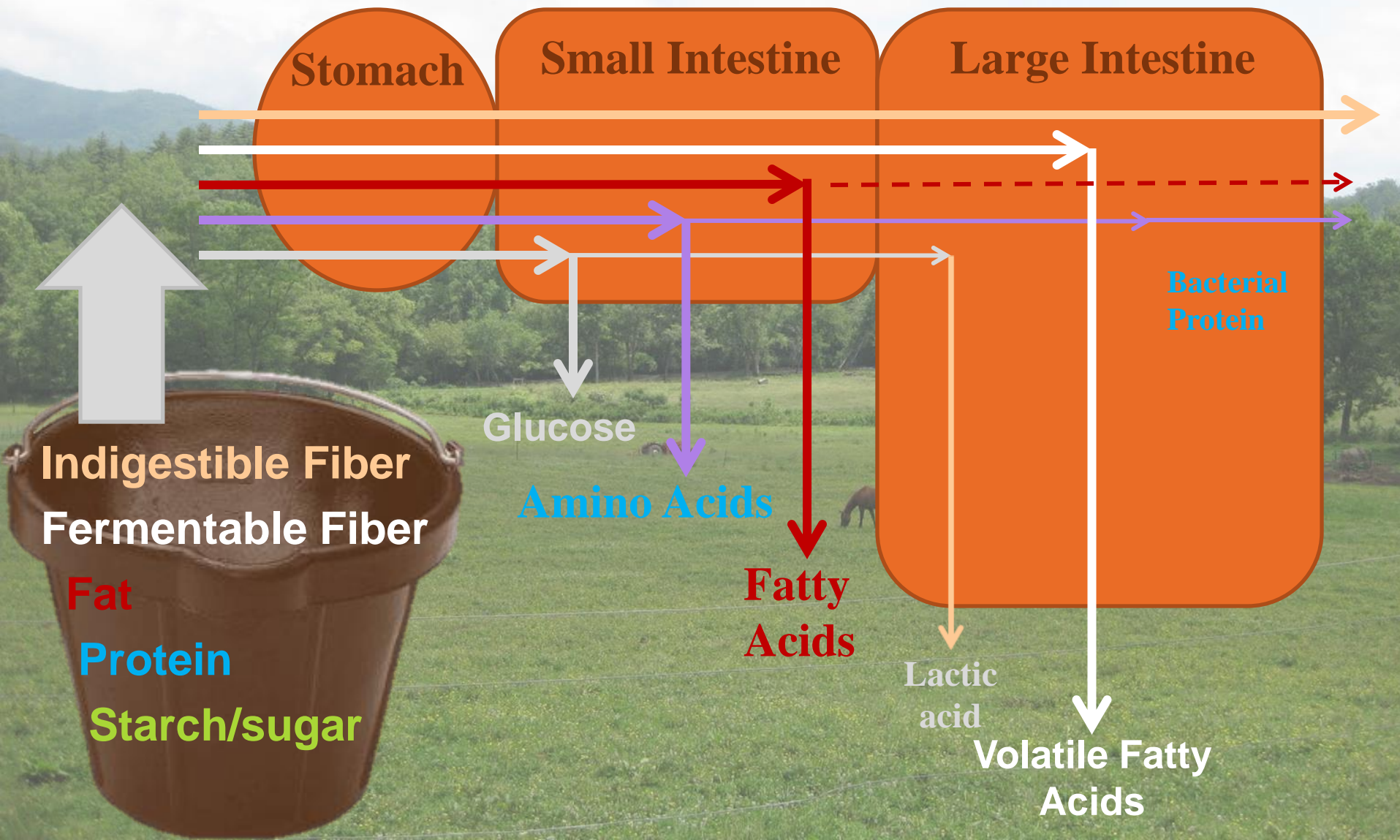
Whether the forage source is from pasture or hay, the horse's digestive system is best designed to consume ***predominately forage*** diets in ***small frequent meals***.



Plant Parts

- Fibrous carbohydrates- cellulose, hemicellulose, pectin (lignin)
 - Broken down to volatile fatty acids in hindgut
 - A horse consuming a mostly forage diet will meet more than 80% of their energy needs from VFAs.
- Simple carbohydrates- simple sugars, starch, oligosaccharides.
- Fat (low in plants)
 - Contains 2.25 x energy of protein or carbs
- Protein (depends on fertilization)

Digestion



Energy

- *Digestible Energy (DE)* affected by gross energy of the feed and digestibility of energy-containing components.



Fiber



DE



Forages

- Horses can consume up to 3% BW per day.
- At least 1% should come from forage.
 - Microbes in hindgut rely on constant substrate for fermentation to maintain overall gut health.

Forages

- Good quality hay:
 - Free from debris, dust, mold & weeds
 - Not weathered
 - Leafy, green
 - Young



Hay Selection

- The best hay is one that will ***meet the nutritional needs*** of the horse at the ***most economical cost***.
- Early cut hays are more likely to meet the nutrient requirements of horses in high production situations than mature hays.



Forages

Grass hay

- Common grass hays
 - Timothy
 - Coastal
 - Fescue
- Cool season > Warm season
- Lower energy vs. legumes
- Cut and cured at right stage for optimal nutritional value!



Forages

Legumes (fix N from atmosphere)

- Common Legume Hay
 - Alfalfa
 - Clover
- vs. grass hay- higher in energy, Ca, protein & vitamin A
- Problems: increased urination, energy, ammonia



What Factors Affect Forage Quality?

1. Maturity stage

➤ *Maturity stage at harvest is the most important factor determining forage quality of any species.*

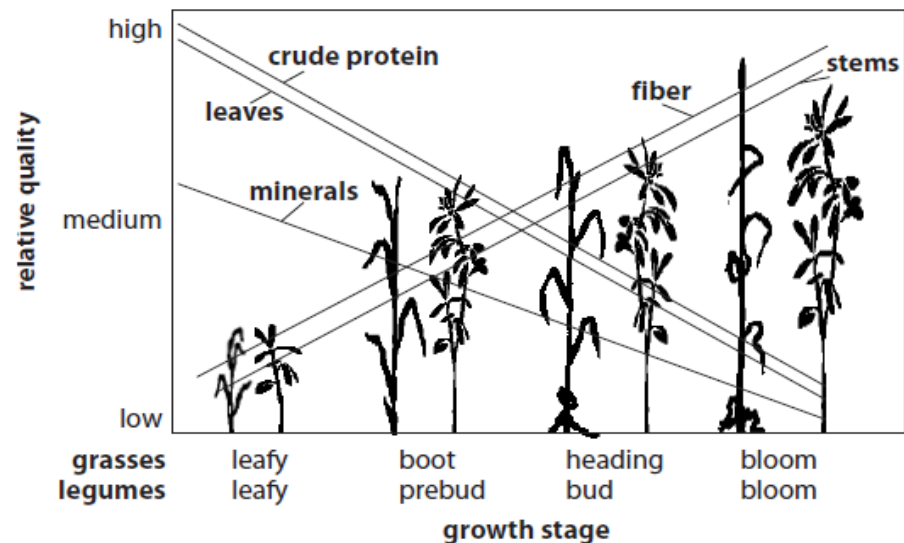
2. Leaf-to-stem ratio

➤ Leaves are higher in quality than stems.
➤ Proportion of leaves declines as the plant matures.

3. Temperature

➤ Plants grown at high temperatures produce *lower quality* forage due to lignification.

Figure 3. Effect of plant maturity on forage intake and digestibility.



Source: Adapted from Blaser, R., R.C. Hammes, Jr., J.P. Fontenot, H.T. Bryant, C.E. Polan, D.D. Wolf, F.S. McClagherty, R.G. Klein, and J.S. Moore. 1986. Forage-animal management systems. Virginia Polytechnic Institute, Bulletin 86-7.

What Factors Affect Forage Quality?

4. Harvesting and storage techniques

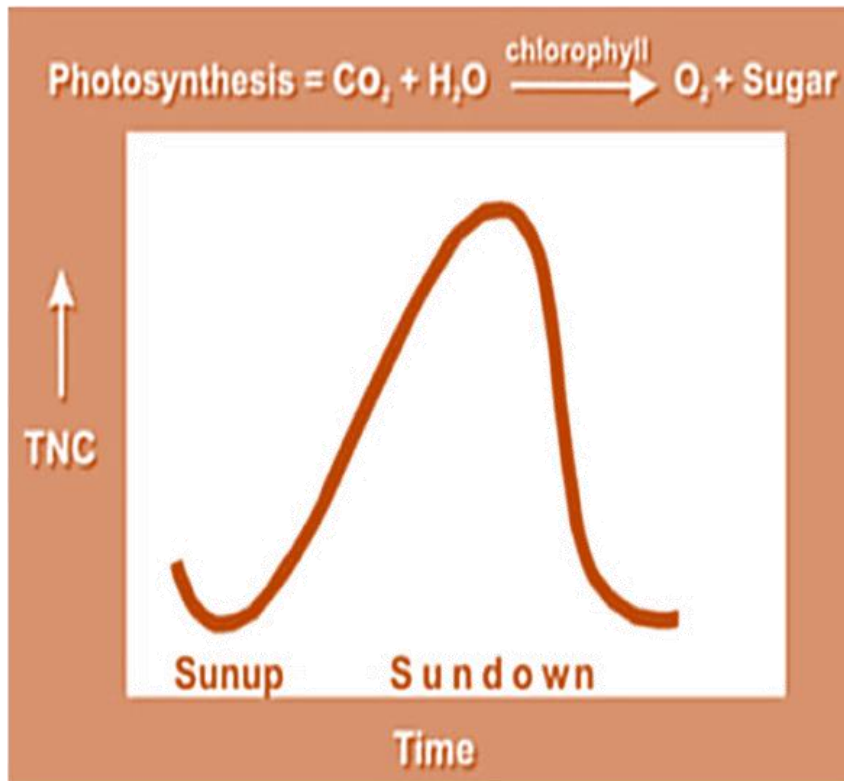
- Field losses include rain damage, leaf loss, and plant respiration.
- Storage losses to uncovered bales can be 40%



What Factors Affect Forage Quality?

5. Daily fluctuations

- Higher carbohydrate content in afternoon-harvested hay



Forage Toxicity

- Fields containing toxic plants not uncommon.
 - Toxicity varies widely among growing season, weather conditions and animal susceptibility.
- Common Situations Associated with Poisonings:
 - Overgrazing/Lack of supplemental forage
 - Unfamiliar pasture
 - Dietary imbalances
 - Incidental/curiosity
 - Weather- drought/freeze
 - Herbicide usage



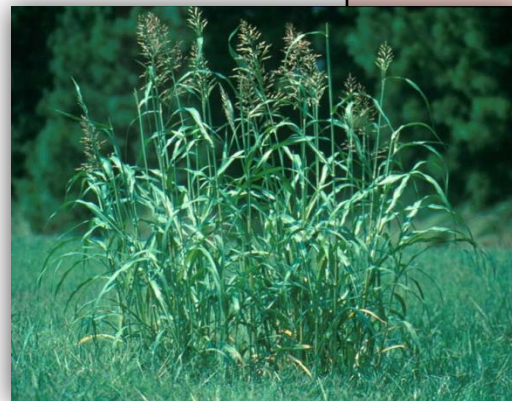
Forage Toxicity

- Nitrate Poisoning

- Anything that slows plant growth can lead to high nitrate levels in well-fertilized plants.

1. Heavy fertilization
2. Stress of drought or freeze
3. Application of herbicide
4. Cloudy weather, low temperatures

Safe levels of total diet N < 1%.



Accumulators
Sorghum-sudan grass
Pearl millet
Johnsongrass
Lambs quarters
Pigweed

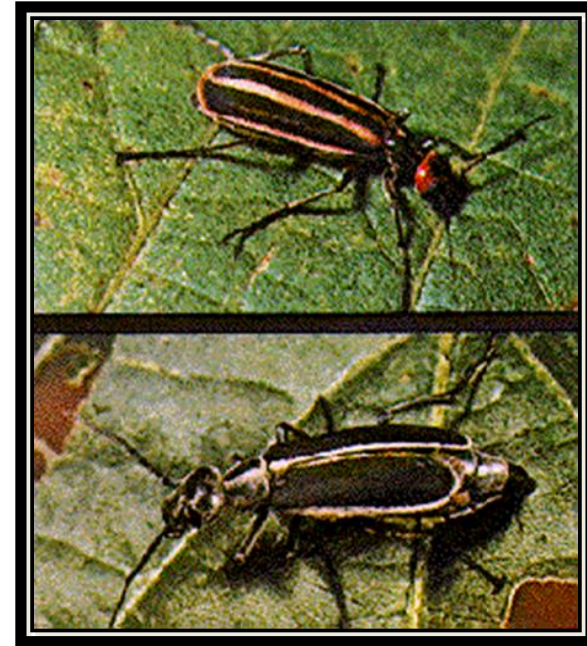
Forage Toxicity

- Sorghum and sorghum-sudangrass hybrids
 - Drought and frost-stressed plants also produce sub-lethal doses of hydrocyanic acid.
 - *Causes condition cystitis.*
 - *Frequent urination*
 - *Lack of coordination*

Forage Toxicity

Some forages have toxic effects due to endogenous substances.

- **Blister Beetles (SW US)**
 - *Alfalfa Hay*
 - Difficult to detect (1 in. length)
 - Contain a toxin (cantharidin) → blisters skin surfaces
 - Ingestion of several lead to death.



Forage Toxicity

- Endophyte-infected tall fescue causes reproduction problems in mares.
 - Agalactia (decreased milk production)
 - Increased gestation time
 - Thickened placenta
- ***Mares should be removed from fescue pasture and hay 90 days before foaling.***



Forage Toxicity

- Many poisonous plants produce toxins fatal to horses.

- Some common plants include:

- Water hemlock
- Black locust
- Bracken fern
- Wild cherry trees
- Oleander
- Acorns
- Nightshade



**Usually, these plants are not palatable and horses will not eat them unless restricted from quality sources of hay or pasture.*

Forage Testing

- **Assesses nutrient composition**

- **Calories (energy)**
- **Protein**
- **Vitamins**
- **Minerals**
- **Water**



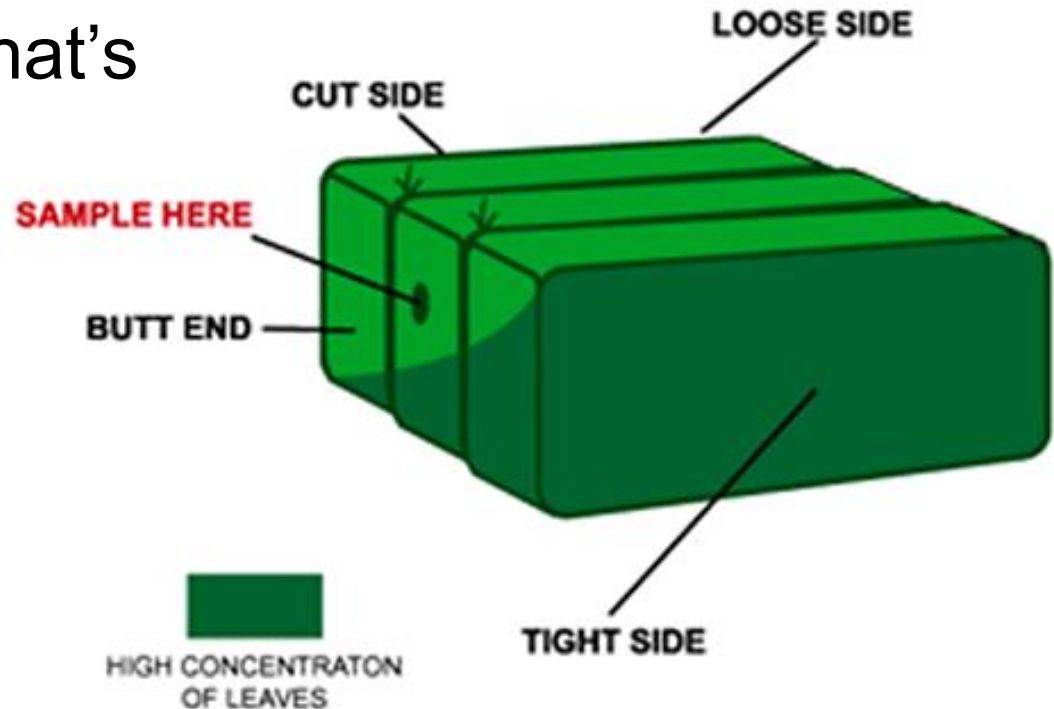
- ***Why test?***

- Match quality with animal requirements.

Forage Sampling

Basis of all analyses

- Sample must be representative of what's being predicted
- Use core sampler
- Random samples



Chemical Analysis

- Chemical analysis will provide a more complete picture of forage quality.
- Knowing this information can better help one make accurate decisions as to the quantity of hay and supplements needed in a feeding program.

Figure 1. Report Form of the Clemson University Cooperative Extension Service Agricultural Service Laboratory

FEED & FORAGE ANALYSIS REPORT

Lab No. 40547 Clemson University
Cooperative Extension Service
Agricultural Service Laboratory
Clemson, SC 29634-0391

Name _____ County: Georgetown
Address _____ Date: 04-29-1991
City _____
Zip Code _____
Sample No. _____ Feed: Hay Bermuda Fed to: Beef Cattle

LABORATORY RESULTS

	Calculated As-Sampled Basis	Determined Dry-Matter Basis
CRUDE PROTEIN	8.3%	9.0%
AVAILABLE CRUDE PROTEIN*	8.2%	9.0%
BOUND PROTEIN	1.0%	1.1%
FIBER - ADF	34.4%	39.7%
- NDF	67.7%	73.8%
CRUDE FIBER*	30.6%	33.3%
TOT. DIG. NUTRIENTS*	49.5%	54.0%
NET ENERGY-L*	0.501 Mc/lb	0.548 Mc/lb
NET ENERGY-M*	0.531 Mc/lb	0.579 Mc/lb
NET ENERGY-G*	0.231 Mc/lb	0.252 Mc/lb
METAB. ENERGY*	934 Kc/lb	1019 Kc/lb
RELATIVE FEED VALUE*	—	73

* VALUES CALCULATED FROM CURRENT RESEARCH FORMULAS

MINERAL ANALYSIS			OTHER ANALYSES		
Calculated As-Sampled Basis	Determined Dry-Matter Basis		Calculated As-Sampled Basis	Determined Dry-Matter Basis	
P	0.18%	0.20%	Fat	1.8%	2.0%
K	1.50%	1.64%	NO ₃ -N	1122 ppm	1223 ppm
Ca	0.35%	0.38%	ASH	4.9%	5.3%
Mg	0.17%	0.18%	pH (SILAGE)	_____	
S	0.28%	0.30%	MOISTURE	8.3%	
Zn	24 ppm	26 ppm	DRY MATTER	91.7%	
Cu	6 ppm	6 ppm			
Mn	44 ppm	48 ppm			
Fe	40 ppm	44 ppm			
Na	445 ppm	485 ppm			
CaP	1.90	1.90			

For additional information please contact your county Extension agent.

APPROVED BY _____

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of Cooperative Extension Work in Agriculture and Home Economics, Acts of May 8 and June 30, 1914

Chemical Analysis

- Forage Quality
 - High < 35% ADF
 - Moderate 35-40% ADF
 - Low > 40% ADF

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Forage Protein Content

	Hay	% CP	% DP	%Lysine
Legumes	Red Clover	14.9	8.3	0.64
	Alfalfa	15.0	10.0	0.64
	Lespedeza	13.4	7.5	0.60
Grasses	Timothy	9.0	6.0	0.40
	Orchardgrass	10.1	6.0	0.35
	Bermudagrass	10.4	4.5	0.36
	Fescue	8.4	3.7	0.41

Forage Energy Content

	Hay	DE Mcal/kg	TDN %
Legumes	Red Clover	2.16	49
	Alfalfa	2.16	49
	Lespedeza	2.07	52
Grasses	Timothy	1.98	45
	Orchardgrass	2.07	44
	Bermudagrass	1.86	44
	Fescue	1.81	45

Feeding Classes of Horses



Maintenance (Mature idle)



Work (Light, Moderate, Heavy, Intense)



Growth



Broodmares & Stallions

Nutrient Requirements

Class	Wt	DMI, lbs	DMI, % BW	DE, MCals	Crude Protein, g	Ca, g	P, g
Maintenance	1102	18.1	1.64	16.7	630	20	14
Light work	1102	18.5	1.67	20.0	699	30	18
Moderate work	1102	20.5	1.86	23.3	768	35	21.0
Intense work	1102	25.4	2.3	34.5	1004	40	29.0

Mature Idle Horse

- **2% BW Grass Hay**
Mid-mature to mature (average quality)
 - **Ex: 1100 lb. horse- 22 lbs. DM or 24.4 lbs./d As-Fed (22lbs/ 0.9)**
- **Vitamin-Mineral supplement according to directions.**



Mature Idle Horse

Start with Forage

- Grass Hay (Average)
 - **0.91 Mcals/lb. (DM basis)**
- Ex: 1100 lb. (500 kg) horse
 - **16.7 Mcals req = 18.35 lbs. DM**
0.91 Mcals/lb.
- *All caloric needs met with average quality hay.*



Light Work

Recreational riding- 1-3 h/wk

- **2% BW Grass Hay**
 - **Mid-maturity**
 - **Slightly higher quality hay to meet slightly higher requirements.**
- **Vitamin-Mineral supplement according to directions.**



Increasing Nutritional Needs

- Increase the quality of hay as work load or production level increases.
 - **Moderate to Heavy Work Load**
 - Mid-maturity to immature grass hay.
 - **Intense Work**
 - Immature grass hay or legume.
 - **Lactation or Growing horses.**
 - Immature to mid-mature.

**Then add concentrates as needed to balance diet.*



Feeding Management

Making changes

- Make changes slowly when going from low plane of nutrition to high
 - Ex: Grass hay to alfalfa hay
 - Replace 25% every 3 days until target reached



Feeding Management

Making changes

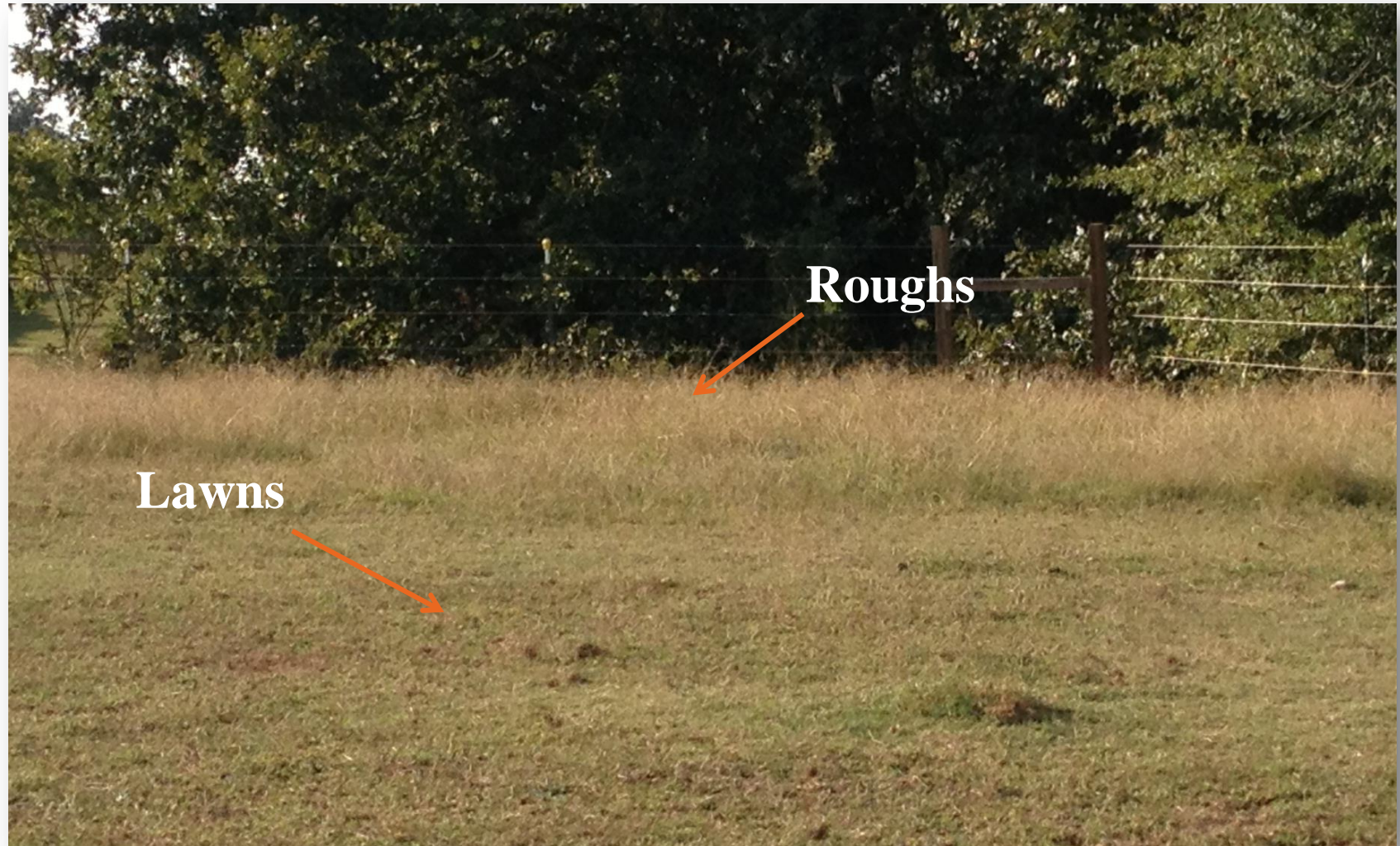
- Make changes slowly when going from low plane of nutrition to high.
 - Ex: Turning out on pasture
 - Start with 1 hr./ day
 - Increase by 1 hr. every 3 days up to 4 hrs.
 - When grazing for 4 hrs. then can leave out

Grazing Behavior

- Horses graze from top down
- Select young immature plants & leaf blades
 - Damages growth reserves
 - Causes “roughs” and “lawns” in pasture
 - Allows weeds to flourish
- Avoid grazing around elimination areas



Grazing Behavior



Estimating Body Weight



Sprint 3G 9:12 AM 93%

Horse Type Measurements

Height (H) : inches *i*

Girth Circ (G) : inches *i*

Body Length (L) : inches *i*

Neck Circ (N) : inches *i*

Calculate



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Questions?