

N E W J E R S E Y

PASTURE MANAGEMENT

GUIDE FOR HORSE OWNERS



*Helping People Help the Land
in New Jersey*



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New Jersey Horses and the People Who Raise Them

New Jersey has more than 42,500 horses. More than 70% of the State's 7,200 equine operations have fewer than eight equine animals.* These smaller operations include commercial facilities, stables, riding clubs and residences where people keep horses on relatively small acreages. This publication is designed to present basic information about the special grazing system and forage needs of horses.

In many cases, people view their horses as pets or companion animals rather than as livestock. They can become emotionally attached to their horses, and are interested in providing the best care for

them. The majority of horse owners do not raise any other livestock.

A well-managed grazing system can offer good nutrition, as well as the most economical and safest care for horses. These simple, inexpensive, low-maintenance management techniques also can protect and preserve natural resources by reducing soil erosion and preventing pollution of surface and groundwater from animal waste that washes off pastures and corrals.

* Source: New Jersey Equine Industry 2007 - Economic Impact, Rutgers Equine Center www.esc.rutgers.edu



Horse Facts

- Most of the time, a horse has “monocular” vision. This means a different image is seen by each eye so that a horse is seeing two different pictures at the same time. A horse can also have “binocular” vision, like humans, but only when it is looking down its nose. A horse can see completely around its entire body except for small blind spots directly in front of its face, underneath its head, and directly behind itself.
- Usually wherever a horse’s ear points is where the horse is looking. If the ears are pointing in different directions, the horse is looking at two different things at the same time.
- Horses cannot breathe through their mouths, regurgitate food or vomit.
- Horses have a prehensile upper lip. Prehensile means “adapted for seizing, grasping, or taking hold of something.” Their upper lips are very sensitive and capable of feeling the smallest of differences in objects.
- A horse’s upper jaw is wider than its lower jaw. During normal chewing, sharp edges or points frequently form along the outside edge of the upper teeth and the inside edge of the lower teeth due to the uneven grinding surface created by the different width of the jaws.
- A horse’s age can usually be accurately determined by its teeth until the horse is about 9 years old. After that, a horse is known as “smooth mouthed” or “aged,” and it becomes far more difficult to tell its age by this method.



Problem Grazers

It is ideal if all of the plants in a pasture are grazed evenly to the same height. But horses are uncooperative grazers. They will eat what they like best until it is no longer available, and only then will graze on other plants in the pasture. The more options horses have in the pasture, the more selective they become.

Equines have a unique digestive system which allows them to utilize large amounts of forage. Unlike ruminants, such as cows, horses are basically continual grazers. They spend 13-18 hours per day grazing, while cows must spend about one-third of the day ruminating. Horses are biting top-grazers, whereas cows are tongue-lapping, tearing side-grazers. Horses eat the tops of plants until the plants in that spot are short. Then they graze new sprouts on that spot and avoid what appears to be good, taller pasture.

Consequently, when horses occupy one pasture for a long time, they graze down their favorite plants repeatedly. Grasses subjected to this repeated leaf removal are unable to photosynthesize (make their own food). They must then draw energy from their root reserves. Eventually these favorite plants are depleted to the point that they die. Bare spots, weed growth and soil erosion will soon follow.

The spot-grazing effect can be so intense and extensive that large spots, and finally whole pastures, are destroyed by grazing too short, too often and too much over an extended period of time.

Horses are large, heavy animals, and the negative effects of their spot grazing are compounded by trampling damage and compaction of the soil. Also, they tend to leave their manure in certain areas without distributing the nutrients and damage over the whole pasture. They will then avoid grazing these areas, wasting valuable forage.



When horses are allowed to overgraze, bare spots develop and the pasture quality suffers.

How Forage Plants Grow

This is probably one of the most important aspects of grazing management. It is also one of the least understood.

95 percent of plant food is taken from the air. Leaves are food factories. In the presence of sunshine, they combine carbon dioxide from the air with water, nitrates and minerals from the soil to make plant food. **Short tops mean short roots.**

5 percent of plant food is taken from the soil. Roots store food. They gather and store raw materials: water, nitrates and minerals, which are converted into plant food by the leaves. This food is essential for future growth. **Short roots mean less future grass production.**

Overgrazing destroys roots and leaves. Pasture management is really leaf area management. A good rule of thumb is to **TAKE HALF, LEAVE HALF** of the plant's leaf area during any grazing rotation. This allows the plant plenty of leaf area to continue making food for regrowth.

Removing 60 percent or more of the leaf area will stop a large percentage of root growth for several days. If repeated, overgrazing occurs and plants become stressed and lose vigor. Beginning grazing heights for cool-season forages are 6-8 inches. Never graze below a 3-inch height to allow adequate leaf area for regrowth.

Pros and Cons of Grazing

Horses naturally meet their nutritional needs through grazing. It is possible to provide a balanced nutritional diet for horses that are not allowed to graze, but there are several advantages to providing good quality pastures for horses.

Good pastures provide one of the best and least-expensive means of feeding horses. The horse's digestive tract needs adequate fiber to function properly. Pasture forages provide fiber, as well as protein, minerals and vitamins.

Horses appear to be healthier when kept outside on pasture with adequate shelter because they get sunshine, fresh air and exercise. Most horses kept on pasture also have a better disposition than horses that are kept in stalls all of the time.

Grazing also may improve reproduction. Mares placed on spring pasture have been shown to ovulate up to seven days earlier than mares of similar age that are kept on dry lots and fed hay.

Without proper management, however, there can be drawbacks to grazing both for horses and the environment. For example, horses can be malnourished in deep, green forage. Extremely lush pastures containing more than 85 percent water can be too wet and too low in fiber for good nutrition and dry-matter intake. Providing too much water and too little nutritional value, plentiful, low-quality pasture can result in hay gut and horse digestive tract impaction (colic). Thus, supplemental feeding on pasture is sometimes needed.

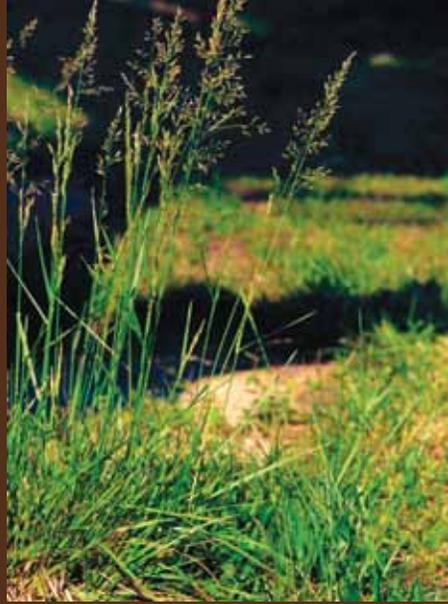
If horses have not grazed pastures all winter, they should not be turned out at once on spring pasture. Immediate access to lush, spring forages can cause colic or laminitis (founder).

A crucial factor in managing horses on pasture is to avoid abrupt changes from a fed ration to pasture and from extremes of pasture quality. Changes especially are a problem when horses are moved from a lower-quality pasture, or no pasture, to a high-quality pasture.

To prevent problems when introducing horses to pastures, feed them a normal amount of hay before turning them out, and limit grazing time to one hour the first day. Then add 30 minutes to one hour of grazing time each day, or as recommended by your veterinarian.

Eating clovers, either by grazing or in hay, often results in excessive slobbering caused by a fungus growing on the clover when conditions are adverse. While not particularly attractive, this poses no health concern to the horse.

In addition, there are a number of plants that are poisonous to horses that can make horses ill, or even kill them, if they are consumed (see plant list on page 17).



E+ Fescue

Tall fescue infected with the toxic endophyte fungus (E+) has long been taboo for use as horse pasture or hay. Toxic E+ tall fescue affects all classes of horses, but the most dramatic effects are seen in pregnant mares. Pregnant mares grazing E+ tall fescue may develop thickened placentas resulting in foal death, and the mare may fail to lactate. Pregnant mares should not be allowed to graze E+ fescue or eat hay containing E+ fescue for 60-90 days prior to foaling.

Varieties of tall fescue are available which do not contain the toxic endophyte. These varieties should be selected for planting. It is prudent for horse owners to eradicate the E+ fescue to the greatest extent possible.

Rotational Grazing

Rotational grazing involves dividing a larger pasture into several, separately fenced paddocks, and rotating horses among the smaller paddocks. The minimum number of paddocks for an effective system is four, but 12 or more paddocks are much better. Keep in mind that many of the paddock divisions can easily be done with temporary electric fencing.

Rotational grazing works because healthy forage plants are more productive if they are given an opportunity to rest and regrow between periods of grazing. As plants grow, they become more mature and less nutritious. Young, immature plants have more leaves than stems, and leaves have two to three times more nutrition than the stems, which are more fibrous and less digestible.

Since digestibility, palatability and nutrition decrease as plants mature, the ideal pasture has young, growing plants. Rotational grazing promotes growth by forcing horses to more uniformly graze a paddock instead of selectively grazing over and over the grasses they like the most.

The rule of thumb is to start horses grazing in a paddock when the forages are 6 to 10 inches tall, then move the horses to the next paddock after they have grazed the forage to an average height of 3 to 4 inches. The paddock just grazed by horses should be mowed or grazed by other livestock to obtain a uniform, 4-inch forage height within the paddock. Allowing the ungrazed plants to remain standing without clipping could stunt regrowth of the other forages by shading them. Immediately following mowing, the paddocks should be dragged to scatter the manure.

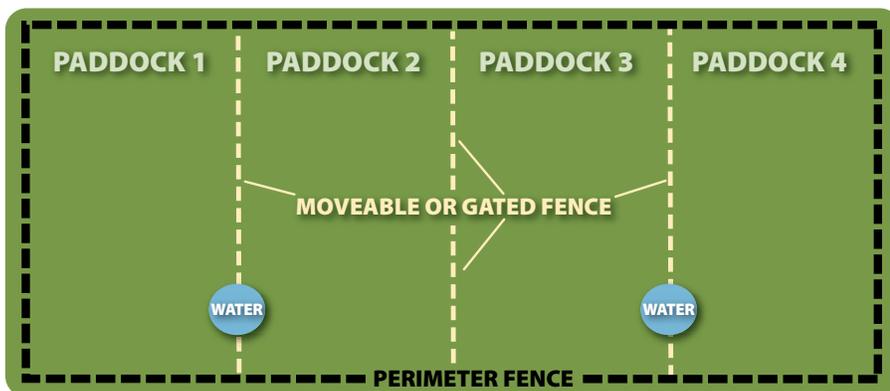
The length of time horses graze on each paddock depends on the amount of available forage and the length of time required for each



Don't Overstock Your Pasture

A mature horse needs about 1.5 to 2 percent of its weight each day in dry forage, though many horses don't stop eating when they've eaten all they need. If the major nutrient source is pasture, a 1,000-pound horse needs about 2,700 pounds of forage during a six-month grazing season. Most of New Jersey's horse pastures are not irrigated, so with average production and management, it would take three to five acres of pasture to meet the nutrient needs of a mature horse.

By switching to rotational grazing, the amount of pasture needed per horse can be reduced, and the grazing season can be lengthened. On moderately productive soils, as little as two acres of well-managed pasture can support one mature horse in a rotational-grazing system for seven to eight months.



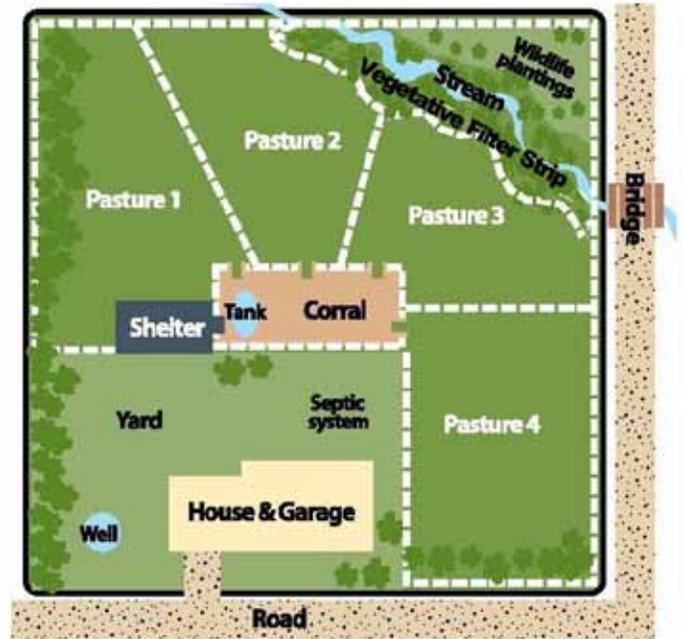
Rotational-grazing paddock layout example

paddock to recover from grazing. The recovery period varies seasonally with the rate of growth. The grazing manager must continually monitor the growth of the forage, and adjust grazing and recovery periods accordingly.

If animals are removed from a paddock at the proper time - when the forage is 3 to 4 inches tall - recovery will require as little as 21 days in the spring. The same paddock might require 45-60 days to recover in dry, summer months when grasses grow more slowly.

For example, if you have two horses and four acres of pasture, you could divide the pasture into eight, one-half-acre paddocks. In the spring, when the grass is growing rapidly, grazing each paddock for three days will give each paddock 21 days to recover before they are grazed again. In a dry summer month, the recovery period could be 60 days, so the grazing period on each paddock would have to be extended to eight to nine days to accommodate this.

Many horse producers don't have the proper facilities to do the best rotational grazing. If you do not have enough land to provide the forage your horses need, and you do not wish to reduce the number of your horses, you will need to keep your horses in a dry lot or stalls, and feed them hay there until your pasture or paddock has regrown to at least 6 inches.



Example of small-acreage grazing system with lot and stalls

For example, if you only have enough land to grow forage for three horses, and you have four horses, they will have to be kept in a corral or stalls and fed hay during times when the grass grows slowly to make it possible to give the forages the proper amount of rest before they are regrazed.

Horses should never be allowed to graze pastures closer than 3 to 4 inches. When your horses have grazed the pasture to this height, remove them and allow the pasture to rest until the grass regrows to height of at least 6 inches.

Resting Guidelines

Grass and legumes need recovery time after being grazed. These are merely guidelines. Stocking rates and growing conditions greatly affect forage growth. Also, the more closely pastures are grazed, the longer the rest period needs to be for species which are sensitive to defoliation.

COOL-SEASON GRASSES

- 14-16 days during first rotation (April)
- 20-30 days during fast growth
(May - late June) and in the fall
- 30-40 days during slow growth
(summer or winter)

WARM-SEASON GRASSES

- 14-21 days during early fast growth
- 21-28 days during normal growing conditions
- 35-45 days during slower growth

LEGUMES

- 24-32 days throughout growing season
- 40-45 days for seed production

New Jersey Animal Waste Rules

The NJDA has developed rules to proactively address non-point source pollution that may originate from livestock operations. This includes operations that accept manure from other agricultural operations. The New Jersey Department of Agriculture (NJDA) was authorized by the Legislature to develop Criteria and Standards for Animal Waste Management (NJAC 2:91).

All agricultural animal operations must follow the General Requirements of the rules:

1. Agricultural animal operation shall not allow animals in confined areas to have uncontrolled access to waters of the state.
2. Manure storage areas shall be located at least 100 linear feet from waters of the state.
3. Land application of animal waste shall be performed in accordance with the principles of the NJDA Best Management Practices (BMP) Manual, which can be found at <http://www.nj.gov/agriculture/divisions/anr/pdf/BMPManual.pdf>.
4. Dead animals and related animal waste resulting from a reportable contagious disease or an act of bio-terrorism shall not be disposed of without first contacting the State Veterinarian.
5. Any person entering a farm to conduct official business related to these rules shall follow bio-security protocol.

Who needs an Agricultural Waste Management Plan (AWMP):

1-7 Animal Units (AU*) - All animal operations are encouraged, but not required to write a self-certified AWMP.

8-299 Animal Units with densities less than 1 AU per Acre - Operations are required to write a self-certified AWMP.

8-299 Animal Units with densities greater than 1 AU per Acre - Operations are required to write a self-certified AWMP that is reviewed by a conservation professional.

300 or more animal units - Operations are required to have a Comprehensive Nutrient Management Plan (CNMP) and must be certified by NJDA.

Operations accepting manure are required to write a self-certified AWMP if they receive more than 142 tons of manure per year.

* 1 AU= 1,000 pounds of live animal weight

New Jersey Adopts Equine Agricultural Management Practice

On June 26, 2008, the State Agriculture Development Committee (SADC) adopted rules that expand the list of equine-related activities eligible for right-to-farm protection and set forth the standards farmers will have to meet to qualify for that protection. The rules also detail what income may be used to satisfy the production requirements in the definition of "commercial farm" in the Right to Farm Act. One of the rules' new eligibility conditions is that an equine operation must be in compliance with a farm conservation plan prepared in accordance with the NRCS FOTG (Field Office Technical Guide). The guide is available online at <http://www.nrcs.usda.gov/technical/efotg/>.

For more information on the new rules and the Right to Farm Act, visit <http://www.state.nj.us/agriculture/sadc/ruleprop/equinerulesbackground.pdf>.

Characteristics of a Good Horse Pasture

- Palatable and nutritious forage.
- Weed-free, leafy and with few seed heads.
- Relatively smooth surface with thick forage - Horses' hooves are more damaging to sod than hooves of other animals. Do not allow horses to graze in muddy pastures because of the severe damage that will result. In addition to damaging the pasture, the uneven surfaces created can cause injury to horses.
- Easy to manage and large enough to provide quality forage and room for exercise.
- Well-drained; not in a marsh or in swampy areas. Avoid floodplains, drainage areas and tracts with long, steep slopes.
- Include an adequate supply of fresh water year-round, shade during summer, and shelter for times of adverse weather.
- Free of poisonous plants, and free of hazardous objects such as wire, stumps, junk, rocks and low-hanging limbs.
- Properly fenced.

General Horse Pasture Management

Key factors in management of horse pastures are proper liming and fertilizing, manure management and stream fencing.

Test the Soil

An inexpensive soil test, available from Rutgers Cooperative Extension (www.njaes.rutgers.edu), can help you determine the type and amount of fertilizer and lime needed for good pasture growth. This will help prevent nutrient runoff from over-fertilized pastures and reduce the cost of fertilizing by applying only what is needed. Test soil at least every three years to determine fertilizer and lime needs and prior to seeding.

Manage Manure in the Pasture

Manure clumps are a major cause of spotty pasture growth. Horses will not graze in areas where manure is present. Manure piles can be scattered by harrowing or dragging, which helps the pasture by distributing the nutrients. It also reduces some parasite problems by exposing the parasites to sunlight. Dragging can be done with a spike-tooth harrow, flexible-chain harrow, or a section of chain-link fence. Dragging should be done in sunny, dry weather to help kill the parasites in the manure. For safety, only drag pastures when they are not occupied by horses. Then leave them unoccupied for at least two weeks before returning horses to the pasture or paddock.

Manure Handling Considerations

A tractor or manure spreader is needed to promote proper application of spreading stored manure. Consider the following when spreading manure:

- Avoid applying too much manure; manure should be applied to the soil in a thin layer. Too much manure can seep and contaminate underground water supplies. A thin layer of manure speeds the drying process and also discourages fly breeding.
- Avoid spreading manure on wet soils to reduce soil compaction.
- Apply manure based on the nitrogen that meets the plants' fertilizer needs.
- Apply manure spreading rates based on soil testing results.
- Avoid spreading manure on frozen pasture.

Keep Horses Out of Streams

If horses must cross streams, construct a proper crossing to provide a safe, easy way to keep horse hooves dry. Wet hooves tend to be weaker, crack, and cause loose shoes more often. Wet hooves also tend to have more cases of thrush and

fungal infections.

Use fencing to encourage horses to use the constructed crossings instead of crossing the stream at will. This allows vegetation to stabilize the stream banks. Keeping horses out of streams also protects the water quality and reduces sediment pollution.

Establish a Sacrifice Lot

When pastures are muddy, when grass growth is very slow due to extended dry weather, or any time you don't have a paddock ready to graze, move your horses to a sacrifice lot. A sacrifice lot is an exercise paddock or riding ring on which you don't expect to keep a grass cover. The area may have grass, wood chips, stone dust or just soil. The intent is to sacrifice a small area of your property in order to give your pastures time to recover.

Locate sacrifice lots on high ground, as far away from waterways as possible. Install buffers or other erosion-control measures to filter runoff. In areas where soils are poorly drained or deep, consider adding a packed layer of rock or limestone screenings to keep the area from becoming muddy and to help prevent injuries caused by slippery conditions. Placing a geotextile fabric under the rock layer will reduce future maintenance needs.

Commercial erosion-control pads or geotextile fabric also can be placed in sacrifice lots and covered with soil or other materials.



Perforated mats were used in a sacrifice lot to minimize damage from rain and pawing.



Know When Not to Graze

A common mistake made by horse owners is grazing new pastures too soon. Wait until the forage is at least 6 inches tall before placing horses on newly seeded pastures; this could take up to 12 months.

If the soil is wet or when rain is expected, do not turn horses into pastures, especially newly planted ones. Horses' hooves do considerable damage to forages and to the soil, even in established pastures, when the soil is wet.

Provide Clean, Fresh Water

Clean, fresh water is essential for good animal health. Horses can consume between 8-12 gallons of water per day when the average temperature is 50 degrees Fahrenheit. That amount increases to 20-25 gallons per day when the temperature climbs to 90 degrees Fahrenheit or when in an exercise program.

Horses should not have to travel more than 800 feet for water. As you divide your acreage into paddocks, establish separate water sources for each paddock or a single water source that is accessible from all paddocks. Water can also be piped to a trough in each pasture.

Fencing for Horses

Horse owners must have adequate fencing to safely contain and manage their horses. Fencing often is considered just a means of containing horses, which is especially important in urban areas. But fencing is much more than that. Daily labor needs and routines are influenced by the fencing plan.

The key to good horse fencing is proper construction and adequate maintenance. Safety of the handlers, visitors and the horses must receive first priority in designing horse fencing. Cost is a major consideration, but it should not dictate unsafe or inefficient fencing. While aesthetics should be considered, it should not overrule safe, functional fencing. For example, do not place boards on the outside of posts just because it looks nicer; it's safer for horses and more functional to place the boards on the inside of the posts where leaning against the fence will not loosen boards.

Barbed wire should not be used for horses, and electric fencing alone is not recommended for perimeter fences. However, because horses are sensitive to electric shock, they can be easily trained to respect electric fences. A major concern is visibility. Electric fencing made of wide tape addresses this concern, but those tapes tend to be relatively poor conductors and do not last long. Another option is plastic-coated, 12.5-gauge, high-tensile wire developed specifically for the horse industry. It is more visible, attractive and safer than uncoated wire.

If wire is used, it should be smooth. A fence made of 12.5-gauge, high-tensile wire with a tape



for visibility works well. If electric fencing is used for perimeter fencing, four to five strands should be used. The top wire should be 40-50 inches above the ground.

Choose fencing that safely meets your economic and aesthetic needs. To minimize damage and maintenance to your fences, consider using an electric strand on top of PVC or wooden fencing if your horse is a cribber or if it chews.

Keep in mind a few basic fencing needs of horses when you make your choice. The general rule is that the top of the fence should be at eye level to the horse. This discourages horses from fighting over the fence.

Lightweight, temporary electric fencing consisting of polytape, polyrope or polywire



Plastic-coated horsewire, an example of permanent fencing wire, is more visible and less likely to cut a horse that may run into it.

strung on lightweight plastic or fiberglass posts works well for dividing a pasture into paddocks in a rotational-grazing system. Use of small, uncoated, 14-gauge or 18-gauge wire commonly used with cattle is not recommended because it is not safe for horses, primarily because they cannot see it. Because of their poor eyesight, horses often make contact with the electric fence, which shocks them and makes them run. This can be disastrous if the wire gets wrapped around a horse's leg. The small wire can also cut horses when they run into it.



Examples of temporary fencing wire.

The Best Forages

There is no forage that is best for all situations. Several forages, singly or in combinations, make good horse pastures. But not all forages are suited for horses. Forages are classified as grasses or legumes, and further defined as cool-season grasses or warm-season grasses. Some are perennials and some are annuals.

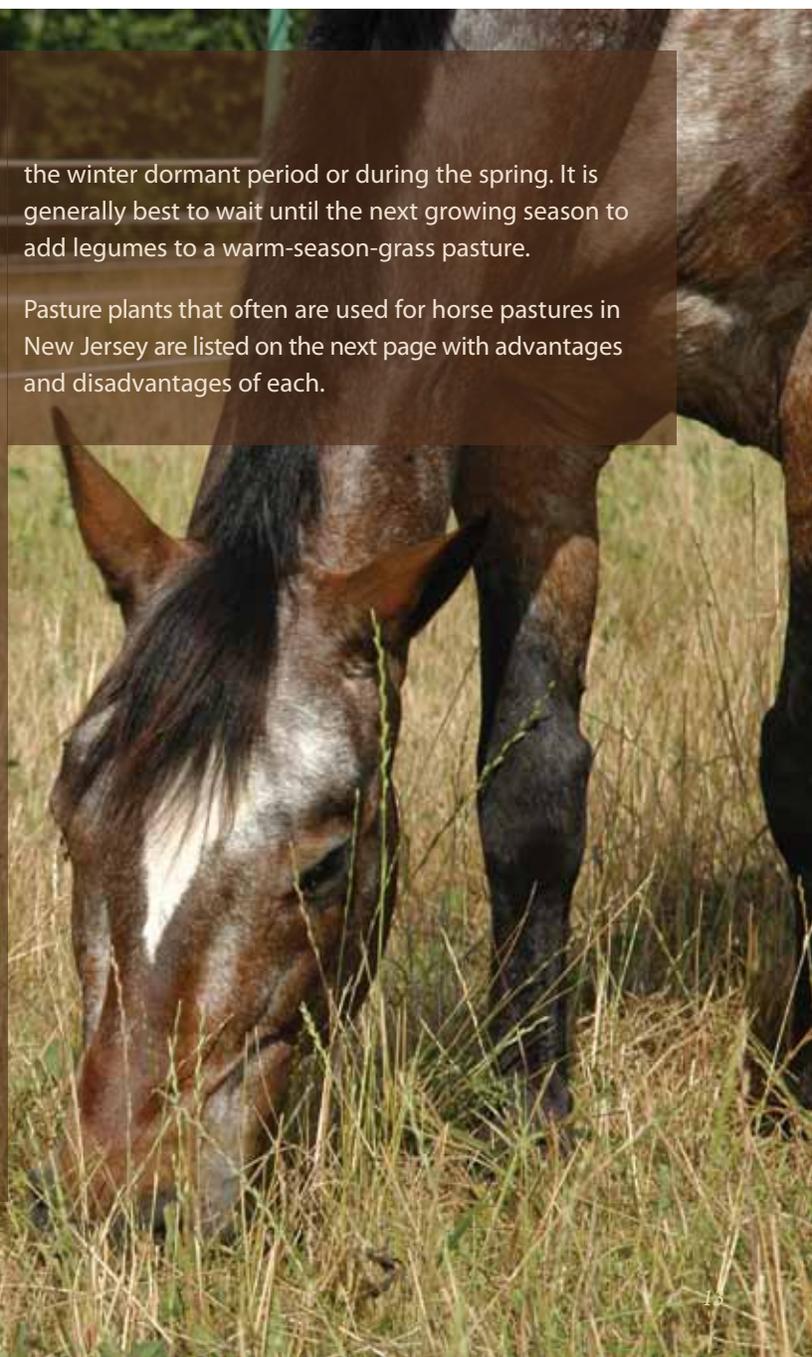
Horse pastures should have one or two grass species that grow well on a specific soil type, plus a legume that is well adapted to the soil. Adding one or two other grass or legume species to this mixture can extend the growing season because each species has a time of the year when it produces best. By using several species, owners could provide horses with adequate pasture for most of the year.

Keep in mind that horses are picky eaters, and will overgraze the grasses they like best while ignoring the other forages. Some horses also prefer grasses over legumes. However, legume forages are more nutritious than grass forages, and they enhance the nutrition of grasses because of their nitrogen-fixing capabilities. A well-managed rotational-grazing system encourages horses to utilize all of the forage species in a paddock.

When establishing a new pasture, plant cool-season grasses in the fall and legumes in the spring. If planted together in the fall, the rapidly growing legumes crowd out the grasses. Warm-season grasses can be planted during

the winter dormant period or during the spring. It is generally best to wait until the next growing season to add legumes to a warm-season-grass pasture.

Pasture plants that often are used for horse pastures in New Jersey are listed on the next page with advantages and disadvantages of each.



Soil Erosion

Soil erosion can be a serious problem on pastures or paddocks. Any sloping area that is not adequately protected with healthy vegetation is likely to produce sediment-laden runoff that has offsite impacts, especially in streams and lakes. Erosion can occur as sheet or rill soil movement, which is subtle, or in concentrated flow as gullies, which can become deep enough to risk animal injury. Fencelines that run up and down hill can be very susceptible to gully erosion due to the typical concentration of the animals along the fence, eliminating all vegetation.

Any gullied areas in pastures or paddocks must be filled and graded to eliminate the hazard. Pastures should be reseeded immediately after grading. Horses must be kept off of repaired and reseeded areas to allow the vegetation to establish.

In a pasture, maintain adequate vegetation for animal nutrition and soil protection. This is done through rotational grazing and forage overseeding. At times even seeding of annual grasses can be prudent if quick cover is needed before the desirable forage species can re-establish.

In a paddock or sacrifice area, vegetation is not practical, so erosion must be controlled with good stormwater management:

- Keep "clean water clean." Use grassed waterways, diversions, or subsurface drains to divert clean runoff around barns, manure storage areas, and paddocks.
- Install and maintain a system of properly sized roof gutters, downspouts, and drains to prevent roof water from becoming polluted by mixing with barnyard manure and sediment.
- Separate barnyards, paddocks, and manure storage areas from any waterway with filter strips of vegetation to trap sediments and absorb nutrients in runoff.



Soil erosion can be a serious problem on pastures or paddocks.

Paddocks as Sacrifice Areas

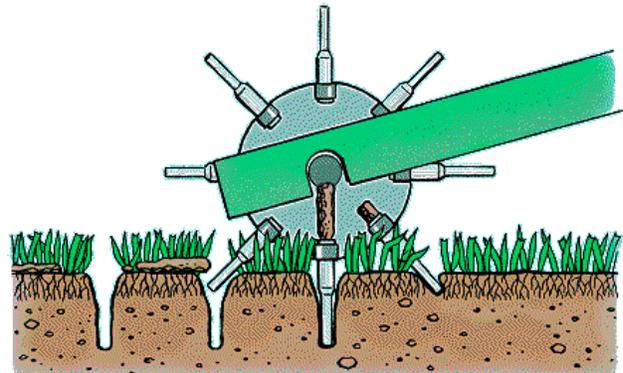
Use turnout paddocks as "sacrifice areas" to preserve pastures. This strategy reduces churning and compaction of wet soils, and overgrazing when pastures require rest. If possible, locate paddocks back from waterways; and avoid swales where overland flows can wash away bare soil or manure. Maintain a vegetated border around paddocks to help filter pollutants. Be sure paddocks provide horses with adequate exercise room.

Soil Compaction

Compaction of the soil surface can greatly reduce rainfall storage and increase runoff and erosion. A porous soil improves plant vigor by allowing the infiltration of water, air, and nutrients. Hoof impact and machinery operation on wetter fields compact soils and intensify loss of this porosity.

Soils that are higher in clay content are more susceptible to hoof compaction than sandier soils.

One of the methods commonly used to reduce soil compaction is to aerate. Aerators are available for purchase or rent and easily hook up to a tractor with a 3-point hitch. Core aerating, which pulls 3-4 inch cores of soil, is generally more beneficial than tine aeration, which cuts narrow 2-3 inch slots. The best time to aerate is in the spring or early summer when grasses are growing most actively. Aerating can be done as part of a fertilizing and reseeding process. Aerate when soils are not wet.



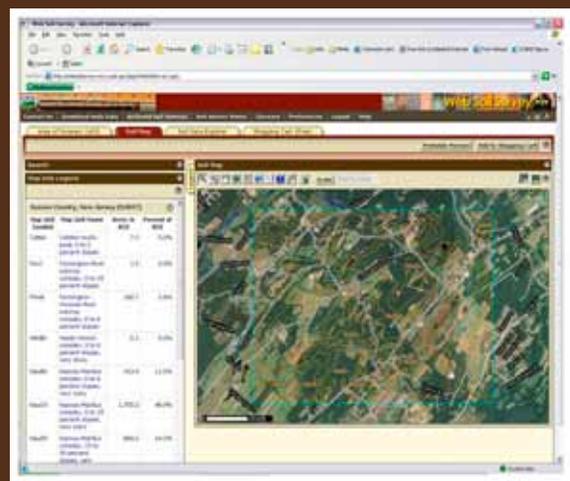
Core aerating pulls 3 to 4 inch cores of soil.

Image Source: Cornell University

A more involved way to improve infiltration on compacted animal areas is deep chiseling or subsoiling. This consists of the running of a shank 12-18 inches deep that penetrates and shatters the compacted layer. This can only be done in the summer, at the driest soil conditions. Followed with overseeding and dragging, the process can renovate the pasture. On steeper slopes, all tillage operations should be on the contour.

Web Soil Survey

Soil data and information produced by the National Cooperative Soil Survey are available on the Web Soil Survey, operated by the USDA, Natural Resources Conservation Service (NRCS). Soil maps and data for 20 of New Jersey's 21 counties can be accessed there. The site is updated and maintained online as the single authoritative source of soil survey information. <http://websoilsurvey.nrcs.usda.gov/>



Visit the NJ NRCS website soils page at <http://www.nj.nrcs.usda.gov/technical/soils/>

Manure Management

Storing manure allows farm managers to spread manure when it is beneficial for the land to receive manure based on plant fertilizer needs and weather conditions. Storing manure reduces the need to spread manure on a daily basis. Horse manure is low in moisture and is handled as a solid manure. Therefore, horse manure is stored predominately in a dry stack or composting facility. Manure storage systems are generally designed to store material no longer than 6 months, but most are designed to store it for less than 3 months.

Manure storage facilities should be in well-drained areas that are accessible to trucks, tractors and other removal equipment. Manure should not be stored in areas where runoff may enter streams or where flood waters might wash the manure away. Manure piles should be at least 150 feet from streams, ponds and wells. Establish and maintain grass buffer strips between water sources and manure piles. Cover manure piles to keep out rainwater.

Composting

Consider building a manure structure or composting bin. These structures protect stockpiled manure from runoff until the manure breaks down and can be used as fertilizer. There are many benefits to setting up a small composting facility. Composted manure makes an excellent, slow-release pasture and garden fertilizer, and is an excellent soil conditioner.

Composting produces a relatively dry product that is easily handled and reduces the volume of manure by 40-65 percent. Composting at proper temperatures kills fly eggs and larvae, pathogens, and weed seeds.

Virtually no viral diseases are transmitted between horses and humans through fecal material, but some bacteria and protozoan, (such as *E. coli* and *Giardia*) can be transmitted in this manner.

Therefore, handle manure carefully to prevent disease transmission.

A variety of bedding sources can be used effectively in correspondence with a farm's management plan. The type of bedding used will influence the efficiency of the storage system and affect the fertilizer value of manure. Straw tends to decompose faster than wood shavings and therefore, provides a quicker composted material. Manure compost with straw bedding will also utilize the nutrients quicker from the manure if spread on pastures and hay fields, where as compost from wood material will provide a slow release of nutrients. The farm's nutrient management plan should take into account how the bedding will influence the management of nutrients on the farm.

Composting Benefits

- Composted material contains organic matter which can be added to the soil to improve soil health and provide plant nutrients for growing crops and pastures.
- Composted material can be used to supplement or replace commercial fertilizers.
- If the manure is properly composted, the material can be sold as an additional product.
- The composted material can be used to reduce the carbon in the air and recycle the carbon back into the soil.



Dry stack manure storage structure

Pasture Management Guide for Horse Owners

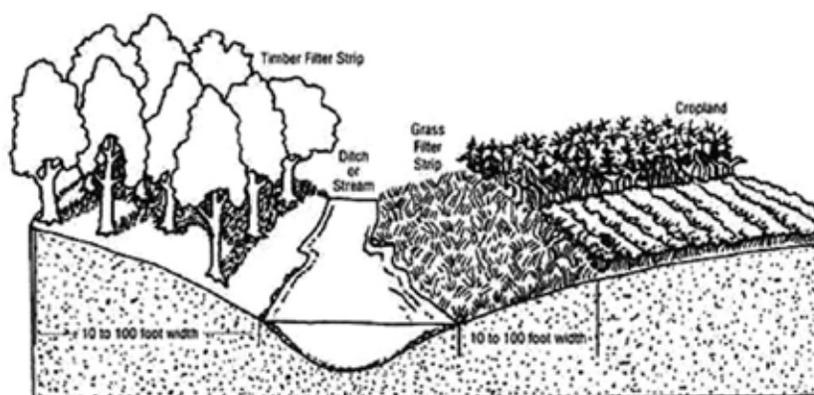
Vegetative Filter Strip

Vegetative filter strips are land areas of either planted or indigenous vegetation, situated between a potential pollutant-source area and a surface-water body that receives runoff (see figure below). The term 'buffer strip' is sometimes used interchangeably with filter strip, but filter strip is the preferred usage. Runoff may carry sediment and organic matter, and plant nutrients and pesticides that are either bound to the sediment or dissolved in the water. A properly designed and operating filter strip provides water-quality protection by reducing the amount of sediment, organic matter, and some nutrients and pesticides, in the runoff at the edge of the field, and before the runoff enters the surface-water body. Filter strips also provide localized erosion protection since the vegetation covers an area of soil that otherwise might have a high erosion potential.

Often constructed along stream, lake, pond or sinkhole boundaries, filter strips installed on pasture or cropland not only help remove pollutants from runoff, but also serve as habitat for wildlife, and provide an area for field turn rows and haymaking. Livestock should be fenced out of filter strips to maximize the pollutant filtering potential. Additionally, filter strips may provide increased safety by moving machinery operations away from steep stream and ditch banks.

Filter strips are an edge-of-the-field best management practice. They often are used in conjunction with other sound agricultural and land management practices, such as pasture management, soil testing, and proper nutrient and pest management. Because of their potential environmental benefits, filter strips are recommended by a number of state and federal agencies as both an urban and agricultural best management practice.

-Source: Ohio State University Extension



Riparian Buffers

Riparian buffers are another type of conservation buffer similar to vegetative filter strips. A riparian buffer is planted with permanent vegetation to intercept pollutants and protect the stream from adjacent land use. A riparian buffer is comprised of two to three zones. The first zone is a filter strip of native, perennial grasses immediately adjacent to the water body.

The second zone contains a combination of native trees and shrubs, in addition to ground cover vegetation to filter sediments and pollutants from surface water runoff. If necessary, the final zone consists of mature trees to provide shade and protect the buffer from potential disruption from adjacent land uses.

In addition to filtering sediment, nutrients, pesticides, and other materials from surface runoff, riparian buffers also provide habitat and wildlife corridors increasing biodiversity. They can also contribute to reducing soil erosion and stream bank stabilization. Varying the vegetation and installing a riparian buffer around farm ponds, can attract a variety of species and increase biodiversity. The increased vegetation can also deter nuisance wildlife, such as Canada Geese, as it limits their sight.

Pasture Plants

Legumes

SPECIES	ADVANTAGES	DISADVANTAGES
Alfalfa	highly nutritious high yielding high palatability	fertility requirements management inputs short lifespan
Bird's-foot Trefoil	productive with low fertility persists well	difficult to establish low seeding vigor lower palatability
Ladino Clover and White Clover	does well with close grazing palatable winter hardy	not drought tolerant lower yielding mold may cause slobbering
Red Clover	highly nutritious adapted to wider range of soils than alfalfa	lasts only 2-3 years doesn't tolerate close grazing mold may cause slobbering

Cool-Season Grasses

SPECIES	ADVANTAGES	DISADVANTAGES
Tall Fescue (endophyte free only)	long lived tolerates traffic and close grazing drought tolerant good yields endophyte-friendly varieties show promise	persistence problems with endophyte free palatability problems as plants mature
Timothy	easy to establish produces well in the spring grows under wide range of soil and climate conditions	not as productive as other cool-season grasses more open sodded, increasing potential for weeds not grazing tolerant potential for cereal rust mite
Orchard Grass	highly palatable good summer growth	not tolerant to close grazing bunch grass offers potential for weeds
Kentucky Bluegrass	highly palatable; horses prefer it over other grasses withstands close grazing well forms dense sod widely adapted	low yields poor drought tolerance
Perennial Ryegrass	very high palatability easy to establish	less persistence poor drought tolerance requires higher fertility
Smooth Bromegrass	very high palatability good drought tolerance	requires higher fertility low fall yields doesn't persist with close grazing



Warm-Season Grasses (Native)

SPECIES	ADVANTAGES (ALL SPECIES)	DISADVANTAGES (ALL SPECIES)
Big Bluestem Little Bluestem Indian Grass	provide good summer production require less fertility not invasive	difficult, expensive, & slow to establish will not tolerate close grazing can become coarse, stemmy, low quality if too mature

Other Forages That Can Be Used

COOL-SEASON ANNUALS

Wheat
Oats
Rye
Triticale
Annual Ryegrass

WARM-SEASON ANNUALS

Millet

Forage Species to Avoid

Alsike Clover
Arrowleaf Clover
Sweet Clover
Vetch
Endophyte-Infected Tall Fescue (for broodmares)
Sorghum
Sudan Grass
Sorghum/Sudan Hybrids
Johnson Grass
Goose Grass
Switchgrass¹

¹ Monocultures of switchgrass may cause photosensitivity and liver damage under certain conditions. It is recommended that switchgrass be avoided until further research is conducted.

Poisonous Plant Considerations

Most plants that are toxic to horses are broad-leaved. Horses — normally do not like broad-leaved weeds but will graze them if more desirable forage is limited. Having a few toxic plants available does not mean you have an acute problem. The list below contains some common potentially toxic plants. It is intended only to increase awareness of potential problems and stress the need for weed control.

Bitterweed	
Black Locust	St. John's Wort
Cocklebur	Water/Poison Hemlock
Horsetail	Wild parsley or carrot
Milkweed	Yarrow
Nightshade Family	Landscaping and garden plants:
Pigweed	castor bean, gladiolus,
Pokeweed	ivy, pea vines, boxwood,
Snakeroot	tomato, Japanese Yew* ²

² Japanese Yew is very toxic to horses.

For more on conservation practices that can benefit equine operations, consult the New Jersey Field Office Guide (eFOTG) .

<http://www.nrcs.usda.gov/technical/efotg/>



*For more information contact your local New Jersey NRCS office
or visit <http://www.nj.nrcs.usda.gov>*



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