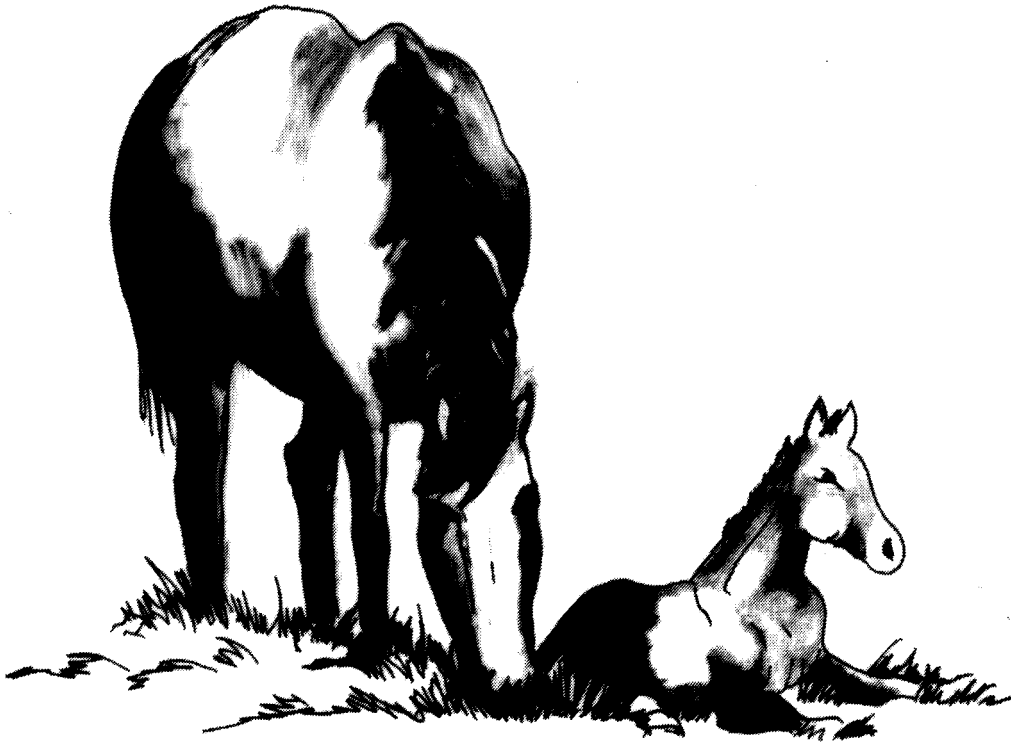


Managing Pastures *to Feed Your Horse*



*North Carolina Cooperative Extension Service
North Carolina State University*



Managing Pastures to Feed Your Horse

Horses evolved as grazing animals well adapted to eating high-quality grasses and hay, or forage. Mature horses can, in fact, thrive on forage-only diets. Yet many owners today rely on grains for the largest portion of their horse's diet.

Forages should be the major component in a cost-effective feeding program for horses at all stages of growth. If you have available pasture, no matter how small, you can provide your horse with grasses and hay that will more than satisfy its needs for essential proteins, vitamins, and minerals.

You will discover other benefits as well. From an environmental standpoint, proper pasture management reduces soil erosion and waste runoff. And for your own horse's welfare, well-run pastures provide room for exercise, help control parasites, and reduce the need for hay.

Use this guide to learn about your horse's nutritional requirements, and how careful pasture management can produce low-cost, high-quality forage that minimizes or perhaps eliminates the need for feeding grain and mineral supplements.

Grazing Satisfies Digestive and Nutritional Needs

As a rule, an adult horse (24 months and older) will consume about 2 to 2 1/2 percent of its body weight in feed on a *dry-matter* basis per day. Dry matter is the portion of hay, pasture, or feed left when all water is removed. At least half of a horse's daily dry-matter intake should come from forages as either pasture or hay, because a horse's digestive system requires the roughage to function properly.

Guidelines for expected feed consumption are given in Table 1. Usually, only horses in high production stages (lactating mares, foals, and those training for competition) need concentrates to supplement their intake of forage. Most pleasure horses are not high-production animals — they fall into the categories of *maintenance* or *light working*.

Note that the ratio of forage to concentrate feedstuffs is based on *average-quality hay*. Research trials indicate that horses will eat a variety of high-quality grasses and legumes. The more good, nutrient-dense forage a horse takes in, the less he'll need of concentrates and supplements. The higher the quality of the forage available to your horse, the more forage it will voluntarily eat, and the less concentrate you will have to supplement.

The ideal pasture

Pasture quality is directly related to several factors: fertilization, forage species selection, stocking rates, the growth stage of the forage, and the environment. Fortunately, you as the horse owner can control most of these with careful attention to sound management practices.

The ideal horse pasture should have:

- a dense stand of nutritious and palatable forage species;
- ample area to permit grazing and exercise;
- a smooth ground surface free from potholes, marshes, noxious plants, and trash and other potentially harmful objects;
- safe fences and gates; and
- an ample supply of fresh, clean water.

The higher the quality of the forage available to your horse, the more forage it will voluntarily eat, and the less concentrate you will have to supplement.

Pasture or exercise paddock: Is there a difference?

Pastures and exercise paddocks serve different needs for a horse, and require different management practices.

Pastures should provide space to maintain a dense stand of forage adequate to meet the horse's nutrient requirements. Experts generally recommend 2 acres of pasture per mature 1,100-pound horse. Two acres, with just modest management, can produce 6 to 8 tons of forage annually, adequate to meet feed requirements for a mature horse in most situations.

Even smaller areas can be managed to adequately feed a horse. For example, you can reduce those 2 acres to 1 acre if you seed or sprig the pasture with a perennial forage, apply lime and fertilizer, and properly manage grazing. Areas of less than an acre can also contribute. In one grazing trial with tall fescue at North Carolina State University (NCSU), 1,100-pound mares were maintained from October through December and April through June on just 1/2 acre per animal. The key is not to use pastures as drylots. Add and remove animals at the correct times to obtain optimum nutrition, rapid forage regrowth, and stand persistence.

Exercise paddocks or drylots can vary in size but should provide a minimum of 400 square feet per horse. These paddocks are typically situated near barns, are used only to provide exercise, and generally contain a limited amount of vegetation. Exercise paddocks can also serve as holding areas during periods of heavy rainfall until pasture conditions improve. Extremely wet pastures can be damaged by the tearing action of horse's hooves while cantering.

One alternative to traditional exercise lots is the long, narrow area called a *run*. Horses prefer to run along fence lines; several long, narrow runs about 14 feet wide will allow separated horses to exercise together without direct interference. Contour these runs with the land to minimize erosion. Grass filter strips, at least 10 feet wide and downslope of an exercise area, will greatly reduce any runoff of animal waste from the area.

Regardless of paddock size, forages planted in an exercise lot can provide nutrients to replace a portion of your horse's forage requirement. Plant them with a persistent forage such as tall fescue, common bermudagrass, or hybrid bermudagrass. The attention

Table 1. A Horse's Expected Daily Feed Consumption

(Source: National Research Council, 1989)

PRODUCTION STAGE	FORAGE		CONCENTRATE		TOTAL Body Weight (%)
	Body Weight (%)	Diet (%)	Body Weight (%)	Diet (%)	
Mature Horses					
Maintenance	1.5-2.0	100	0-0.5	0	1.5-2.0
Mares, late pregnancy	1.0-1.5	70	0.5-1.0	30	1.5-2.0
Mares, early lactation	1.0-2.0	50	1.0-2.0	50	2.0-3.0
Mares, late lactation	1.0-2.0	65	0.5-1.5	35	2.0-2.5
Working					
Light ¹	1.0-2.0	65	0.5-1.0	35	1.5-2.5
Moderate ²	1.0-2.0	50	0.75-1.5	50	1.75-2.5
Intense ³	0.75-1.5	35	1.0-2.0	65	2.0-2.5
Growing Horses					
Nursing foal ⁴ (0-3 mo)	0	0	1.0-2.0	50	2.5-3.5
Weanling (4-6 mo)	0.5-1.0	30	1.5-3.0	70	2.0-3.5
Short yearling (12 mo)	1.0-1.5	40	1.0-2.0	60	2.0-3.0
Long yearling (18 mo)	1.0-1.5	50	1.0-1.5	50	2.0-2.5
2 year old (24 mo)	1.0-1.5	50	1.0-1.5	50	2.0-2.5

Note: Forage estimates are based on average-quality hays. Concentrate estimates assume a feed containing 1.5 Mcal digestible energy (DE) per pound and hay containing .91 Mcal DE per pound. All figures expressed on a 90 percent dry-matter (DM) basis.

¹ Examples include horses in pleasure and equitation classes, and recreational trail riding.

² Horses in ranch work, roping, cutting, hunting, jumping, gymkhana.

³ Horses in polo, endurance/competitive trail riding, racing, three-day eventing.

⁴ Dam's milk supplies at least 50 percent of nutrient intake.

you pay to managing either your pasture or paddock will determine how much nutritional value your horse gains from the forage planted there.

Estimating Pasture Yield

Example:

A mature mare can consume 2.5 percent of her body weight per day in forage dry matter. An 1,100-pound mare might eat about 27.5 pounds ($1,100 \times .025 = 27.5$) of forage dry matter daily.

Consider:

Bermudagrass (Coastal or Tifton 44) pasture is capable of producing from 10 to as much as 80 pounds (an average of about 45 pounds) of forage dry-matter per acre per day from May through September.

Based on expected daily forage production over the grazing season, each acre would produce about 3.5 tons or 7,000 pounds. ($45 \text{ pounds} \times 153 \text{ growing days}$) (May-September).

Estimating Grazing Days:

On an acre of this grass, conservatively, the mare will actually eat about 4,500 pounds of the total forage produced; during grazing, trampling, selective grazing, and other factors will result in waste of the other 2,500 pounds of forage.

The pasture should then produce enough forage for 163 days of grazing ($4,500 \div 27.5 \text{ pounds} = 163$

days). In other words, the mare could easily have enough to graze during the entire 153-day period.

On some days, such as during early May or late September, the pasture might provide less than the 27.5 pounds of forage actually needed. On the other hand, during the peak growing season of June through August for a warm-season grass, more than one horse could graze, or a section of pasture could be fenced off for hay production. Cross fencing and rotational grazing will increase forage growth and utilization.

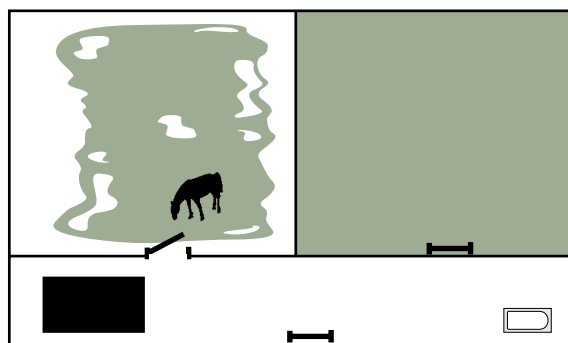
You can calculate this same basic information for tall fescue-clover pastures or any other appropriate pasture species.

Conventional Grazing Management

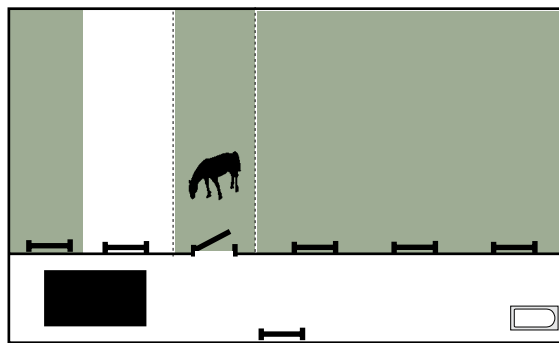
Two types of grazing management—continuous and rotational—are commonly used. *Continuous* grazing involves keeping horses in one pasture for the entire season or even year-round. *Rotational* grazing involves dividing the pasture into two or more subpastures that are then grazed and rested in some sequence.

Less fencing is required for continuous grazing, but the main disadvantage is significant. Because there is no management, the pasture area actually used by the horses is eventually *reduced*. Why?

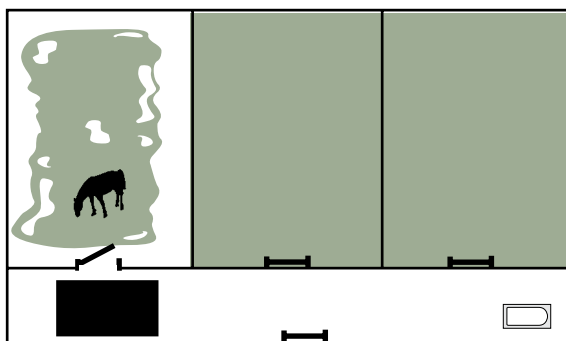
Rotational Grazing Systems



a. 2-Way Rotational Grazing

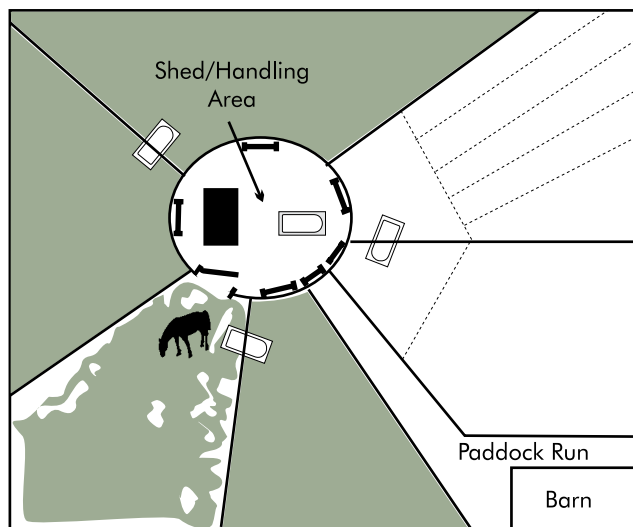
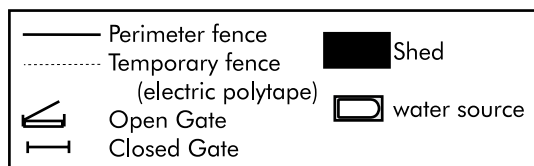


c. Controlled Intensive Grazing



b. 3-Way Rotational Grazing

Legend
(areas not to scale)



d. Wheel-type grazing system. Suggested temporary fence locations are shown in pastures at right.

Figure 1. Pastures can be divided with permanent fencing into two (a), three (b), or more sections (c and d). Horses would be rotated from one pasture to another to maintain sufficient forage availability. Spot grazing is reduced by more frequent rotation. For example, "a" would be more

prone to spot grazing than "c". Note the sequence of open and closed gates; horses should have constant access to water and shelter. Figure d illustrates a wheel-type grazing system with permanent fencing surrounding a centralized water and shelter area.

The grazing behavior of horses encourages "spot grazing." A horse grazes from the top of the forage canopy downward, positioning the choicest plants with its sensitive lips, then snipping off the blades between its upper and lower teeth. As soon as there is young, tender regrowth, the horse bites it off, weakening the plant until it dies. Grazing and regrazing the choicest plants leaves less desirable species and weeds to mature and go to seed.

Spot grazing is most severe if you graze horses in a pasture with appreciably more grass than they can use in a short time (within three to five days). The

horse will avoid the older, more mature plants in favor of young regrowth, and thereby develop *greens* (short, heavily-grazed areas) and *roughs* (taller, more mature, and undesirable areas).

With rotational grazing, horses are rotated among divided pastures, usually with permanent fences and two or three sections. Pasture size is allocated so horses will be rotated every 14 to 21 days depending on the rate and amount of pasture regrowth.

With this system, if you can't stock enough horses per acre, your pastures will develop excess mature forage and horses will spot graze. With too many

horses per acre, the pastures will become overgrazed. Try to maintain the stocking rate to ensure consumption of young, leafy forage without overgrazing.

Innovating Your Grazing System

A controlled, intensively grazed rotational system is the most efficient grazing method. In this system, the pasture area is divided into a number of sub-sections, enclosures, or paddocks, and horses are rotated from paddock to paddock based on available forage and animal nutrient needs. Usually, the period of stay in any one paddock is relatively short, one to three days, depending on the amount of forage present before grazing starts and the rate at which the forage is consumed. Figure 1 presents examples of rotational grazing systems.

You may want to use both a warm- and cool-season pasture species to provide year-round grazing (for example, a bermudagrass pasture for summer and a fescue-clover pasture for fall and spring.)

To subdivide a pasture, use safe, inexpensive, temporary electric fencing, including electrified aluminum wire or polytape, which can be easily put up and removed. Horses quickly adapt to electric fence after brief periods of training. In some cases after an initial shock, horses will not test the fence again. Others may require a fence with constant voltage.

When you move horses from a rotational paddock or pasture, clip the area to remove old, ungrazed plants and stimulate new, leafy regrowth. Parasite control and nutrient recycling can

also be improved by dragging the pasture, either during or after clipping, to break up and spread manure evenly over the paddock.

Cattle grazed in sequence after horses on the same pasture will also improve the pasture. Since the grazing behavior of horses and cattle differs, cattle will graze some of the forage left by the horses. They can be forced to graze the more mature forages by restricting them to the area, although their performance may be reduced. Cattle grazing also helps reduce levels of parasites that affect horses. The internal parasites affecting horses do not affect cattle; nor do cattle parasites bother horses.

Grazing Behavior — Research Trials

Work done at the North Carolina State University Equine Educational Unit has demonstrated that mature quarter horse and thoroughbred mares, and yearling quarter horses, can be controlled by using electric fences in small paddocks.

Horses were rotationally grazed on tall fescue throughout the spring-summer growing season and effectively managed on stockpiled fescue in the fall and winter. Horses quickly adjusted to the limited area for grazing (sub-pastures as small as 0.1 acres with four animals) and consumed the forage in each sub-pasture in three to five days. This stocking density is equivalent to 40 mature horses per acre for the same period.

Quickly grazing the paddock reduced the incidence of spot grazing and provided more uniform grazing which allowed for quick plant regrowth. Calculations for annual production indicated that, under average environmental conditions, approximately 1 to 1.5 acres would easily meet the annual forage needs of an 1,100-pound mare.

The use of controlled intensive grazing to regulate forage consumption and grazing time permitted the stocking rate to be increased. Spring rotational grazing of tall fescue produced an additional two weeks of grazing for yearlings, and three weeks for mares, as compared to yearlings and mares maintained in a continuous grazing system. Horses on the continuous system had to be removed from pasture and given supplemental hay.

Research conducted at NCSU and on-farm demonstrations has shown that horses will graze an average of 16 hours per day. Pastures with stands of forage shorter than 3 inches caused horses to graze longer (up to 20 hours per day). In all studies, the horse spent at least 10 hours a day grazing. Researchers concluded that in situations where horses are turned out to graze for a limited time (less than 12 hours) it is likely that the horses' intake would be reduced. Thus, restricting the grazing time is an effective way to control weight gain in obese horses.

Establishing Pastures

A variety of forages are suitable for horses in North Carolina. When you begin designing a forage program, keep in mind these two important considerations:

- Use forage species with growth patterns that provide forage for most of the year to develop a year-round grazing system.

Evaluate the relative growth rates for individual species and combinations of species.

Figure 2 presents information on forage compatibility, growth rate, and yield. Bermudagrass, ryegrass, alfalfa, tall fescue, orchardgrass, bluegrass, and small grains have been successfully used for horses. Less information is available on how horses use some of the other forage species.

- The relative nutritive value or quality of forage is as important as the quantity produced. Select forage species that meet your horse's requirements. Figure 3 presents the nutritive value of the major groupings of forages in the grazed and hay forms under typical growing conditions. Coastal bermudagrass is presented as an example of a warm-season perennial, and tall fescue is an example of a cool-season perennial. Digestible energy requirements for horses in different physiological conditions are superimposed.

Note that hay is always lower in nutritive value than the same forage when grazed. In the curing and baling process, leaves and nutrients are lost. Also, a grazing horse is selective; it will eat the more palatable plants or plant parts, which are generally the younger, more nutritious ones. If you allow the horse to directly graze the forage, it will improve the quality of its diet and feed efficiency, as well as eliminate the time and labor costs of harvesting. Why not let the horse harvest the forage and maximize its nutrient intake?

Permanent Pasture

Perennial plants should be the foundation of a permanent pasture system. There are a variety of species adapted to different areas and soil types in North Carolina. Whenever soil and climate permit, cool season grass-clover mixtures are preferred to pure grass stands. The clover component can fix atmospheric nitrogen, therefore reducing the need for applying nitrogen fertilizer to the pasture.

Forage Growth Patterns

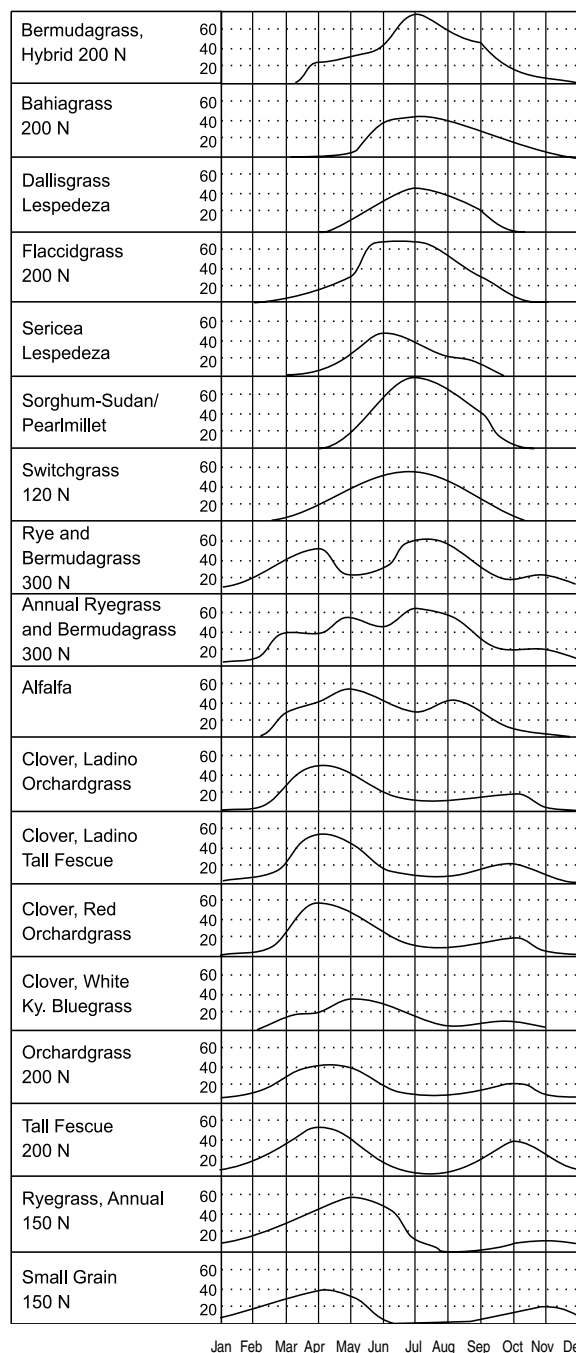


Figure 2. Relative growth rates for forage crops (pounds/acre/day.)

Bermudagrass attains maximum growth in the summer (May-September) while cool-season species have higher yields in early spring (March-June) and fall (September-October) (Figure 2). A combination of cool- and warm-season grasses established in separate

Grazed Forage is Better

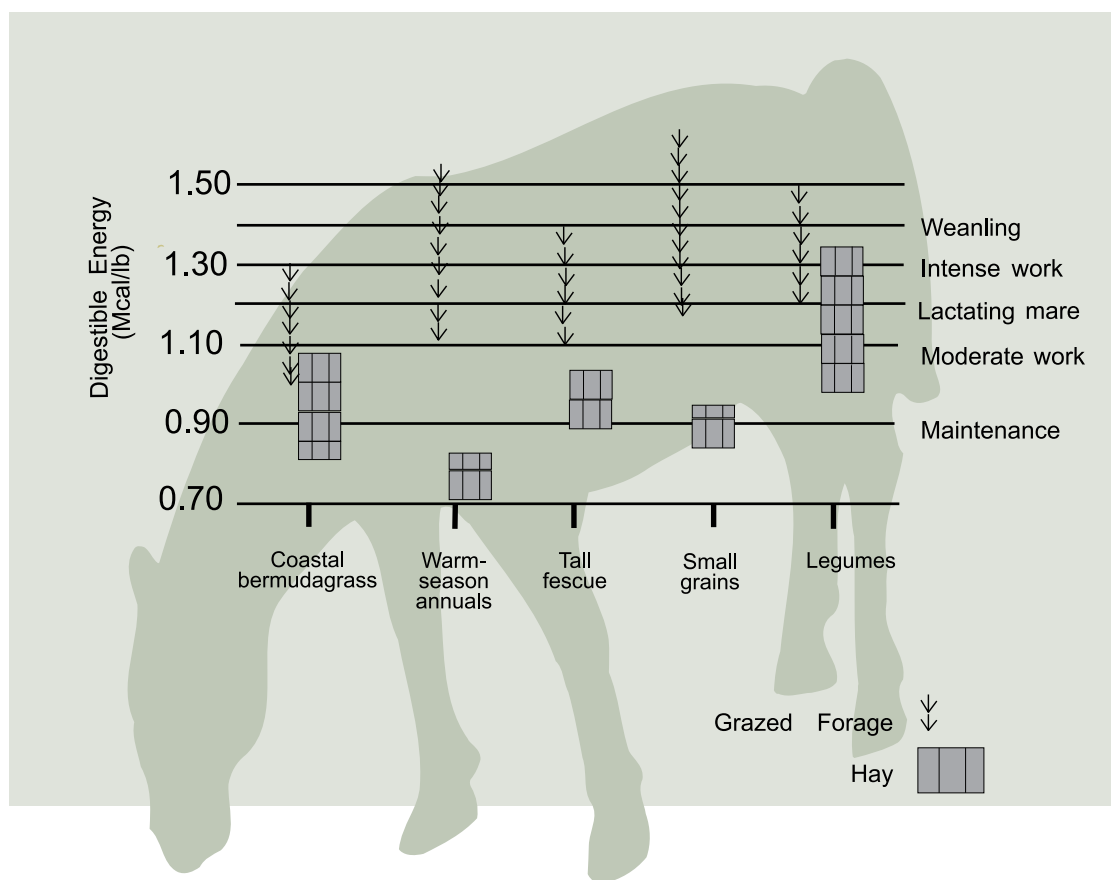


Figure 3. Grazed forage is always higher in nutritive value than the same forage cut and baled for hay. This figure shows the digestible energy content of selected forage

species and the energy requirements for horses at various production levels. Letting your horse harvest the pasture maximizes nutrition and saves baling costs.

stands in a pasture system will provide a more even supply of forage, and lengthen the grazing season. An ideal pasture system would include 50 to 75 percent cool-season forages with the balance in warm-season grasses.

Consult the forage planting guide in *Production and Utilization of Pastures and Forages in North Carolina*, or your county Extension agent for advice on species and variety selection.

Temporary Pastures

Temporary pastures are planted annually and are usually available within one to two months of planting, then used for six to eight months longer. Small-grain annuals such as rye, oats, wheat and perennial ryegrass (a perennial which grows like an annual in North Carolina) are typically used for temporary pas-

tures in late fall and winter. They may be interseeded into bermudagrass or other warm-season pastures, or planted alone in September to provide quality grazing from December through May.

Pearl millet is the only recommended summer annual for horse pastures. It should be planted in May and will usually provide grazing from late June to September. The growth should reach 16 to 20 inches before grazing begins and the horses should be removed when the stubble is 6 to 10 inches tall.

The proper combination of permanent and temporary pasture will provide almost year-round grazing under ideal conditions. Only a limited 30- to 90-day supply of hay will be required in a properly managed pasture system, allowing for excessive snow cover, periods of unseasonably cold temperatures, and drought.

Estimating Nutrient Intake from Pasture

Most adult horses can thrive on a forage-only diet. However, a horse's relatively small digestive system limits its ability to consume and digest feedstuffs.

For instance, a horse is not able to digest and use poor-quality, mature forages as well as a cow or other ruminant. In the horse, feed enters the stomach after swallowing and digestion begins. One to two hours later, the digesta moves into the small intestine, the major site for nutrient absorption in the gastrointestinal tract. Feed not digested or absorbed moves into the cecum and large intestine, where microbes digest the fiber and other unabsorbed feed. Although the microbes are effective in digesting much of the feed, there is not as much absorption of nutrients here as in the small intestine. In a ruminant, most microbial digestion occurs *before* the small intestine, therefore more nutrients are available for absorption.

Another factor governing intake is gut fill. Grazed or fresh forages are extremely high in moisture, which dilutes their nutrient concentration. Therefore, a horse needs to consume more fresh forage to obtain the same dry-matter nutrient levels of forage fed in a dried form. Table 2 presents the dry-matter nutrient

levels of various pasture species, in both their early and late stages of maturity.

Normally a horse can consume about 2 1/2 percent of its body weight in dry matter before gut fill occurs and intake stops. Mature mares grazing high-quality pasture or consuming high-quality hays can have intakes as high as 4 percent of body weight.

Use Table 2 to estimate the nutrient composition of pasture forage varieties. Notice that while mature forage supplies higher dry-matter levels, the same forage in its early growth stages provides higher levels of many nutrients. The legumes are considerably higher in energy, protein, and calcium than grasses.

Combining what we have learned about a horse's expected feed consumption (Table 1) and the nutrient levels of several pasture species (Table 2), we can begin building a pasture feeding program for your horse. A horse with an estimated mature body weight of 1,100 pounds has varying nutritional needs from birth through maturity. These are summarized in Table 3, and will help you calculate how well pastures meet your horse's daily feed requirements.

For purposes of this example, the dry-matter and daily nutrient intake values of selected pasture species have already been calculated in Table 3. Several classes of horses, grazing immature bermudagrass or

Table 2. Nutrient Levels of Selected Pasture Species (Source: U.S.-Canadian Tables of Feed Composition, 1969)

	State of Maturity	DM Percent	DE Mcal/pound	CP Percent	Ca Percent	P Percent
Grasses						
Bermudagrass	Early	28	1.42	17.1	.89	.32
	Mature	39	1.24	5.8	.40	.18
Bluegrass	Early	31	1.44	17.4	.33	.30
	Mature	42	1.12	9.5	.30	.25
Fescue	Early	28	1.34	15.1	.51	.38
	Mature	35	1.19	8.9	.42	.30
Orchardgrass	Early	28	1.32	13.1	.25	.29
	Mature	30	1.32	8.4	.23	.22
Legumes						
Alfalfa	Early	21	1.21	20.5	2.30	.31
	Mature	25	1.21	16.5	1.53	.27
Ladino, clover		19	1.38	25.1	1.33	.37
Red, clover	Early	20	1.40	21.1	2.26	.38
	Mature	28	1.28	14.9	1.01	.27

Nutrient values are expressed on a 90 percent dry-matter basis.

Key: DM – Dry matter. The portion of the feed that contains no water.
 DE – Digestible energy. A measure indicating energy available from a pound of feed.
 CP – Crude protein. An estimate of total protein content in feed. Essential for tissue formation.
 Ca – Calcium. Mineral required in large amounts for proper bone development.
 P – Phosphorus. Mineral essential to normal bone development.

Table 3. A Model Pasture Feeding Program.

(Source: National Research Council, 1989)

Nutrient Requirements Age and Nutrition Class	DE Mcal/day	CP Pounds/day	Ca Grams/day	P Grams/day
Long yearling	17.0	1.6	28	19
Maintenance	16.4	1.4	20	14
Late pregnancy	18.4	1.6	34	23
Lactation (month 1-3)	28.3	3.0	50	34
Nutrient Intake				
Selected Pasture Species				
Bermudagrass				
Immature 15 lb DM (54 lb as fed)	21.3	2.5	60.6	21.8
Mature 15 lb DM (79 lb as fed)	18.6	0.9	27.2	12.6
Grass/Legume mixed (60%/40% immature fescue/ladino clover)				
15 lb DM (62 lb as fed)	20.4	2.9	57.2	19.1
22 lb DM (90 lb as fed)	29.9	4.2	83.9	28.0

Nutrient intake is calculated for horses with an estimated mature body weight of 1,100 pounds.

Key: DM – Dry matter. The portion of the feed that contains no water.

DE – Digestible energy. A measure indicating energy available from a pound of feed.

CP – Crude protein. An estimate of total protein content in feed. Essential to tissue formation.

Ca – Calcium. Mineral required in large amounts for proper bone development.

P – Phosphorus. Mineral essential to normal bone development.

fescue-clover mixed pastures, can obtain the necessary digestible energy, crude protein, calcium, and phosphorus to meet their nutrient requirements by consuming 15 pounds of forage (dry-matter basis) daily. These include long yearlings, a horse at maintenance, and mares in late pregnancy.

However, lactating mares consuming the same amount of bermudagrass pasture would be deficient in energy, protein and phosphorus. The same lactating mare could meet all of her nutrient needs from a 60/40 grass-legume mixture if she were able to consume 90 pounds per day on an as-fed basis.

A more severe deficiency of protein, calcium and phosphorus occurs in mares in late pregnancy forced to graze mature bermudagrass pastures. Such nutrient deficiencies can be corrected by supplementing pastured horses with a balanced concentrate mix in moderate amounts.

(See accompanying inset, “As-Fed versus Dry Matter” for help calculating the amount of fresh forage a horse needs to meet nutrient intakes expressed on a dry-matter basis.)

Supplementing Trace Minerals

Trace minerals and vitamins should be supplemented free choice with fresh, clean water when grazing. Loose, trace-mineralized salt (granular form) or

Sampling Your Pastures

Many factors affect the quality of the forage in your pasture, including species selection, soil condition, and climate. Laboratory analysis is the best way to know if you are providing your horse with balanced rations.

Samples clipped from pasture can be sent to the forage testing laboratory at the North Carolina Department of Agriculture (NCDA) for chemical analysis. For a \$10 sample fee, the NCDA provides a composition breakdown. Your local Extension Service agent can then give you nutritional recommendations based on the NCDA findings.

Mailing kits for samples are available from NCDA offices or from county Extension Centers. Deliver samples to the Constable Laboratory, 4000 Reedy Creek Road, Raleigh; or mail them to: Forage Testing Facility, Constable Laboratory, NCDA, P.O. Box 30600, Raleigh, NC 27622.

trace-mineralized salt blocks should provide adequate amounts. However, if the soil is trace-mineral deficient, these salt supplements are not enough. Many soils in eastern North Carolina are severely deficient in copper and zinc, trace minerals important in the development of bone in young, growing horses. Horses fed a concentrate and grazing pastures known to be trace-mineral deficient should be supplemented with a trace-mineral, vitamin premix added directly to their concentrate mix or in the form of a fortified mineral supplement designed specifically for free-choice feeding to horses.

Forage Precautions

Sorghum and sorghum-sudangrass hybrids are not recommended for grazing horses. A condition known as *cystitis*, which can be fatal, has been sporadically reported when horses grazed these summer annuals during drought conditions or immediately after a frost. Cystitis is caused by a sublethal dose of hydrocyanic acid, and is characterized by frequent urination or lack of coordination; mares appear to be constantly in heat. Hay harvested at any time, including during a drought or after a frost, can be safely fed after storing for two to three months. Cystitis has not been reported in horses grazing pearl millet.

Founder or *laminitis* is a condition characterized by inflammation of the soft laminae of the feet. It can result in chronic lameness. It is usually caused by overeating grain, but can also occur from overeating lush, succulent pasture. Horses should be gradually switched from a dry lot to lush pasture over a 10-day period. Gradual adaptation will also limit scouring or loose stools.

Sand colic can result if horses graze forage close to ground level in sandy pastures. It frequently occurs when horses are allowed to remain on bermudagrass pastures during the late fall and winter when the grass is dormant. Horses will dig for bermudagrass rhizomes which are high in carbohydrates. In the process, they ingest large amounts of sand, which can result in an impaction or displacement colic. If bermudagrass is the only pasture available, a portion of the pasture can be overseeded with a small grain or ryegrass so the animals have forage available during the time bermuda is dormant. There are a number of laxative-type equine products available that aid in the excretion of sand from the gastrointestinal tract. Avoid feeding hay on the ground in pastures with sandy soils to minimize additional sand intake.

Nitrates can be a problem with drought-stressed grasses that have been fertilized with moderate to heavy amounts of nitrogen (N). Nitrate levels of 1

As-Fed versus Dry Matter

How to Determine Dry Matter Levels of As-Fed Pasture

Since hay and pasture nutrients are expressed on a dry-matter basis, the percentage dry matter of forages must be considered when calculating nutrient availability. Use information from Table 1 and Table 2 to calculate how much fresh forage your horse must consume to provide proper amounts of dry matter each day.

Example: An 1,100-pound mare grazing mature fescue pasture.

■ *From Table 1:*

1,100 pounds x 2.5 percent body weight = 27.5 pounds dry matter per day

■ *From Table 2:*

Mature fescue pasture is 35 percent dry matter. Thus, 27.5 pounds of fescue dry matter is 35 percent of what amount of fresh forage?

$27.5 \text{ pounds} \div .35 = 78.6 \text{ pounds fresh fescue (as fed)}$

■ *An 1,100-pound mare would have to consume 78.6 pounds of mature fescue pasture to provide 27.5 pounds of dry matter intake per day.*

percent of the total diet or greater are considered toxic for the horse. Excessive application of sewage sludge and liquid manure frequently result in high nitrate levels. Avoid grazing drought-stressed grasses, particularly pearl millet, until the plants recover and produce growth. Hays high in nitrates can be diluted with other nitrate-free hay or grain to maintain a nitrate content of 0.5 percent or less in the total diet.

Slobbering is most commonly caused by high levels of slaframine, a chemical substance that is produced by specific plant molds. The fungus forms concentric dark brown or golden rings on leaves and occurs primarily in legumes, most commonly red clover, during periods of high moisture. It has also been reported in ladino clover, white clover and lespedeza pasture. Slaframine causes excessive saliva production which may cause dehydration within 24 hours. Slobbering can be minimized if (a) the legume component of a grass-legume mixture does not exceed 40 percent of the stand; (b) horses are switched gradually to lush, legume-dominant pastures, and (c) there

is frequent clipping or grazing of the plant close to the ground surface. Removing the horse from the moldy hay or pasture relieves the condition. Veterinarian attention may be required for extreme cases.

Tall fescue has been associated with a fungus or endophyte, (*Acremonium coenophialum*) known to cause *fescue toxicosis* in brood mares. It produces a variety of reproductive problems, including abortions, stillborns, retained placentas, little or no milk production (agalactia), and reduced rebreeding efficiency. The unidentified toxins appear to block the mare's production of prolactin, the hormone required for normal milk production. The accumulation of milk in the udder is one of several mechanisms that trigger foaling in the normal mare; hence, prolonged pregnancies are a symptom of fescue toxicosis.

Fescue toxicosis has been noted in horses consuming hay or pasture infested with a 5-percent or higher level of the endophyte. A 1984 survey of tall fescue horse pastures in North Carolina found 95 percent of the tested pastures contained the endophyte at an average level of 68 percent. Additional research studies show that removing brood mares from fescue within 30 days of foaling and supplementing their diet with high-energy grains has not been effective in eliminating fescue toxicosis symptoms. Diluting the endophyte in fescue (by supplementing legume hay or grain, or by interseeding clover or other forage species in pastures) is also not completely effective.

Maintaining good forage stands requires proper management of low-endophyte tall fescue pasture. Low endophyte fescue varieties (5 percent or less) are safe for all classes of horses. Unfortunately, the low-endophyte varieties are not as persistent as endophyte-

infested fescue. As a rule, brood mares should be removed from endophyte-infected hay or pasture 90 days prior to foaling.

Blister beetle poisoning occurs in hays not grown in North Carolina. Blister beetles congregate in areas typically frequented by large populations of grasshoppers such as Oklahoma, Texas, Arizona, and Illinois.

The beetles are trapped and killed in the windrows of forages harvested by hay mower conditioners; the condition is most prevalent in second and third cuttings. Dead or alive, the beetles contain a toxic substance called "cantharidin." When ingested, cantharidin causes severe gastrointestinal tract lesions with death occurring quickly. As few as three beetles could kill a 1,000-pound horse.

Miscellaneous grazing problems include consumption of noxious, or irritating matter. Weeds, which can be toxic, will usually be grazed by horses fed a fiber-deficient diet or reduced levels of dry matter typical of an overgrazed pasture.

Consumption of wood, trees, dirt, and hair indicates a lack of fiber intake, a nutrient deficiency, and/or boredom. In these cases, improve your horse's diet by supplementing hay or additional pasture to provide adequate dry-matter intake.

As a rule, brood mares should be removed from endophyte-infected hay or pasture 90 days prior to foaling.

Toward More Effective Feeding

Well-managed pastures can be a major component of your successful horse management program. They are a relatively inexpensive feed source that can produce enough protein, energy, and vitamins to meet the nutritional needs of most adult horses. Ultimately, you will have to determine what mix of feedstuffs best answers your horse's nutritional needs at any given stage. Consider high-quality forage to ensure proper nutrition and normal digestive function.

Further Reading

Detailed descriptions of individual forages, including when and how to plant, and information on horse nutrition behavior are available in the following publications.

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Pond, K. R., D. K. Dugan, D. T. Barnett, J. C. Burns and D. S. Fisher. *Grazing Behavior of Mares and Steers on Orchardgrass and Mares on Common Bermudagrass*. Proceedings of the Equine Nutrition and Physiology Symposium. 1995. Department of Animal Sciences, NCSU, Raleigh, North Carolina 27695.

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