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Agricultural Management Practices for Commercial Equine Operations

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Agricultural Management Practices for Commercial Equine Operations

INTRODUCTION

The equine industry is a very large and diverse component of New Jersey agriculture. The industry supports thousands of jobs, generates nearly $700 million in horse-related expenditures, and provides a variety of recreational opportunities for horse owners and the general public. Over 80,000 acres of land are used for equine-related purposes, providing many thousands of acres of agricultural open space.

The purpose of this document is to establish generally accepted Agricultural Management Practices (AMP) for the various equine-related activities that may be associated with the operation of a commercial farm. These activities include: managing pastures and manure, constructing fences and shelters, determining farm stocking rates, controlling dust, maintaining arenas and training tracks, and organizing horse shows and special events.

Throughout this AMP, a horse is defined as a 1,000 pound animal, which is equivalent to one animal unit.

SECTION I. FARM STOCKING RATES

Since horses do not require pasture grasses to meet their nutritional needs, higher farm stocking rates can be obtained if pastures are not used as the major factor in determining animal densities. The land size required to maintain a horse is not as critical an issue as the management and use of the animals. Appropriate equine stocking rates will vary with the management practices of the farm. At increased stocking rates, adopting good farm management practices becomes a higher priority. Manure management plans must be strictly adhered to as stocking rates increase. Higher animal densities can be attained if horses are confined to stalls or drylots for a large portion of the day. More specific information on animal waste management can be obtained in the manure management section of this AMP.

For the purpose of establishing guidelines for farm stocking rates, farms will be considered to fall into one of three management regimes:

- Farms which use pastures as an important component of nutrition and exercise
- Farms which use drylots for turnout and exercise rather than pastures
- Farms which use riding, driving, and training programs as a source of exercise with no regular turnout provided

Each regime allows for increased levels of animal densities and requires different management strategies as described below:

<u>Pasture Regime</u>

If pastures are used on the farm to provide a significant source of nutrition and exercise, animal densities that would maintain at least 70% vegetative cover in the pastures should be established.

The following recommendations can serve as guidelines for establishing stocking rates, based on restricting the number of horses and time allowed for turnout in order to maintain 70% or higher vegetative cover in the pastures:

- One horse can be maintained on one-half acre of pasture, if turnout time is limited to fewer than three hours per day.
- One horse can be maintained on one acre of pasture, if turnout time is limited to three to eight hours per day.
- One horse can be maintained on one and one-half acre of pasture, if turnout time is limited to eight to twelve hours per day.
- One horse can be maintained on two or more acres of pasture with unlimited turnout time.

The stocking rates listed above can be increased with elevated levels of management. Mowing, irrigating, fertilizing, overseeding, and rotating pastures can allow higher animal densities while still maintaining at least 70% vegetative cover.

Drylot Regime

Higher animal densities can be obtained on a farm if drylots are used for turnout. Drylots have little or no vegetation. The primary function of a drylot is exercise. If horses are maintained in drylots, care must be taken to segregate the horses in cases where individual horses or groups of horses are not compatible.

Drylots should be well-drained so the animals are not standing in mud. Drylots are frequently constructed with a stone base and covered with natural clay or crushed stone. Measures may need to be in place to control erosion of stone, soil, and manure into areas that will impact water quality. These measures may include diversions, filters, and buffer areas as described in the NRCS Field Office Technical Guide.

The following recommendations can serve as guidelines for establishing stocking rates and manure management practices for drylot turnout, where vegetation has been reduced to less than 70%:

- If the overall farm density is fewer than three horses per drylot acre and the drylot vegetation is maintained between 50% and 70%, then manure should be removed from deposition areas at least once a month. Manure may need to be removed more frequently during peak fly breeding periods, which occur when temperatures exceed 65 degrees, and if odor and runoff become an issue. The farm should comply with all nutrient management and manure storage guidelines as referenced by the NRCS Field Office Technical Guide.

- If the overall farm density is three or more horses per drylot acre, manure should be removed from deposition areas on a weekly basis. The farm should comply with all nutrient management and manure storage guidelines as referenced by the NRCS Field Office Technical Guide.

No Regular Turnout Regime

In some instances, commercial equine operations may choose not to turn horses out on a regular basis. Since movement is important to proper digestive function and overall horse health, horses that are kept primarily in stalls should be afforded the opportunity to exercise and/or be part of a riding, driving, or training program. Horses in intense training, such as show or race horses, and horses in lesson programs may not receive regular turnout. In these commercial agricultural farm settings, which are continuous and intensive, it is difficult to set restrictions on equine numbers. The farm should comply with all nutrient management and manure storage regulations as referenced by the NRCS Field Office Technical Guide.

SECTION II. PASTURE MANAGEMENT

Importance of Pastures and Hay

Due to differences in age, size, genetics, health, and use, horses vary greatly in the amount of feed needed to maintain body condition. Generally, horses will need to consume 1.5% to 3% of their body weight in feed per day. Although there are many ways of meeting a horse's nutritional requirements, it is recommended that a horse receive 70% to 100% of the feed as pasture and/or hay. Grain-based concentrates can be used as needed to compliment the forage in the diet.

Although pastures are not necessary in meeting a horse's forage needs, pastures offer many advantages. Grazing reduces the amount of hay that is necessary, helps distribute manure in the field, allows horses access to exercise that is necessary for proper function of the digestive system, provides opportunities for equine social interaction, and provides an aesthetically pleasing environment for rural and residential neighbors.

Pasture Stocking Rates

As a general rule, pasture quality can easily be maintained at stocking rates of two or more acres per horse with limited management. Higher stocking rates can be obtained by limiting the time that horses are allowed to graze and by rotating grazing pastures.

Stocking rates for pastures change as the seasons and weather conditions change. Cool season pasture grasses produce tremendous growth in spring and fall, and very little growth during hot, dry summers. Pastures that can support three 1,000-pound horses (three animal units) per acre in the spring when the pasture grasses are actively growing may only support one-half of a horse per acre in summer. Stocking rates depend on the yield potential of the forages, hours of turnout, and level of management (rest, rotation, mowing, fertilization, and weed control). Pasture use and turnout time should be varied to match pasture growth.

The following information should serve only as a guideline for maintaining and improving pastures. Appropriate pasture management strategies vary from farm to farm, and need to be determined on an individual basis.

Rotational Grazing

Resting pastures are very important in maintaining healthy plants. Horses tend to feed on grasses in the same area, and can eventually weaken and kill the plants. It is very beneficial to remove horses from the pasture when the short grass species (bluegrass and ryegrass) fall below 1-2 inches, and the tall grass species (timothy, orchardgrass, tall fescue, and brome) fall below 3 inches. Horses can be returned to the pasture when the short grass has recovered to 5-6 inches and the tall grass is about 7 inches in height. Removing horses from pastures allows the grass time to produce more leaf tissue and regenerate carbohydrate reserves in the roots. The length of time a pasture needs to rest depends on how fast the grasses are growing. The height of the grass itself will dictate the resting period.

Most farm managers do not have enough land to practice intensive rotational grazing. However, just splitting an existing paddock and rotating the horses between the two new pastures can create

dramatic improvement in productivity. Regularly restricting horses to dry lots or stalls and limiting turnout time on pastures is another available option. Pastures can be adequately maintained at stocking rates of 1–2 acres per horse, if the pastures are rotated and/or grazing time is restricted.

Soil Testing and Pasture Nutrients

Properly applying fertilizers to pastures is a critical component of pasture management. Nitrogen, phosphorous, potassium and pH levels can vary greatly. The only way to accurately determine the soil nutrient needs of a pasture is to conduct a soil test. Soil test kits and directions on collecting soil samples for analysis are available at all local Rutgers Cooperative Extension offices. The analysis report will document soil pH and fertility levels, and will provide lime and fertilizer recommendations. Applying fertilizer and lime based on soil test recommendations will result in maximum forage production, and provides economic and environmental benefits in preventing the application of unnecessary soil nutrients. Nitrogen (N) promotes the maximum growth of cool season grasses in pastures. An adequate supply of nitrogen is associated with vigorous vegetative growth and a plant's dark green color. Reduced plant growth and a pale green or yellow color characterize nitrogen deficiency. Adequate phosphorous (P) insures greater crop quality, greater stem strength, increased root growth, and earlier crop maturity. Potassium (K) deficiency is characterized by reduced plant growth, poor stalk strength, reduced disease resistance, and reduced winter hardiness.

Mowing

Mowing is a major component of pasture management. Mowing helps remove many weeds and prevents them from going to seed. It is also very important in maintaining a grass stand that is uniform in maturity. Horses tend to eat the shortest grass, because it is tender and higher in protein. Mowing helps promote a higher quality pasture. Shorter grass species, such as bluegrass and rye grass, should be mowed at 2-3 inches; taller grass species should be mowed at 4-5 inches.

Pasture Species

Most pasture seed mixes contain a large variety of species. It is expected that several of the species in the mix will thrive in a particular pasture. Pastures should be seeded with a pasture mix and not seed mixtures designed for lawn. Many cultivars of turf fescue and rye grasses contain endophytes, which have been bred into the species to enhance survival. The endophytes produce a toxin which is detrimental to grazing animals. When selecting a seed mixture, species should be chosen that match the particular site, farm goals, and management practices. **Bluegrass** will grow only in cool weather and goes dormant during the summer. However, it can survive heavy grazing pressure and trampling, and can form a thick sod. Although no grasses grow well in the heat of summer, **tall fescue** grows better during warm weather than other cool season grasses. It may not be as palatable, but provides some summer forage if conditions are right. Only endophyte-free varieties of fescue should be seeded for pasture use. **Timothy, brome,** and **orchardgrass** are tall grasses that are ideal for pastures. **Orchardgrass**, in particular, responds well to nitrogen applications. Although **timothy** and **brome** are high quality forages, they will not tolerate heavy grazing, and should not be seeded if grazing pressure is high. **Reed canarygrass** grows well under wet conditions, but matures quickly and is not palatable when mature. **Clover** can be used in small quantities, if desired. **Clover** is beneficial,

since it adds nitrogen to the soil. However, clover can harbor a fungus which causes horses to salivate when grazing on it.

The chart below is a summary of cool season grass characteristics:

Legume	Seedling Vigor	Tolerance to Soil Limitations			Winter Hardiness	Tolerance to Frequent Grazing
		Droughty	Wet	Low pH		
Kentucky bluegrass	M	L/M	M	M	H	H
Orchardgrass	H	M	M	M	M	M
Perennial ryegrass	H	L	M	M	L	M
Reed canarygrass	L	H	H	H	H	M
Smooth bromegrass	H	H	M	M	H	L
Tall fescue	H	M	M	H	M	M
Timothy	M	L	L	M	H	L

H=High, M=Medium, L=Low

Weed Management

Although some weeds are high in protein and quite nutritious, horses rarely eat weeds as a steady part of their diet. By far, the best defense against weeds is maintaining a healthy stand of grasses that can compete with weed seedlings. Maintain healthy pasture grasses by:

- Rotating and resting pastures so that the grasses can recover from close grazing
- Mowing to encourage grass tillering and reduce existing weeds
- Fertilizing and liming to promote proper soil conditions and nutrients for the growth of pasture grasses
- Controlling weeds with herbicides when necessary

If weeds are a persistent problem, herbicides may be applied to remove them. When using herbicides, it is important to follow all label directions and restrictions. If weeds heavily infest pastures, new weeds will often fill in the spaces that are created when herbicides are used. If weed pressure is high, it is important to correct the conditions that promote weed growth in addition to eliminating weeds with a herbicide.

Before using a herbicide, the types of weeds that are present should be determined. Perennial weeds, such as thistle, buttercup, and pokeweed go dormant in the winter but will regrow from the same plant in spring. These plants can be effectively controlled in spring, but are best controlled in late summer. Many pasture weeds, such as lambsquarters and pigweed, are summer annuals. They only live one year and produce seeds in summer which germinate in the following spring. The best time to control these weeds is in late spring when the weeds are small. There is no reason to use herbicides on summer annual weeds in late summer or fall, because they will die after the first hard frost. Winter annuals, such as chickweed, mustard, and pepperweed also live one year, but germinate from seed in the fall. They will be seen in pastures in late summer and will persist through the winter. Winter annual weeds flower very early in spring and then drop their seeds and die. By summer, they no longer exist in pastures – but the seeds will germinate again in early fall. Winter annuals can be controlled in late summer or early spring.

It is also important to determine just what species of weeds are present, since some herbicides are more effective on certain weeds than others. There are many good reference books on weeds. Rutgers Cooperative Extension agents can also provide assistance with weed identification and herbicide recommendations.

Renovation

Pasture renovation can be utilized to completely establish a new pasture, thicken stands that are sparse, or introduce desirable grass species to an existing pasture. When renovating a pasture, soil fertility should be at optimum levels, the grass should be mowed or grazed fairly short, and the weeds should be controlled.

The best way to overseed a pasture is with a no-till drill. Many farmers have drills and may be willing to overseed a pasture. Equipment companies are now manufacturing no-till drills especially designed for pasture use. No-till seeding of pasture grasses is a very effective method of creating new pastures or overseeding existing pastures.

Broadcasting seed on the soil surface is usually unsuccessful when trying to enhance the pasture. There is not enough soil to seed contact for the germinating seeds to become established. If this is the only option available, every attempt should be made to loosen the soil surface. A disk or harrow can be used for this purpose. Seed should be broadcast and a harrow should be used to drag the seed into bare spots. After broadcasting, the soil should be packed with a roller or cultipacker to enhance soil to seed contact. Since it can take four weeks for some grass seeds to germinate, the best seeding time is early spring (April through May) or late summer (late August through early September).

Frost seeding is a common method of introducing desirable species into an existing pasture. The technique involves spreading the seeds onto the pasture in late winter when the ground is frozen at night and thaws during the day. Freezing and thawing creates openings (honey combs) in the soil surface in which the seeds fall. If adequate soil to seed contact exists, germination occurs when the soil warms. Frost seeding is an effective way to introduce clover into existing pastures. Grasses are difficult to establish using this method.

Poisonous Plants and Trees in Pastures

There are literally hundreds of plants and trees in North America that can be poisonous to livestock. Fortunately, most poisonous plants taste terrible and are rarely consumed. The most common reason for livestock poisoning is undernourishment. In early spring, late fall, or during periods of extended dry weather, animals may eat plants that they normally would not consume if other forage was available. Occasionally, animals may eat poisonous plants accidentally or when craving variation in their diet. Feeding hay when pasture grasses are sparse may reduce the chance of accidental poisoning.

SECTION III. FENCING

The Basics of Effective Fencing

An important, accepted agricultural management practice is the construction and maintenance of fences around horse pastures and exercise areas.

The act of fencing horses is contrary to their nature. Horses have evolved as free-ranging herbivores whose response to fearful situations is to flee. It should be noted that, in a state of panic, horses can run through or jump over many types of fences. Horses are very social by nature and frequently challenge fences to get to animals in adjacent pastures, to escape from horses in their existing pastures, or to seek more attractive pastures.

When constructing a fence, a horse's ability to see the fence should be considered. The safety and effectiveness of a fence depend upon good visibility.

Types of Fences

There are many types of acceptable fences, and each type has its own advantages and disadvantages. Wood fencing has been a standard on horse farms for many years and has the advantage of being safe and highly visible. Diamond mesh fence is another very safe fence, and is a good option for farms that raise foals. High tensile fence is also frequently used on horse operations, and can be safe when properly installed. New fencing materials are appearing on the market every year. Many of these new materials are plastic and may require less maintenance. Electric fencing can also be a very effective fence for horses. Many new tape and braid-type electric fencing materials exist that increase electric fence visibility. To improve horse safety, the electric wire on electric fences can be made more visible by hanging streamers from the wire to alert new horses of the fence boundaries. Older horses will quickly familiarize themselves with the fence location, and will avoid contact with the fence as long as the fence is electrified. Metal posts that are traditionally used with electric wire can create some injury risks, which can be minimized by using plastic caps for the posts. Electric fences should be posted with appropriate warning signs so that people on the farm and neighboring properties are aware of the electric fence and its potential hazards.

Barbed wire fencing is not acceptable for horses due to its potential for serious injury. Horses fight harder than other livestock if trapped in a fence. Barbed wire can cause significant damage to a struggling horse.

Construction of Fences

Fences should be located such that the horses are unable to cause damage to neighboring properties. Although it is an acceptable practice to construct fencing on a property line, consideration should be given to setting new fencing back from the property line. Setting back the fencing can serve several purposes. It may prevent horses from causing damage to trees and shrubs on neighboring properties, and facilitate mowing and fence repair. It may also prevent neighbors from having access to the horses without trespassing on the farm owner's property.

SECTION IV. SHELTER

Supplying shelter is an important component of good equine management.

1. All horses must have access to adequate shelter during weather extremes.

2. In determining the type of shelter provided, one must consider the horse's daily maintenance requirements, age, breed/type, physiologic condition, size, production and activity level, stage of development, and environmental conditions.

3. Shelters may be natural, including trees, land windbreaks, and overhangs, or weather barriers that are constructed.

4. Constructed shelters must be of sufficient size to provide adequate space for each horse to lie down and move its head freely, be structurally sound, have a safe interior surface, be free of injurious matter, have ventilation for adequate air exchange, and be maintained in adequate repair.

5. Floor surfaces must be kept dry enough to prevent horses from standing or lying on wet surfaces for prolonged periods.

6. Bedding must be provided in stalls with cement floors, kept reasonably clean, and periodically changed.

In addition, when utilizing natural barriers as shelter for horses, consideration should be given to the level of protection that is provided in adverse weather conditions. A single tree in an exposed drylot would not offer sufficient protection during periods of severe winter weather. However, a thick grove of trees could provide adequate shelter for horses that are well-fed.

Open sheds should face away from the prevailing winds. If run-in sheds are utilized as shelter, it is important to make sure that all horses have access to the shelter. Horses are highly social animals by nature, and herds possess a strong horse hierarchy. Horses lower on the social scale may be prevented from using a shelter, or be trapped in small enclosures by more dominant individuals. If herd size is fairly large, it may be necessary to increase shelter size or add additional paddocks and shelters. As a general rule, when constructing a run-in shelter, approximately 90 to 150 square feet should be allowed for each horse. This size may be reduced for smaller and/or younger animals or in instances when herd mates are very compatible.

It is generally recommended that barns and sheds should be set back at least fifty feet from property lines and one hundred feet from neighboring houses.

SECTION V. MANURE MANAGEMENT

1. Manure should be managed as described in Rutgers Cooperative Extension fact sheets on horse manure management. The fact sheets summarize state and federal regulations and guidelines, and provide information on horse manure management, composting, and nutrient management.

2. The Natural Resources Conservation Service Field Office Technical Guide should be used when adopting agricultural management practices in manure management and storage.

3. All horse farms that are required to be permitted as Concentrated Animal Feeding Operations (CAFO) must meet all permitting requirements as administered by the New Jersey Department of Environmental Protection to qualify for right-to-farm protection.

4. To minimize environmental risk, all commercial horse farms should develop a nutrient management plan that is based on the NRCS Field Office Technical Guide and the manure management section of the Equine AMP.

Nutrient Management on Horse Farms

When managed properly, nutrients from manure should be seen as part of a larger cycle occurring on the farm. Nutrients enter the farm as feed or fertilizer, are excreted as manure, and are subsequently spread on the soil, taken up by plants, or transported off the farm as waste.

Soil can store nutrients, provided the amount of manure applied to the soil is not excessive. When the land application of manure is not managed properly, heavy rains can cause nutrient runoff or leaching to groundwater. When land is over-manured and the ability of crops to take up nutrients is exceeded, these nutrients will build up in the soil and pose a hazard to ground or surface water.

Stall Waste Production and Characteristics

A 1,000-pound horse will defecate from four to thirteen times each day and produce 35 to 50 pounds of manure (feces and urine) daily, or approximately nine tons per year. A 1,000-pound horse will produce, on the average, 37 pounds of feces and 2.4 gallons of urine daily, which totals about 50 pounds of raw waste per day in feces and urine. A horse kept in a stall may require fifteen to twenty pounds of bedding per day. Bedding products include: wood by-product (shavings or chips), straw, hay, or paper. Bedding must be provided in stalls with cement floors, kept reasonably clean, and changed periodically. Manure plus bedding will have a volume of between two and three cubic feet per day.

Soiled bedding can equal almost twice the volume of the manure. It will vary based on management practices. A stalled horse will require the removal of 60 to 70 pounds of waste per day. This results in between 12 and 13 tons of waste per stall per year with 9 tons being manure, 3.5 tons urine, and the remainder bedding. The density of horse manure is about 63 lb/ft^3. Annual stall waste from one horse will fill a 12 ft. x 12 ft. stall about 6 ft. deep. This leads to a steady stream of manure to handle.

Table 1. Daily manure and waste production from a typical 1,000 lb. horse			
Manure Daily	31 lbs. feces	2.4 gallons urine	51 lbs. manure (0.8 ft^3)
Stall Waste Daily	15-20 lbs. bedding (1.6 ft^3)	51 lbs. manure (0.8 ft^3)	60-70 lbs. stall waste/day (2.4 ft^3)

(Table adapted from Pennsylvania State University, 2000, *Horse Stable Manure Management)*

Table 2. Density of bedding materials	
a. Loose bedding	**Density (lbs./ft^3)**
Straw	2.5
Wood shavings	9
Sawdust	12
Sand	105
Non-legume hay	4
Alfalfa	4
b. Baled bedding	
Straw	5
Wood shavings	20
Non-legume hay	7
Alfalfa	8
c. Chopped bedding	
Straw	7
Newspaper	14
Non-legume hay	6
Alfalfa	6

Source: *Manure Characteristics. MidWest Plan Service. MWPS-18, Section 1.*

Table 3. Absorption of bedding materials	
Material	**(lbs. water absorbed per lbs. bedding)**
Wood	
Tanning bark	4.0
Fine bark	2.5
Pine	
Chips	3.0
Sawdust	2.5
Shavings	2.0
Needles	1.0
Hardwood chips	1.5
Shredded newspaper	1.6
Corn	
Shredded stover	2.5
Ground cobs	2.1
Straw	
Oats	2.5
Wheat	2.2
Hay, chopped mature	3.0

Although straw, wood shavings, and bulk and pelleted sawdust are the most popular bedding materials, the other sources listed in Tables 2 and 3 may also be used. Pine shavings or sawdust will result in less disposable material than straw, but cannot be disposed of with mushroom producers. Wood shavings, sawdust, and straw are relatively absorbent. Many horse producers, particularly owners of racing or performance horses, prefer shavings over straw because they are less dusty and may result in less respiratory irritation. Shavings produced from black cherry and black walnut should be avoided. Even very small amounts of black walnut in bedding products can cause laminitis and founder in horses.

Bedding should be absorbent, dust-free, easy to handle, comfortable to the horses, readily available, easily disposed of, unpalatable, and affordable. The more absorbent a bedding is, the less that will have to be used. All beddings should be stored in well-ventilated areas to remain as dry as possible prior to use.

Manure Storage

The capability to store manure reduces or eliminates the need to spread manure on a daily basis. The primary reason to store manure is to allow farm managers to land spread manure at a time

compatible with the climate and cropping systems on the land receiving manure. Saturated, wet, frozen, or snow-covered soil conditions are not suitable for land application of manure. The nutrients in horse manure are best utilized by the crop when spread before or during the growing season of the crop.

Many horse farms do not have extensive fields on which to spread manure. Manure storage facilities also allow the farm manager to store the manure until it can be removed and used by other farm managers or landscapers.

Locating Manure Storage Areas and Facilities

Manure associated with horse production includes stall litter (feces, urine, bedding) and manure collected from exercise lots. Manure storage areas may simply be well-drained areas where the material is stacked or stockpiled for subsequent spreading operations. Manure should be stored in areas accessible to trucks, tractors, and other manure removal equipment. Manure storage areas should not be located near waterways or wetlands. Rainfall or floodwater could carry manure into these water bodies. A well-drained manure storage area will prevent the pooling of polluted runoff that could serve as a breeding area for mosquitoes and flies. Manure should not be stored in paddocks or exercise lots, since lots can become infected with parasites. The presence of trees around the facility will help to dissipate odors and keep storage out of sight.

If no well-drained, level areas exist for manure storage, or if run-off presents a water quality issue, permanent manure storage facilities may be required as described in the NRCS Field Office Technical Guide. Permanent manure storage facilities should have an impervious bottom, and may have solid walls to confine the solids and a “push” wall for stacking and loading of the solids. Contaminated runoff or leachate from manure storage facilities must be managed as described in the NRCS Field Office Technical Guide.

Composting may also be an integral part of a solid manure storage system. The agricultural management practice for on-farm composting operations on commercial equine farms is specified in N.J.A.C. 2:76-2A-8.

Table 4. Minimum distances between manure storage/composting areas and other activities

Sensitive Area	Minimum separation distance (feet)
Property line	50
Residence or place of business	200
Private well or other potable water source	100
Wetlands or surface (streams, pond, lakes)	100
Subsurface drainage pipe	25
Water table (seasonal high)	3
Bedrock	3

(Adapted from *On-Farm Composting Handbook*, NRAES 54, 1999)

In New Jersey, set-back distances between manure storage areas and facilities and streams can range from 25-300 feet. Manure storage areas and facilities should be sited based on the New Jersey Department of Environmental Protection Water Quality Standards. When there are questions, the NRCS Field Office Technical Guide should be consulted.

Sizing of Manure Storage Facilities

The size of the manure storage area is dictated by manure removal practices specific to that farm. If the manure is spread on crops on the farm, the storage area should be large enough to hold manure when fields are inaccessible. If manure is removed for off-farm use, the size of the manure storage area will be determined by the storage space requirements between removal periods. The NRCS Field Office Technical Guide should be consulted for more specific information about sizing storage facilities.

Management of Stored Manure

When properly managed, flies, odors, dust, and particulate matter can be controlled. Manure should be kept as dry as possible, since wet manure provides a breeding ground for flies and will lead to the presence of fly maggots. A roofed storage area may be advisable to keep manure as dry as possible when stored for long periods of time. It is possible to reduce fly larvae using predatory wasps and other parasites for control. It is important to avoid overusing pesticides to control flies.

Spreading Manure

A tractor and a spreader are needed to ensure proper field application of stored manure. Solid manure can be removed from storage using front-end loaders, scrapers, or other handling equipment. The size of the equipment influences the time required to load, haul, and spread manure. Pull-type spreaders are traditionally used, although truck-mounted spreaders are sometimes used on larger farms.

Manure should not be spread where and when there is any risk for surface water pollution. The local soil and water conservation district or Natural Resources Conservation Service office can help identify these special protection areas on farmland and bordering properties.

Stored manure should be applied to the soil in a thin layer to speed drying and discourage fly breeding. Spreading improperly composted manure on horse pastures should be avoided because of the risk of infecting pastures with internal parasites. Manure should be spread equal to agronomic rates (rates equal to or less than plants will use in a year). When stockpiled manure is spread on crop fields, the application may not meet the total needs of the crop. Each source of horse manure will vary, especially when different bedding sources are used. Typically, a ton of horse manure will contain eleven pounds of nitrogen, two pounds of phosphorous, and eight pounds of potassium. The standard values given in Table 5 can help to determine the number of acres needed to apply the horse manure. Refer to Rutgers Cooperative Extension Agronomy Guidelines or the Penn State Agronomy Guide to determine proper application rates. If a more accurate measure of nutrient content that accounts for additional hay and bedding is needed, contact your local Cooperative Extension office to get a list of laboratories that will do manure analysis.

Table 5. Nutrient Content of Horse Manure

Manure (tons/year)	Percent Solids	Nitrogen (N) (lb./year)	Phosphorous Phosphate (P_2O_5) (lb./year)	Potash (K_2O) (lb./year)
9.1	22.0	102	40	84

Spring is the preferred time to apply manure. Forage or hay crops generally provide the greatest flexibility in planning land application operations. Cool season grasses can generally utilize manure nutrients from early spring to late fall, and application equipment generally does not adversely affect the crop regardless of its growth stage. However, spreading manure on wet soils should be discouraged as it leads to soil compaction.

When spread, not all nutrients in manure are available for plant use. The amount of nitrogen available is a function of the percentage of nitrogen in the manure, whether or not it is incorporated in the soil, and the rate of organic matter decomposition of the manure. Nitrogen availability will range from 35% of the total nitrogen when manure is spread on the soil surface to 60% when incorporated into the soil within a day. Availabilities of phosphorus from phosphate (P_2O_5) and potassium from potash (K_2O) are commonly set at 80% and 90% of totals, respectively.

Manure Disposal

If manure is not spread on the owned acreage, it will have to be spread on rented acreage or disposed of otherwise. Some producers may contract with a hauler to remove the manure. The hauler will take the manure to a centralized composting facility or spread the manure on farmland. Dumpsters may be used to store manure until it is removed. Dumpsters are placed near the stable and are replaced with an empty dumpster when full. The dumpster should be placed on a concrete pad or other impervious surface that allows for the collection of leachate. When there is inadequate land for spreading and the circumstances do not lend to composting, the use of dumpsters is an option. Farmers may also sell or give their manure away, composted or non-composted, for off-farm use.

Composting

Composting is a recommended management practice for horse manure management. Composting of horse manure, when done properly, will result in the destruction of internal parasites. The composted product can then be spread on pastures. Composting is managed, accelerated decomposition of organic materials. Microorganisms, including bacteria, actinomycetes, and fungi, break down the organic materials at elevated temperatures. It requires proper levels of moisture and air, and the appropriate feedstock mixture to ensure proper composting. Turning the composting material helps to ensure that all parts of the manure are at elevated temperatures for certain time periods. The final product will be freer of odors than horse manure and may have value as a soil amendment or fertilizer. Siting issues need to be addressed, and are similar as discussed under manure storage.

More information about composting can be obtained from Rutgers Cooperative Extension and/or the NRCS. The agricultural management practice for on-farm composting operation on commercial equine farms is specified in N.J.A.C. 2:76-2A-8.

Concentrated Animal Feeding Operations (CAFO)

A key aspect of the Federal Clean Water Act is to minimize public health risks and environmental impacts of runoff from animal feeding operations (AFOs). When not managed properly, runoff from animal waste can pose risks to public health and water quality by depositing ammonia, nutrients, pathogens and sediment in the environment. A horse farm is designated as a Concentrated Animal Feeding Operation (CAFO) if it contains the equivalent of 500 horses or 500 animal units (a 1,000 lb. horse is the equivalent of one animal unit). However, any farm that discharges animal waste into a body of water could also be designated as a CAFO by the New Jersey Department of Environmental Protection, which enforces the Federal Clean Water Act. A horse farm could also be designated as a CAFO if manure is stored on a stream bank or wetland, horses are allowed to walk in streams or waterways, or storm water contamination of a stream occurs.

Farms designated as CAFOs must go through a permit process that may require eliminating the discharge of animal wastes into any body of water. This process may also require construction of retention structures for animal wastes, periodic reporting of water quality monitoring results, proper land application of wastes, adoption of best management practices, and pollution prevention plans. CAFO permit holders are given legal protection through the Federal Clean Water Act in the case of overflows resulting from catastrophic events (including tornadoes, hurricanes, and 25-year/24-hour storms, and chronic rainfall — a series of wet weather conditions that prevent waste removal from properly maintained waste retention structures). The New Jersey Department of Environmental Protection issues CAFO permits.

The CAFO permit process focuses on cleaning up point sources of pollution (such as pollution from a particular pipe or discharge). The permit should ensure that best management practices are being followed, that a nutrient management plan that accounts for storage, spreading and disposal is in place, and that appropriate pollution measures are taken. Retention or storage structures, storm water diversion and management, grassed filter systems, and stream bank fencing should be utilized, as necessary.

Stream Bank Fencing

Fencing stream banks is required in order to limit the access horses have to rivers, streams, and waterways. Horse manure may cause elevated levels of nutrients and/or microbes in water. This will be of particular concern in water bodies that are classified as impaired.

The Natural Resource Conservation Service has guidelines that can be used for determining how and where stream bank fences should be implemented. The NRCS Field Office Technical Guide or the New Jersey Department of Agriculture publication, *On-Farm Strategies to Protect Water Quality,* provides technical information on stream bank fencing.

SECTION VI. RIDING AND TRAINING AREAS

Location and Size

Riding and training areas are an important addition to any commercial equine operation. Providing training and lessons can contribute significantly to the economic viability of the farm. There is no standard size for all riding and training areas. The size generally depends on the available space on the farm, type of riding or training offered, number of horses in the area at one time, and the amount of money available for construction.

Riding and training areas include, but are not limited to, indoor and outdoor arenas, race tracks and training tracks, and open fields.

Riding and training areas should be located in a well-drained area of the farm. Arenas are generally composed of a compacted sub base consisting of materials on the site. A base of four to six inches of compacted crushed stone may be placed on the surface before footing materials are added. The area should be sloped so that water flows across the area and not through the base.

Types of Footing Materials

Footing types vary greatly based on the intended use of the arena. There is no universal footing formula. The materials used will vary, based on availability, environmental conditions, and budgetary constraints. It is also essential to remember that the footing materials will only be as stable as the prepared base that they are placed upon.

Examples of footing materials include, but are not limited to:

- Grass, which is common but difficult to establish and maintain. With excessive traffic, bare spots, mud holes and dust tracks tend to become commonplace.

- Dirt, which is usually obtained from the existing material on the site and can be composed of sand, loam, silt and clay. Depending on the clay content, water absorption can be high. Clay footing materials require significant maintenance.

- Sand, which can be composed of a wide range of mineral-based materials. Unwashed sands comprised of rounded or fine particles (river or beach sand) compact easily when wet and roll when dry. “Clean-up or Fill” sand has a high content of silt, clay and loam particles that break down faster under use, generating dust. Washed concrete sand and mason’s sand are medium-coarse grade sands with angular components that stand up better to wear.

- Stone dust or screening, which can be used alone as a base, is frequently mixed with sand. Pure stone dust will compact and become almost as hard as concrete if not regularly dragged or harrowed and allowed to dry out. With proper maintenance, this material provides excellent footing.

Maintenance

Riding and training areas should be conditioned on a regular basis. Regularly harrowing the arena will rotate footing material within the surface layer, mixing material that is starting to break down with more solid material, reducing compaction and helping to distribute moisture. The frequency of dragging/harrowing an arena will depend on the type of footing material, moisture content and the intensity of use. Regular conditioning will:

1. Keep footing at an even depth throughout the arena
2. Prevent worn/compacted areas
3. Keep footing on the surface loose and soft
4. Help maintain the arena base

It may be necessary to replace footing materials periodically. The older the footing material or the higher its rate of use, the greater the potential for developing dust problems. Replacing footing materials can be cost-prohibitive for many farms, and other solutions may be necessary.

Soil modification, the addition of another type of material to the existing material, may be used to lessen compaction, improve moisture retention, and increase resiliency. There are a number of rubber and wood products available on the market that can be added to arenas to help reduce the amount of particle abrasion. However, footing modification is only beneficial when very little degradation of the existing material has started. Soil modification products should be examined carefully. Many materials are too light in texture and will tend to break down quickly, and wash or blow away. Heavier rubber products such as crumb rubber (1/8 to 3/8 inch rubber particles produced from shredded tires) tend to work best and are the most stable. Adding too thick a layer of rubber particles can cause the surface to sheer, creating unsafe riding conditions.

Riding and training areas should be watered and/or have dust control agents applied as needed. Manure should be picked up regularly to prevent it from compromising the footing.

If horses are turned loose in the arena for exercise and fed hay, uneaten hay should be removed to eliminate breeding sites for flies and prevent incorporation into the surface footing.

Addition of manure or dirty bedding (shavings or straw) to arenas is not recommended. It retains too much moisture, causing slippery conditions and increasing dust potential. Condensed areas of organic matter impede proper drainage, and may harbor potentially harmful spores and bacteria. It is also the perfect breeding ground for flies.

The outside of an arena should be maintained as well as the arena surface. A build-up of weeds, un-mowed grass, or other debris can impede the flow of rainwater out of the arena, and provides an excellent habitat for insects and rodents.

Dust Control

One of the most frequent complaints from neighbors of horse facilities is that of dust pollution. It is vital to develop and implement a dust control program that will result in a healthier environment for those at the facility and the surrounding area. Excessive dust is unhealthy for horses, riders, farm workers, visitors, and the neighbors. Dust consists of dry, solid particulate matter, less than 0.0625 millimeters (1/400 inch) in size. Most dust is mineral material that comes from bare soil arenas and vehicle roadways/lots and dry, decaying organic materials such as shavings, wood chips, and manure.

Dust is dispersed through the wind. As the particles dry out, the wind repeatedly picks up, carries and deposits the fine particles. However, the heavier particles initially picked up by the wind tend to settle more rapidly.

The sources of dust on horse farms include driveways, parking areas, dry lots, training tracks, riding arenas, exercise lots, and round pens. The more traffic (number of horses using the arena) and the larger the arena size, the more severe the problem will be. Round pens and small exercise areas are prone to a high incidence of severe dust problems due to excessive use in a restricted area, resulting in rapid material breakdown.

The potential for generating an excessive amount of dust from these high-use sites is a result of using footing materials that:

- Contain a high percent of fine and very fine sand, plus silt and clay
- Break down easily, e.g. wood shavings/chips, or substances that have a mineral composition that is softer and less tolerant to abrasion
- Have low water/moisture retention properties or are water resistant

Dust Control Products

Dust control products are available, but need to be used judiciously to prevent buildup and possible contamination of water sources. These additives work by increasing moisture retention and causing footing materials to bind together. Extra care needs to be taken to monitor horses exercised in areas treated with dust control additives, as some of these products may cause dermatological reactions, especially on the legs of sensitive horses. A common practice of thoroughly washing the horse's legs after use should be incorporated into the horse's daily routine. The list below contains some, but not all, of the acceptable dust control products that may be used on commercial horse farms. The negative as well as the positive features are provided for each product.

- Calcium chloride is generally considered to be a non-toxic product, but may have a toxic effect on some plants, and is corrosive on equipment and metal buildings. Arena areas/driveways and parking lots with a high concentration of calcium chloride may become slick when wet. Care should be taken to prevent contact with skin and eyes. Horses' legs should be washed after use in areas treated with this product.

- Magnesium chloride has the same attributes as calcium chloride, but is slightly less corrosive.
- Lignosulfanates, a by-product of the wood-pulp industry, can have a toxic effect on some species of fish, and has been known to cause skin and eye irritations. Footing surfaces may become hard and slick.
- Petroleum-based products may cause irritation/injury to skin and eyes.
- Polymers, originally designed to aid in water retention for the turf industry, are made of starch and retain moisture in footing materials. The product is applied as dry crystals, then turns into a gel which can become very slick. In cold climates the gel will turn into hard, frozen balls.
- Surfactants and enzymes are generally considered to be non-toxic, but may be irritating to the eyes and have a drying effect on the skin.
- Other oil products, such as soybean, coconut, palm and corn oil have been developed to aid in dust control and are environmentally friendly. Many of these oils need to be reapplied frequently, and cost becomes a limiting factor. Results vary with the type of footing.
- Water is the most commonly used measure for dust control, and is frequently the most economical and effective means of managing dust.

Waste oil was at one time considered to be an effective way to control dust. Time and research have shown that waste oil may contain carcinogenic substances. It is also a threat to waterways and the environment because of its heavy metal content, and is now regulated by the EPA. Applying waste oil as a dust control product is no longer acceptable.

Water as a Dust Control Agent

Water is probably the most frequently used and effective dust control and bonding agent in indoor and outdoor arenas. The frequency of watering will depend on weather conditions, the type of footing, and the amount of use the arena is receiving. A minimum of two inches of water penetration is necessary to be effective.

There are numerous ways to implement an effective watering system. Sprinkler systems with a 30–50% overlap are effective in assuring that water is applied evenly to the entire surface. Sprinklers can be installed at ground level or on raised pipes around the perimeter. This type of system can be costly depending on size and is equally as costly to maintain. Sprinkler systems are only as effective as the maintenance they receive to stay optimally functional. Other methods of applying water include rolling, retracting irrigation units or systems mounted on trucks or trailers. Although time-intensive, hand held hoses are an effective means of applying water to an arena.

Ideally, riding and training areas and driveways should be watered in the evening. In the evening, arena use and traffic is at a minimum allowing a deeper absorption of water through the footing materials. It is also more efficient and economical, since less water is lost due to wind and evaporation. Water may need to be applied at other times as well, if dust becomes a problem.

SECTION VII. TRADITIONAL EQUINE ACTIVITIES AND SPECIAL EVENTS

In order to enhance profitability, activities such as training, boarding and providing lessons are an integral component of most commercial equine operations. In addition, ancillary activities such as conducting horse shows, clinics, summer camps, and other special events may contribute to the economic viability of the farm. All ancillary activities conducted on commercial equine operations must be in compliance with municipal standards.

Maintaining horses and horse businesses successfully in a densely populated area has become an on-going challenge. Horse facilities in an urban/suburban setting are in the public eye every minute. Sights, sounds, and smells that barn managers take for granted may cause conflict or disconcert among non-horse neighbors. Respecting the rights of adjacent property owners and following good management practices will help to lessen the possibility of offending neighbors.

Speed limits should be posted and enforced on all access drives into and around the facility to lessen dust problems. These limits should also apply to farm machinery such as tractors and utility vehicles. If possible, locate access driveways away from property lines or close proximity to neighboring houses. This may not be economically feasible with existing operations. Driveways providing access to public roads and used for trailer traffic should be designed with a long line of sight, both for drivers exiting and entering the facility, and those passing by.

Farm managers should require that clientele be courteous to neighbors and respect their privacy. Loud noise should be kept to a minimum. As a part of good management, arena lights, bright exterior barn lights and parking lot lights should be turned off when not needed. As a general rule, most daily lessons and training activities requiring outdoor lights should end by 11:00 p.m. Shows, clinics, and other special events may necessitate longer hours of operation. Outdoor lights should not be directed towards neighboring homes or living spaces such as patios, decks or pools. For safety concerns, it is an acceptable practice to use low-wattage lights around barns, driveways, and other necessary outdoor areas from dusk to dawn.

As an aid to dust and noise control, evergreen trees can be planted around property borders or high-use areas. This will also help block light encroachment during nighttime arena use.

Organizing a horse show, clinic, open house, or other special activity on a commercial horse farm requires a great deal of planning and organization in order to ensure a safe and effective event. The event should be conducted in a business-like manner with planning that begins nine months to a year in advance of the event. All special events should comply with municipal standards.

Safety for participants, horses, and spectators is a priority. Horse show rings should be large enough to safely accommodate class size, and should be level, uniform and contain safe footing material. The ring may be fenced with board fencing or other suitable material and should be in good repair. Water should be available to water the ring and for exhibitor use.

Health requirements for animals, including proof of a negative Coggins test, should be clearly outlined in show catalogs and entry blanks, and strictly enforced.

Safety precautions and emergency management planning should receive high priority in organizing a horse show or special event. The management committee should be sure that a plan is in place to deal with emergency situations that could arise involving spectators, exhibitors, or horses. Emergency phone numbers should be posted at the secretary's stands.

Provisions for exhibitor and spectator parking need to be well planned. Safe ingress and egress to the farm is of paramount importance. Horse traffic patterns between trailers and schooling and show arenas should be arranged to minimize the interaction of horses and spectators.

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