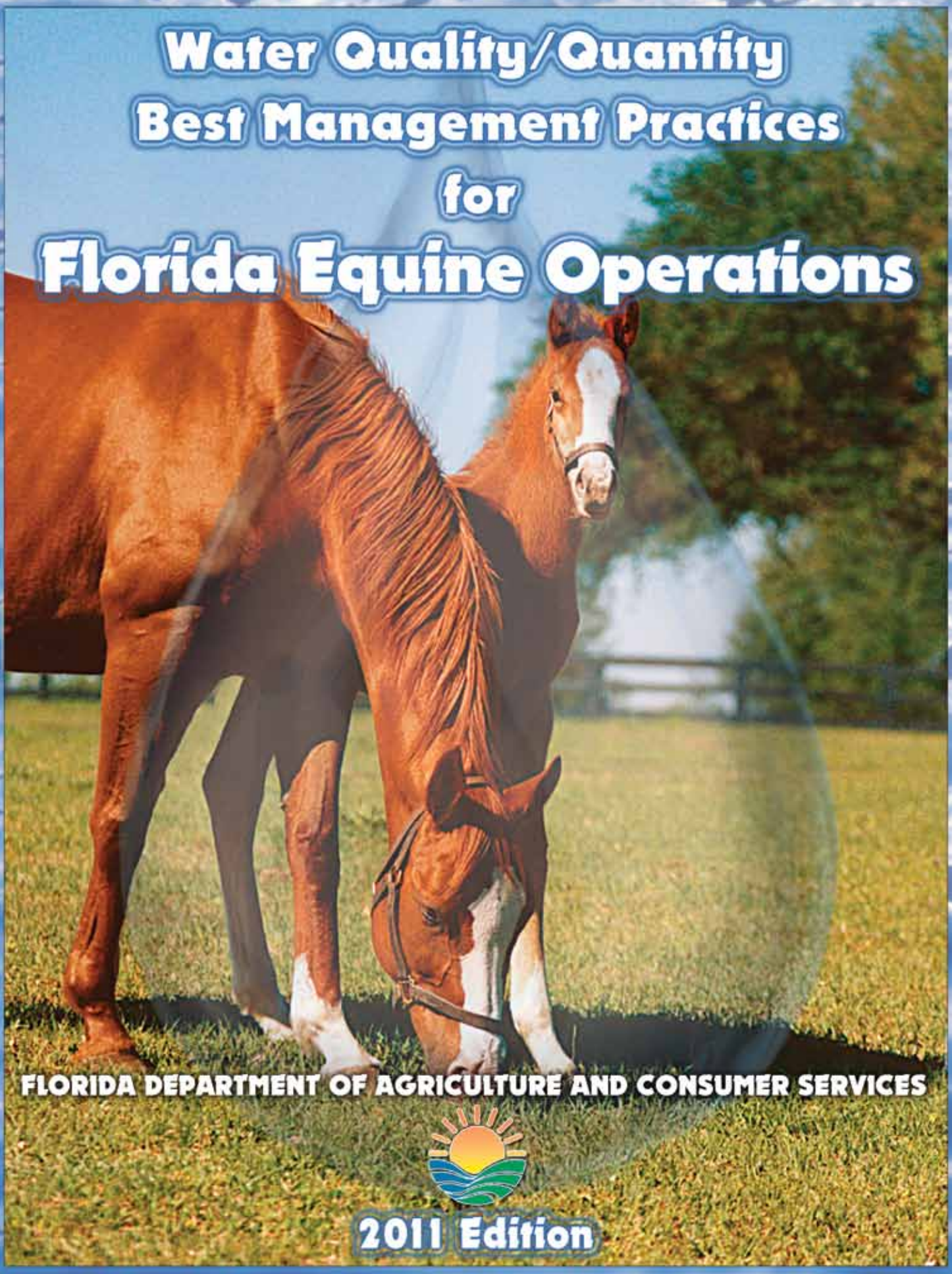
Water Quality/Quantity Best Management Practices for Florida Equine Operations



FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

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Commissioner Adam H. Putnam

COMMENTS BY COMMISSIONER ADAM H. PUTNAM

Dear Agricultural Producers:

This manual, *Water Quality/Quantity Best Management Practices for Florida Equine Operations*, reflects the hard work of representatives of the industry; federal, state, and local government; and other stakeholders. In general, agricultural lands maintain valuable water recharge areas and preserve open spaces. The BMPs in this manual address water quality and quantity impacts from production activities and help maintain the environmental advantages of keeping the land in agriculture.

While best management practices have been in place for many years in our state, their role in environmental protection was formally established in 1999 with the passage of the Florida Watershed Restoration Act. This legislation provides the framework for implementing Florida's Total Maximum Daily Load program, which sets water quality targets for impaired waters. It also identifies best management practices implementation as the means for agriculture to help meet those targets.

As Florida's population continues to increase, there are more impacts to and competition for Florida's limited water resources. All Floridians must take part in conserving and protecting these resources. This manual represents the industry's commitment to do just that.

As a native Floridian whose family has long been involved in agriculture, I want to thank all who participated with the Department in the development of this important manual. With the active support and participation of so many dedicated people, I am optimistic about the future of Florida's agricultural industry. I trust that you will join me in supporting this valuable water resource protection effort.

Sincerely,

Adam H. Putnam
Commissioner of Agriculture

ACKNOWLEDGEMENTS

The following is a list of individuals who participated in the development of this manual. Each of these individuals and their organizations made important contributions to the process, and their work is sincerely appreciated.

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PREFACE

The Equine Industry in Florida

Florida's equine industry is very diverse, consisting of multiple breeds and use categories. Florida is home to almost all breeds of horses, led by Thoroughbreds, Warmbloods, Quarter Horses, and Arabians. Categories of equine operations include breeding, training horses for racetracks, horse shows, hunter/jumper operations, rodeos, polo, and pleasure-riding. The highest density of equine operations in the state is in Marion County.

According to the American Horse Council's 2005 *The Economic Impact of the Horse Industry on the United States*, Florida is home to more than 500,000 horses year round and has the third-largest equine population in the United States. That is an increase of 200,000 since the last major study was conducted in 1998.

Human Population

According to the U.S. Census Bureau 2010 estimate, more than 18.8 million people live in Florida, which makes it the fourth most populated state in the nation. Florida's Office of Economic and Demographic Research estimates that by 2030 Florida will be home to about 24 million residents. Rapid population growth brings many issues to our attention. Where will people live in the future? How will our cities adapt? What will happen to rural areas? Will our new neighbors understand the dynamics of agriculture and equine farms and facilities, and what about limited natural resources, such as water?

Addressing Water Quality Impacts

Elevated levels of phosphorus, nitrogen, sediment, bacteria, and oxygen-demanding organic material all contribute to water quality degradation. As an equine owner or manager, your facility management practices determine your impact on Florida's water resources.

How will we manage equine facilities to minimize negative impacts on water quality? The practices outlined in this manual are designed to protect Florida's water resources and allow you to comply with state water quality standards. Use this manual to improve practices at your equine facility. Implementing the BMPs in this manual will demonstrate the equestrian industry's commitment to water resources protection, thereby minimizing regulatory intervention. This manual is a living document, to be updated as new technologies and new practices are developed.

As an industry, we must take advantage of the opportunity to implement water quality practices, such as the BMPs outlined in this document. Good management techniques beautify our properties and reduce odors, flies, and parasites. This also helps to improve our image with non-equine owning neighbors. A clean, green, equine facility invites admiration and increases property values. When you implement the BMPs in this manual, you help demonstrate the effectiveness of using non-regulatory programs to protect water resources.

INTRODUCTION

Operations Intended to use this Manual

This manual is adopted by the Florida Department of Agriculture and Consumer Services (FDACS), and is designed for use by commercial agricultural equine operations. Therefore:

- FDACS efforts will be focused on enrolling agricultural equine operations conducted as a business, rather than on non-commercial horse owners.
- The Florida Department of Environmental Protection (FDEP) is developing a set of BMPs for use by non-commercial horse owners. This list will be made available through FDEP, FDACS, and the University of Florida Institute of Food and Agricultural Sciences (UF-IFAS). In the meantime, you may contact the FDEP Nonpoint Source Management Section (see **Appendix 8**) to ask questions or provide input on the development of these BMPs.

Also, note that commercial non-agricultural equine operations, such as racetracks (pari-mutuel operations) and large horse shows, are regulated by the FDEP Industrial Wastewater Section.

Note: If your farm/facility is considered a Concentrated Animal Feeding Operation (CAFO), or an Animal Feeding Operation (AFO) you may be subject to federal and/or state permitting requirements. If so, federal National Pollutant Discharge Elimination System regulations pursuant to 40 CFR, Part 122, and/or state regulations pursuant to 62-670, F.A.C., may apply. See http://www.dep.state.fl.us/water/wastewater/iw/afo.htm or call (850)245-8589 if you need help determining whether your facility requires a permit.

Things to Keep in Mind as You Use This Manual

- Words that appear in ***bolded red italics*** are defined in the glossary.
- Specific record-keeping requirements are noted using a pencil icon: 

You can access this manual electronically at www.floridaagwaterpolicy.com.

Best Management Practices Defined

Best Management Practices are individual practices or combinations of practices that, based on research, field-testing, and expert review, are determined to be the most effective and practicable means for improving water quality. BMPs are typically implemented in combination to prevent, reduce, or treat pollutant discharges. BMPs must be based on sound science, be technically feasible, and be economically viable for landowners.

BMPs and Water Quality

Studies conducted by the Environmental Protection Agency (EPA) indicate that nonpoint sources (both urban and agricultural) are the nation's greatest contributors to water pollution. Much of the contribution is due to stormwater carrying pollutants (which may include manure and fertilizer) into lakes, rivers, wetlands, estuaries, and ground water. It is good stewardship and makes good sense for horse owners to prevent or minimize these impacts by using BMPs. In fact, the Florida Legislature has established BMP implementation as the non-regulatory means for agricultural nonpoint sources to comply with state water quality standards. When you implement BMPs you are also confirming the Legislature's support for this approach.

Under the Federal Clean Water Act and Florida law, FDEP must identify impaired surface waters and establish total maximum daily loads (TMDLs) for pollutants entering these waters. A TMDL establishes the maximum amount of a pollutant that can be discharged to a waterbody and still meet state water quality standards. Some pollutants for which TMDLs have been set include: total phosphorus, total nitrogen, total suspended solids, and coliform bacteria.

FDEP may develop and adopt Basin Management Action Plans (BMAPs), which contain the activities that affected interests will undertake to reduce point and nonpoint source pollutant loadings. In ***watersheds*** with adopted BMAPs, and in some other areas designated by statute, agricultural producers either must implement FDACS-adopted BMPs or conduct water quality monitoring prescribed by FDEP or the water management district.

Florida already has adopted a significant number of TMDLs, and many more waterbodies are listed for TMDL development. This list encompasses lakes, rivers, streams, springs, and estuarine systems. More information on listed waterbodies and adopted TMDLs is available at http://www.dep.state.fl.us/water/tmdl/index.htm. To see a map of BMAP areas, go to http://www.dep.state.fl.us/water/watersheds/

bmap.htm. If you need help figuring out whether you are in a BMAP area, call (850) 617-1727, or e-mail AgBMPHelp@freshfromflorida.com.

Benefits of Implementing BMPs

Before FDACS adopts BMPs, the FDEP reviews them and determines whether they will be effective in addressing water quality impacts from agricultural operations. Benefits to enrolling in and implementing FDACS BMPs include:

- A presumption of compliance with state water quality standards for the pollutants addressed by the BMPs.
- Release from the provisions of s. 376.307(5), F.S., (fines for damages) for pollutants addressed by the BMPs.
- Technical assistance with BMP implementation.
- Eligibility for cost-share for certain BMPs (as available).
- The Florida Right to Farm Act generally prohibits local governments from regulating an agricultural activity that is addressed through rule-adopted BMPs when farmers implement them.
- Producers who implement FDACS-adopted BMPs might qualify for exemptions from water management district surface water permitting, and/or satisfy other permitting requirements.
- Some BMPs increase production efficiency and reduce costs.
- BMP participation demonstrates agriculture's commitment to water resource protection, and maintains support for this approach to meeting water quality and conservation goals.

Implementation of BMPs does not excuse agricultural operations from complying with applicable permitting or other regulatory requirements.

Permit Exemptions

Some agricultural activities, especially those that alter on-site hydrology, may require an Environmental Resource Permit (ERP) or other surface water permit, for example, the construction of a stormwater management system (e.g., retention or detention pond). Check with your water management district before beginning construction of any stormwater management system to see whether a permit is needed, or whether the following exemptions apply:

- Under subsection 373.406(2), F.S., any person engaged in the occupation of agriculture may alter the topography of any tract of land for purposes consistent with the practice of agriculture. However, these activities may not be for the sole or predominant purpose of diverting or impeding surface waters, or adversely impacting wetlands. Agricultural activities that meet these criteria may be exempt from an ERP, as FDACS has the authority to make this binding determination whenever a dispute arises.
- Under 373.406(9), F.S., environmental restoration activities on agricultural lands that have minimal or insignificant impacts to water resources may also be exempt from an ERP, upon written request by the producer and written notification from FDEP or the water management district that the proposed activity qualifies for the exemption.

Even if an exemption applies, producers within a watershed with an adopted BMAP that addresses agricultural impacts either must implement BMPs or conduct water-quality monitoring.

Local Government Regulation

In general, nonresidential farm buildings are exempt from the Florida Building Code and associated county building codes, in accordance with sections 604.50 and 553.73, Florida Statutes. However, permits may still be required for construction or improvement of certain farm buildings, so it is important to check with your county building and permitting office before beginning construction.

The Florida Right to Farm Act (section 823.14, F.S.) provides that, with certain exceptions, a farm that has been in operation for one year or more and was not a nuisance at the time of its established date of operation is not a public or private nuisance if the farm conforms to generally accepted agricultural and management practices. In addition, the Act provides that a local government may not adopt any ordinance, regulation, rule, or policy to limit an activity of a bona fide farm operation (with an agricultural land classification under s. 193.461, F.S.) if the activity is regulated through implemented BMPs adopted by FDEP, FDACS, or a water management district. Not all activities conducted on a farm are addressed by adopted BMPs.

POTENTIAL WATER QUALITY IMPACTS ASSOCIATED WITH EQUINE OPERATIONS

Florida's grazing lands provide significant benefits to society and the environment. Grazing lands release oxygen to the atmosphere, help to significantly cool surrounding surface temperatures, naturally filter pollutants from runoff water, reduce soil erosion, replenish our water supply, and provide aesthetic and recreational value. However, improperly managed runoff may adversely affect the quality of our lakes, streams, and other surface waters. In addition, pollutants may also leach with infiltrated water through the soil into ground water. These concerns are especially pertinent to high-density equine operations.

Nonpoint source pollution from livestock is affected by the stocking rate, length of grazing period, the season of use, concentrated manure deposition sites and proximity of livestock to the nearest watercourse. Animals grazing on native pastures generally do not increase the nutrient levels in an area as long as sufficient space is provided for each animal. Intense grazing on pastures that are fertilized, along with the use of supplemental feed, can increase the amount of nutrients, sediments, and/or coliform bacteria moving offsite and entering surface waters. This can elevate nutrient levels, adversely affecting water quality and aquatic plants and animals.

Impervious areas on the farm can be useful, and in some cases are necessary, but they should be minimized as much as possible. Impervious areas can increase and channelize the runoff (flow) from the farm, which can lead to greater erosion rates. This problem can be compounded downstream, as high flows often cause undercutting and slumping along stream banks, resulting in increased stream sedimentation. Because of these potential impacts, the creation of impervious areas on the farm should be limited to roofing, flooring, and waste storage/composting areas. Check with your water management district before creating any new impervious areas on your property, since this may be a regulated activity.

Nutrients

Excess nitrogen and phosphorus are the most common sources of water quality impairments in Florida. These nutrients can enter surface waters through stormwater runoff, or can be introduced directly into the water from animal waste if livestock are allowed to loaf in ***wetlands*** or waterbodies. High nutrient levels in surface waters may result in excessive plant growth. Nutrients can also leach through soils into ground water.

The nitrogen form most abundant in natural waters is nitrate, which is an oxidized form of nitrogen that can originate from both organic (e.g., animal wastes) or inorganic (e.g., fertilizer) sources. Due to its high mobility, nitrate can also leach into ground water. Ammonium is a reduced form of nitrogen that commonly originates from organic sources and either volatilizes or converts to nitrate in soil under aerobic conditions. On equine operations, sources of ammonium include urine, decomposing manure, feed, and other organic matter.

Phosphorus is one of the key elements necessary for growth of plants and animals. In terms of freshwater ecology, it tends to be the limiting nutrient for growth. Unlike nitrogen, phosphorus is more effectively retained in the soil. It enters waterbodies attached to particulate matter via sediment transport or it can exist in various chemical forms in water. In some soils, phosphorus is prone to leaching into ground water.

High levels of nutrients in surface waters can result in abnormal plant growth, including algae. Algae are essential to aquatic systems; as a vital part of the food chain, algae provide the nutrition necessary to support aquatic animal life. Certain types of algae also provide habitat for aquatic organisms. However, excess algal production can cause many problems in a waterbody. The presence of algal blooms, noxious weeds, and too many floating aquatic plants can block sunlight necessary for photosynthesis by submerged aquatic plants. The mass die off and decomposition of these materials lowers the available dissolved oxygen, which can lead to fish kills.

Blue-green algae (***Cyanobacteria***) can become so abundant that they will cause a scum layer to form on the surface, shading the sunlight-dependent life below and disturbing the food chain. Untreated surface water (any water not obtained through a public water system) with increased Cyanobacteria poses a health risk. Livestock and pet deaths have been attributed to consumption of water with an abundance of Cyanobacteria. It produces a toxin known to cause liver and nervous-system effects in

humans. Potential risks from recreational contact include skin, respiratory, and mucous membrane irritation.

Sedimentation

Sedimentation occurs when eroded soils are washed into surface waters, creating a buildup of solids on the bottom and suspended solids (turbidity) in the water column. Sedimentation impacts most commonly associated with livestock grazing come from the erosion of denuded areas and streambanks. Care must be used to prevent livestock-induced erosion and the movement of eroded soils to waterbodies.

Sediments can fill in water bodies, clog waterways and affect water clarity. These effects combine to reduce fish, shellfish, and plant populations, and decrease the overall productivity of lakes, streams, estuaries, and coastal waters. Decreased penetration by sunlight can affect the feeding and breeding behaviors of fish, and the sediments themselves can clog gills and cause irritation to the mucous membranes covering the eyes and scales. As the sediment settles, fish eggs can be buried. Recreational use may also decline because of reduced fish populations, less visibility, and reduced desirability of downstream swimming areas.

Deposited sediment also reduces the flow capacity of ditches, streams, rivers, and navigation channels, which can result in more frequent maintenance dredging or flooding. Nutrients and other contaminants can attach to sediments, which can contribute to downstream water quality impairments. Chemicals, such as some pesticides, phosphorus, and ammonium, may be transported in sediment. Over time, these chemicals may be released from the sediment and become suspended in the water column.

Fecal Coliforms

Fecal coliforms are another cause of water quality degradation. The decomposition of fecal and other organic matter in water can lead to increased biological oxygen demand and lower dissolved oxygen levels. Fecal coliforms also can pose a health hazard to animals and humans. Health impacts to humans and livestock include dysentery, gastrointestinal infections, ear infections, and skin infections, especially in open wounds.

The risk of fecal coliform contamination by animals that are allowed direct access to a waterbody is high. Runoff from ***high-intensity areas*** and areas receiving uncomposted manure or biosolids as fertilizer may also lead to elevated fecal coliform numbers in nearby waterbodies. The likelihood of contamination is increased if these materials are applied in excess of agronomic rates or under wet weather conditions.

KEYS TO POLLUTION PREVENTION

It is the responsibility of Florida equine operations to protect water quality by implementing good land management practices. Implementing the BMPs in this manual helps demonstrate the industry's commitment to protecting water resources and the effectiveness of using incentive-based programs in lieu of the traditional regulatory approach. This also helps us improve our image with our neighbors.

Key information and water quality considerations are summarized below; however, these are provided as an overview. The BMPs for selection appear later in this manual.

Understand Water Quality Issues

Water quality relates to water's chemical, biological, and physical characteristics. Elevated levels of phosphorus, nitrogen, sediment, bacteria, and oxygen-demanding organic material all contribute to the degradation of water quality.

The potential for discharges from equine operations to cause water quality problems varies, depending on soil type, slope, drainage features, stocking rate, nutrient management, and activities in or near wetlands, surface waters, or ***karst*** features. Your equine facility management practices determine your operation's impact on water quality. Some common equine facility issues/problems include:

- Dumping manure in or near ***sinkholes***, wetlands, lakes, streams, or canals, which introduces contaminants into ground water and surface water.
- Piling manure in areas subject to stormwater runoff, which could cause contamination of surface water.
- Allowing pastures to become denuded of vegetation (overgrazed), which leads to soil erosion and sedimentation.
- Having areas where horses congregate (around a feeding/water trough, or near a gate) can create a concentrated source of bacteria and organic material, which may end up in surface or ground water and lead to a decrease in oxygen levels.
- Application of manure or fertilizer to pastures without regard to soil test results.

Manage Nutrient Sources Properly

You can minimize pollutants that leave your property by controlling the materials you use on your farm. Nutrient-related pollutants can come from excess use or careless handling of fertilizers, manure, ***biosolids***, and/or feedstock materials containing nitrogen and phosphorus. Managing nutrients carefully is critical to protecting water quality.

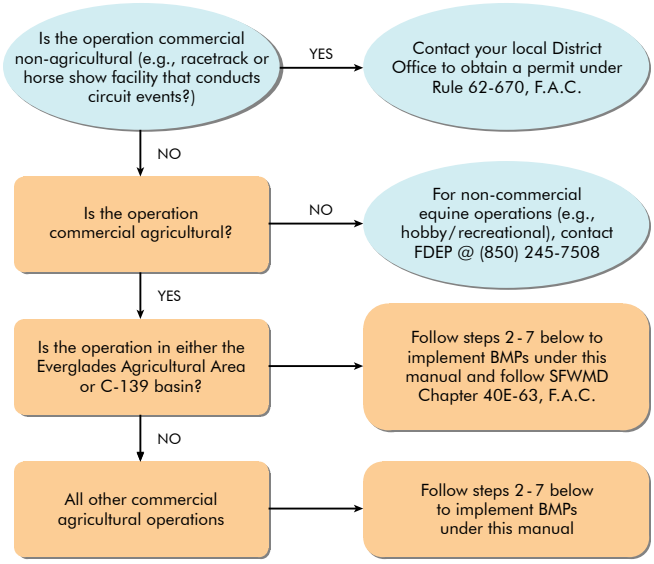
Minimize the Potential for Erosion Impacts

Over-grazing, land clearing, culvert installation, road building, ditch and canal maintenance, pasture renovation activities, and cultivating short-term crops can expose soil and lead to erosion that can increase pollutant loading. It is important to take appropriate erosion control measures during these activities.

User's Guide to BMP Enrollment and Implementation

The steps below will help you select which BMPs to implement to reduce or avoid impacts to water quality coming from your facility.

1. **Choose the Pathway Applicable to You**: In the flowchart below, identify the circumstances that best apply to you.*



*__Note:__ *In areas where FDEP has adopted a Basin Management Action Plan, agricultural operations must either implement applicable FDACS-adopted BMPs or monitor their water quality. Contact FDACS field office staff for more information (See **Appendix 8** for contact information).*

2. **Request On-farm Technical Assistance, as Needed**: FDACS, UF-IFAS BMP Implementation Teams, Soil and Water Conservation Districts (SWCDs), USDA-NRCS and/or UF-IFAS Extension staff are available to assist with the mechanics of BMP identification, selection, and implementation. Contact information for these entities is in **Appendix 8** of this manual.

3. **Conduct an Inventory**: The selection of BMPs begins with a basic inventory of the farm's natural features, which will help you determine how the operation of your farm may affect environmentally sensitive areas. When developing the inventory, sketch your farm/facility, noting buildings, high-intensity areas, well locations and other water sources, ditches, retention/detention areas, flow control structures, etc. Identify areas of particular concern that need to be addressed. These may include streams, wetlands, springs, sinkholes, and ponded or other poorly drained areas, among others. You can use the inventory as a starting point to select the BMPs applicable to your farm. To help you conduct your inventory effectively, the following tools are available:

- ✓ Aerial photographs (http://earth.google.com/index.html, or other providers)
- ✓ USDA-NRCS soil survey maps (http://websoilsurvey.nrcs.usda.gov/app/)
- ✓ USGS topographic maps (http://topomaps.usgs.gov)
- ✓ National Wetlands Inventory (http://www.fws.gov/wetlands/data/index.html)
- ✓ Historic rainfall records (http://www.ncdc.noaa.gov/oa/ncdc.html)

Numerous factors influence the movement of nutrients or other contaminants to areas where they can cause undesirable impacts to the environment, humans, or animals. The types of soils and the topography of the site may lead to significant surface runoff during a typical storm event and/or rapid seepage of rainfall into the ground water. Knowing the physical characteristics of your area will help you select the most appropriate BMPs to minimize or avoid environmental impacts.

The assessment questions below will help you determine the environmental sensitivity of your site. The results of the assessment will suggest BMPs to address specific concerns, which should be identified on the BMP checklist along with the other BMPs in the manual that are applicable to your operation.

A. Assessment of Surface Water Concerns

☐ **Y** ☐ **N** When digging fence posts or other holes on your property, would you describe the soil within the top 6 inches as compacted (i.e., penetration with a shovel at the soil surface is difficult)?

☐ **Y** ☐ **N** When digging fence posts or other holes on your property, would you describe the texture of the soil within the top 24 inches as clay or sandy clay (i.e., Soil sticks to the shovel, or penetration with a shovel is difficult through all soil layers, and is almost impossible when the soil is dry.)

❑ **Y** ❑ **N** During an average afternoon thunderstorm, does rainfall begin to runoff immediately or do puddles form in your pasture and remain more than 30 minutes after a rain event?

❑ **Y** ❑ **N** When inspecting your pasture and area of operation, is there any evidence of surface water runoff? (Runoff indicators may be in the form of gullies where soils are exposed and eroded, or sediment and plant debris that have been relocated and concentrated on the surface).

❑ **Y** ❑ **N** During the wet season (June to October) is the water table on your property within a few feet of the soil surface or occasionally saturated at the soil surface?

❑ **Y** ❑ **N** Does your area of operation have slopes where the elevation changes 5 feet or more over a horizontal distance of 100 feet or less?

❑ **Y** ❑ **N** Do you have a lake, stream, river, spring, or wetland adjacent to or flowing through your property?

❑ **Y** ❑ **N** Do you have a drainage ditch or swale that directs runoff from your property to a water body?

Evaluation of Surface Water Responses:

If you answered "YES" to any of the questions above, it is possible that during a storm event, stormwater runoff carrying contaminants is discharging to surface water. Therefore, practices under BMP groups 4.2, 5.1, and 6.2 may be particularly critical for you to implement, in addition to other applicable BMPs contained in the manual.

B. Assessment of Ground Water Concerns

❑ **Y** ❑ **N** Is your equine operation in a karst area (i.e., sinkholes, springs, caves, sinking streams, etc., on or near your property), or is there any exposed limestone on your property?

❑ **Y** ❑ **N** Would you describe the texture of the soil within the top 24 inches as "uncompacted sand" (i.e., a shovel or posthole digger easily penetrates the soil), and is the depth to ground less than 10 feet?

Evaluation of Ground Water Responses:

If you answered "YES" to any of the questions above, rapid infiltration of water into soils may pose a threat to ground water and possibly drinking water sources. Therefore, practices under BMPs 6.3 and 9.0 may be particularly critical for you to implement, in addition to other applicable BMPs contained in this manual.

4. **Select the Applicable BMPs:** Carefully read BMP sections 1.0 through 9.0 and select all of the BMPs in the manual that are applicable to your operation and are technologically and economically feasible for you to implement. Record the BMPs on the checklist in **Appendix 10** of this manual. The checklist includes a column for you to schedule BMP implementation if a practice is not already in place.

   Level I BMPs focus primarily on management actions, rather than structural practices. In general, Level I BMPs should not require cost share to implement, though there may be a few exceptions. Depending on the location and specific conditions of the farm, not all of the Level I BMPs may be applicable to a particular site.

   Level II BMPs address water quality risk features that require more attention. Producers may need to implement one or more of these BMPs, based on site-specific needs identified by the Level II assessment questions.

   It is advisable to consolidate your inventory and all your BMP decision-making, including the BMP Checklist, into a simple implementation plan. This can serve as a record of scheduled and completed BMPs, including operation and maintenance activities. A well thought-out, written plan enables managers and owners to schedule their activities and accomplish their objectives. Remember to keep the plan available and update it regularly. It will help you communicate with your employees, your county extension agent, USDA-NRCS staff, or others.

5. **File a Notice of Intent to Implement (NOI) BMPs**: Complete and submit to FDACS an NOI, contained in **Appendix 10** of this manual, along with the BMP checklist. Once received by FDACS, the Notice of Intent formally enrolls your operation under the BMP program. Implementation of the BMPs provides a presumption of compliance with state water quality standards for the pollutants the BMPs address. Implementation includes ongoing record keeping and maintenance of the BMPs.

6. **Implement the BMPs**: Implement all applicable Level I BMPs as soon as you can, but no later than 18 months after submittal of the Notice of Intent to Implement. However, if you need additional time to implement Level I BMP 6.2.1 (Streams Protection), you must justify the time needed in the space provided at the end of the checklist. Implement all other BMPs according to the schedule (month/year) you have indicated on the BMP checklist.

7. **Keep Records on BMP Implementation**: FDACS rule requires record-keeping to document BMP implementation. Fertilizer applications and rainfall amounts are two types of record-keeping. Record-keeping requirements in the manual are highlighted using this figure:  All BMP records should be accurate, clear, and well-organized. You may develop your own record-keeping forms or use the ones provided in Appendix 7. You must retain the records for at least 5 years. However, it is desirable to retain records for as long as possible, to address any potential future legal issues. All documentation is subject to review.

BMP Implementation Follow-Up

FDACS has developed a BMP "Implementation Assurance" program to help evaluate how BMPs are being implemented, and to gather feedback on whether there are obstacles to using any of the practices. On a staggered schedule by BMP program, FDACS mails surveys to enrollees, which contain questions about BMP-related activities on enrolled operations. FDACS staff also visit selected operations to get more direct input from producers. The Implementation Assurance effort helps in:

- Documenting the level of participation in implementing agricultural BMPs.
- Identifying needs for education and implementation assistance.
- Reinforcing the importance of BMP implementation.
- Evaluating the effectiveness of FDACS BMP programs.
- Updating FDACS NOI records.

Your participation in these follow-up activities is important to the continuing success of agricultural BMP programs in Florida.

BEST MANAGEMENT PRACTICES

1.0 NUTRIENT MANAGEMENT

Nutrient management *is the control of the amount, source, placement, form, and timing of the application of nutrients and soil amendments to ensure adequate soil fertility for plant production and to minimize impacts to water quality.*

Most commonly used farm materials contain plant nutrients such as nitrogen (N), phosphorus (P), and potassium (K). Typical sources of these nutrients on equine operations are manure, commercial fertilizers, and residual nutrients from legumes. Nitrogen and phosphorus are two of the essential elements for plant and animal growth, and are necessary to sustain production. However, excess N and P in runoff stimulate algal blooms and growth of noxious plants in receiving water bodies and wetlands. Nutrient management is an integral part of a BMP program that helps to minimize these impacts.

Nutrient Budget

An important step in nutrient management is to quantify nutrient demand and available on-farm nutrient sources to determine the need for additional nutrient inputs. This calculation is often termed a "nutrient budget." Using a nutrient budget helps to avoid the over-application of nutrients and thereby reduce impacts to water quality. The major components of a nutrient budget are: (1) nutrients required by pasture forage, (2) nutrients already available in the soil, and (3) nutrients applied using animal manure, biosolids, and commercial fertilizers. The following sections provide more detail about each component of the nutrient budget.

Nutrients Required by Pasture Forage

The amount of fertilizer needed to grow forage (agronomic rate) is dependent on the forage, desired production level, and existing soil fertility level (see **Appendix 4** for details on soil and tissue testing). When establishing pastures, follow the recommendations in *Forage Planting and Establishment Methods* at: http://edis.ifas.ufl.edu/ag107 and *Pastures and Forage Crops for Horses* at: http://edis.ifas.ufl.edu/pdffiles/AA/AA21600.pdf. A properly designed pasture forage nutrient management program should include:

- Determining the amount of P and K needed based on soil test results (combined soil/tissue test for P for bahiagrass).
- Determining the amount of N needed based on UF-IFAS recommended fertilizer application rates for your forage type.
- Determining the availability of nutrients based on soil pH.
- When planting new pastures, delaying fertilization until after roots are established.
- Applying additional nutrients to the pasture only when there is an unmet crop nutrient demand.

The UF-IFAS agronomic-based fertilizer recommendations for N, and laboratory soil test recommendations for P and K, give you the amount of nutrients you should apply to your pasture. To meet this nutrient demand, there are four potential nutrient sources: manure, biosolids (wastewater residuals and septage), residual from previous crops (legumes) and manure applications, and commercial fertilizer.

Nutrients Available in the Soil

Adequate soil fertility is necessary for good forage production. The soil fertility level may be sufficient to support the crop nutrient demand of most pastures. If not, manure and fertilizers can be applied to increase nutrients available for forage establishment and production.

Soil testing provides an estimate of the amount of plant-available nutrients already in the soil. It is the most scientifically acceptable method of determining P, K, Ca, Mg, and other micronutrients based on forage type, and is the foundation of a sound nutrient management program. The University of Florida Soil Testing Laboratory offers a testing service where samples can be submitted directly to the laboratory or through your local county extension office. Results of the test provide basic fertilizer and lime application recommendations. Most acidic soils require periodic liming to increase soil pH, and to supply calcium and magnesium. The availability of many nutrients decreases with low soil pH, as indicated in **Figure 1**. Therefore, producers should consider periodically incorporating lime to maintain availability of these beneficial nutrients and to decrease the availability of other toxic elements, such as aluminum. Apply lime according to soil test recommendations.

Applied Nutrients

Manure

Manure, which includes animal excrement and/or bedding waste, is often an abundant material. Although manure can be a locally available source of N, P, K, and organic matter, the use of manure as a sole nutrient source can be challenging. For detailed information see **2.0 Manure Management**, and follow the manure storage and handling guidelines in that section.

Nutrients in Feed

The nutrients in forages, commercial feeds, and other ingredients commonly fed to horses are not usually in balance with the horse's nutrient requirements. Nutrients provided in excess of what the horse needs will be excreted in the urine or feces. This excretion can add to nitrogen and phosphorus loads that, if not properly managed, may affect surface or ground water quality. Because of this, managers should avoid excessive supplementation of protein and phosphorus in horses' diets. For more information on nutrients in feed, go to Rutgers Equine Science Center, *Nutrition Management on Livestock Farms* at: http://esc.rutgers.edu/publications/factsheets_nutrition/FS1064.htm.

Land Application of Manure

If you have sufficient land available, application of fresh or composted manure on cropland or pasture may be a good nutrient management option. Manure contains nitrogen, phosphorus, potassium, sulfur, and various micronutrients, which are all required for proper plant growth. It is also high in organic matter, which can enhance soil quality by improving soil structure, increasing water and nutrient-holding capacity, and reducing susceptibility to erosion. When to apply the manure and how much to apply depends on several factors, such as: physical, chemical, and biological characteristics of the soil; composition of the manure; and the type of crop or pasture where the manure will be spread.

Before land applying fresh or composted manure, obtain a sample of your soil and the manure

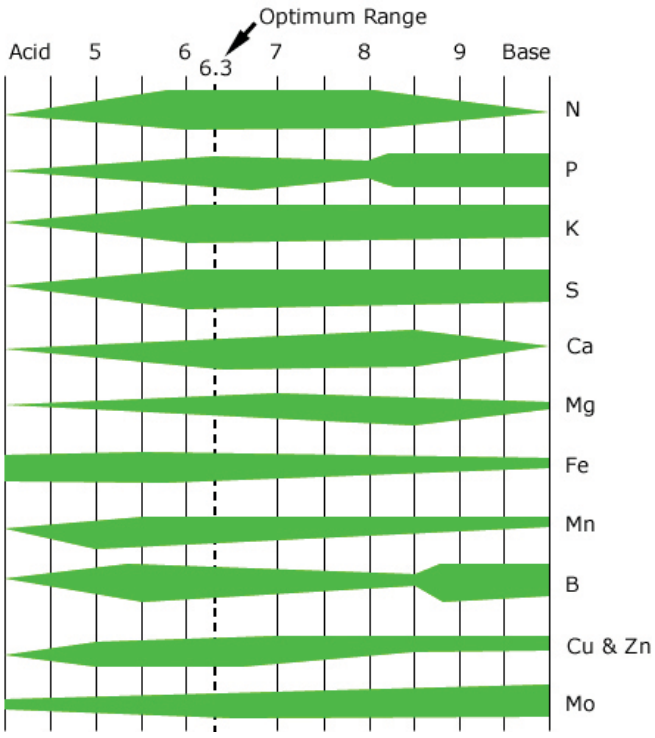


Figure 1

product and have them analyzed. Calculate the manure application rate based on the crop nutrient requirement and test results, and apply the material using a manure spreader that is properly calibrated. It is important to remember that not all nutrients in manure are immediately available to the present crop. Approximately 50 percent of the total nitrogen, 80 percent of P, and 90 percent of K in the manure are available the first year. Therefore, nutrients remaining in the soil from previous manure applications must be considered each time you apply manure or compost to pasture or cropland.

Over-applying manure can add excess nutrients to the soil. The ratio of N to P in the manure typically is different than the ratio of crop nitrogen to phosphorus requirements. When the plant has taken up all available N from the manure there is still likely to be excess P that the plant cannot utilize. Consequently, an equine operation fertilizing with manure at a rate sufficient to supply all the N needs of the crop will likely be applying much more P than needed. Therefore, application rates of manure must be based on P concentrations, with additions of N from commercial fertilizers to make up the difference in crop requirements.

If using land application, be careful to prevent manure from entering streams adjacent to pastures due to runoff from heavy rains. Avoid spreading manure within a 100-foot radius of a drinking water well because of potential contamination.

Biosolids

Biosolids include wastewater residuals and septage. Wastewater residuals are the solid, semi-solid or liquid residue generated from the treatment of domestic wastewater from an FDEP-permitted wastewater treatment facility. This material is more commonly referred to as sewage sludge. Septage is the mixture of sludge, fatty materials, human feces, and wastewater removed from on-site sewage treatment and disposal systems (septic tanks). Equine operations should not accept or use untreated septage.

Land application is the most common disposal method for domestic wastewater residuals and treated septage. Their high organic matter content can improve soil water-holding capacity and provide nitrogen, phosphorus, potassium, calcium, sulfur, and magnesium in a slow-release form. Lime or other alkaline materials are sometimes added to reduce pathogens, and the treated material is required to have a minimum pH of 12.5 prior to land application.

Abide by all applicable regulations in FDEP Rule 62-640, F.A.C., for wastewater residuals application, and Florida Department of Health (FDOH) Rule 64E-6, F.A.C., for treated septage application. When applying biosolids, follow the applicable provisions of the Agricultural Use Plan or Nutrient Management Plan for the site.

Residuals used for land application are classified as Class AA or B depending on how they have been heated or processed to remove pathogens, in accordance with Title 40 of the Code of Federal Regulations. Class AA residuals are the highest quality, and do not have harvesting or grazing restrictions. Only Class AA residuals can be used to grow leafy vegetables. Class B residuals are of lower quality, are treated to eliminate only a portion of the pathogens, and have harvesting and grazing restrictions.

All residuals have required setbacks from surface waters and drinking water wells, and must be applied at agronomic rates in accordance with an approved Agricultural Use Plan (AUP), or a Nutrient Management Plan (NMP) which is now required. Refer to your FDEP permit for specific setback requirements. A NMP must be developed for each land application site to be used by the wastewater facility, and must be approved by FDEP as part of the facility permit. The landowner of the application site must sign the NMP form to acknowledge the accuracy of the plan.

Whether using wastewater residuals or treated septage, there are cumulative application limits for certain constituents, such as heavy metals. Some of these constituents may accumulate in the soil and create long-term plant toxicity effects. Therefore, producers should educate themselves before using these products.

Commercial Fertilizers

Commercial fertilizers come in many different blends and are formulated as water-soluble (quick release) or as controlled-release (slow release) products. Commercial fertilizers list the amount of each nutrient in the bag, which is referred to as a guaranteed fertilizer analysis. An example fertilizer analysis is indicated in **Figure 2.** By matching the amount of N-P-K in commercial fertilizer with your soil analysis and the forage nutrient requirements you can apply the appropriate amount of nutrients to your pasture. Remember first to account for nutrients from any land-applied manure sources and from nutrients remaining in the soil from the previous year.

GUARANTEED ANALYSIS
14-0-26

TOTAL NITROGEN (N) 14.00%
14.00 % Urea Nitrogen (N)*
SOLUBLE POTASH (K2O) 26.00%
SULFUR (S) Total..... 19.70%
10.50% Free sulfur (S)
9.20% Combined sulfur (S)
IRON (Fe) Total..... 0.96%
MANGANESE (Mn) Total 0.48%
Water Soluble Manganese (Mn)
DERIVED FROM: Polymer Coated Sulfur, Coated Urea, Sulfate of Potash, Iron sulfate, Manganese sulfate.
CHLORINE (Cl) Max..... 2.00%
* 7.00% Slowly Available Urea Nitrogen from Polymer Coated Sulfur Coated Urea

Figure 2

Although slow-release fertilizers are often more expensive, these engineered fertilizer materials release nutrients at a rate that more closely matches the plant uptake rate, which means more of the nutrients go to plant growth and less is likely to leach or runoff into the environment. An alternative way to approximate the effect of a slow-release fertilizer is to apply the same total amount of fertilizer, but use multiple (split) applications throughout the growing season.

Florida forage pasture fertilization recommendations are available through Extension Circular SL-129 titled: *UF-IFAS Standardized Fertilization Recommendations for Agronomic Crops*. This document is on the internet at http://edis.ifas.ufl.edu/SS163, and provides up-to-date fertilizer recommendations for bahiagrass and common bermudagrass, the two most common pasture grasses in Florida. SL-129 also includes guidance on when to conduct soil and/or tissue testing.

Minimizing Nutrient Loss to the Environment

Nutrient loss can result in degradation to the environment and/or waste of valuable plant nutrients.

- To avoid nutrient loss through runoff, apply fertilizers and manures during times when soils are not saturated. Do not apply fertilizer if a heavy rain event (2 inches or more) is forecast.
- Time your applications so that they coincide with periods of rapid plant growth and nutrient uptake.
- If applying highly soluble commercial fertilizers, apply the fertilizer in several small (split) amounts instead of one single application, to maximize availability and minimize runoff and leaching.
- Consider using controlled-release fertilizers near environmentally sensitive areas. Avoid spreading fertilizers in or near ditches, canals, karst features, or filter strips, as this may result in the off-site loss of nutrients.
- Locate fertilizer mixing/loading sites away from water bodies where spills can contaminate water resources.

Nutrient Management BMPs

1.1 Fertilizer Management

Level I BMPs

✓ **1.** Comply with the recommended rates in UF-IFAS Circular SL-129 *(revised April, 2009)* for the forage grown. *See Reference 2 below.*

✓ **2.** Base fertilization rates for P and micronutrients on soil test-based recommendations from a lab that uses a method used by the UF-IFAS Extension Soil Testing Laboratory. For bahiagrass, a tissue sample must be submitted along with the soil sample. See **Appendix 4** for more information on soil and tissue testing. Keep a copy of your soil and tissue test results.

✓ **3.** If land applying manure or biosolids, or incorporating leguminous forage into the soil, use the Nutrient Budget Worksheet in **Appendix 5** to account for these nutrient inputs, and adjust your fertilization program accordingly. Keep a copy of your worksheet(s).

✓ **4.** Follow split application recommendations in UF-IFAS Circular SL-129 *(revised April 2009)* for your particular forage and fertilization regime to maximize nutrient uptake and minimize leaching and runoff potential. *See Reference 2 below.* As an alternative, use ***enhanced-efficiency fertilizers*** as practicable for your operation.

✓ **5.** Avoid applying nutrients when the soil is saturated or inundated with water, or when heavy rain is forecast.

✓ **6.** Keep records of all nutrient applications. Include, at a minimum: date of application, total amount applied, acreage covered, fertilizer analysis or grade, rate per acre, and application method.

References:

1. USDA-NRCS Nutrient Management Code 590, Feed Management Code 592, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg/
2. UF-IFAS, Standardized Fertilization Recommendations for Agronomic Crops, SL-129. April, 2009. http://edis.ifas.ufl.edu/SS163
3. Rutgers Equine Science Center, Nutrient Management on Livestock Farm: Tips for Feeding. http://www.esc.rutgers.edu/publications/nutrition.htm
4. UF-IFAS, Pasture and Forage Crops for Horses, SS-AGR-65. http://edis.ifas.ufl.edu/AA216
5. UF-IFAS, Forage Planting and Establishment Methods, SS-AGR-161. http://edis.ifas.ufl.edu/AG107

Note: *See Appendix 7 for list of record-keeping requirements and example record-keeping forms.*

2.0 MANURE MANAGEMENT

Manure management *is the proper handling and beneficial recycling of manure to prevent nutrients and potential pathogens from entering surface and ground water.*

A 1,000-pound horse produces nearly 10 tons of manure and stall waste each year. A poorly managed manure pile can harbor intestinal parasites, provide a breeding ground for flies and insects, and produce objectionable odors. Runoff from improperly stored manure can quickly become a pollutant source, because it can carry nutrients, pathogens, and organic particles into surface waters or can leach into underlying ground water. This can create significant health and environmental concerns.

As an equine operator, your land management decisions affect not only your property, but also adjoining properties. A poorly managed equine operation that stockpiles large quantities of manure draws negative attention from neighbors and the general public. Proper manure management can prevent complaints, and can help offset commercial fertilizer use on pastures. For instance, a ton of fresh manure containing bedding has an average nutrient content of 8 pounds of nitrogen, 2.5 pounds of phosphorus, and 8 pounds of potassium. Not all of these nutrients are readily available to plants in the first year, with the remaining balance becoming available in subsequent years.

Effective manure management incorporates storage and handling, on-site composting, land applying fresh and composted manure at agronomic rates, and/or disposal of product when it exceeds the on-site reuse capacity.

Manure Storage and Handling

Storage Location

Regardless of the method of disposal, manure will generally have to be stored for some period of time, whether in a formal storage facility or a simple free-standing manure pile.

In deciding on a location, a producer must consider seasonal water table depths, the degree of stormwater flow through the potential storage area, drainage features, whether areas are prone to flooding, and the need for setbacks from adjacent environmental features. Locate manure storage facilities where there is minimal runoff potential to reduce the risk of surface water contamination. Do not locate manure storage facilities in depressional areas, where water tends to pool, because of the potential to contaminate ground water. The manure storage facility should be convenient to barns and other areas where horses are housed and manure is generated, but not too close in case of a fire. If possible, locate manure storage facilities out of sight of public places and neighboring residences.

Storage Facility Design

The design of a manure-storage and handling facility depends on two key factors:

- **Volume of manure** – The number of horses, the type of feed, and the type and amount of bedding used will determine the amount of manure produced in each operation. The density of horse manure (feces and urine, no bedding) is approximately 63 lb/ft3 (or 1700 lb/yd3). The manure generated by a 1000-pound horse will average 0.9 ft3/day. The addition of bedding can easily double or triple this volume.
- **Length of storage** – The length of storage will depend on the intended use of the manure. For example, if the manure is to be used as a fertilizer material, storage facilities must hold all the manure until the appropriate time for application, which can be six months or more. As a general rule, the longer the intended storage time, the larger the storage facility will need to be.

Storage Facility Construction

The type of material used in facility construction is important. The flooring material should prevent contaminants from leaching into ground water. An impervious surface, such as a concrete slab or well-compacted soil high in clay, is suitable flooring material. Concrete, tightly fitted wood planks, or cement blocks can be used for constructing walls. Storage facilities that have walls will better contain the manure pile and will facilitate the use of mechanical equipment. Remember to consider wind-load requirements for any farm structures that are not exempt under the Florida Building Code.

Constructing a roof or covering the manure pile with a tarp or similar material will reduce runoff and seepage from the storage area. Leaving the storage area open may be suitable during the dry season, but this is not recommended year-round. Covering the pile will reduce the risk of producing contaminated runoff.

On-Site Composting

Composting is of particular interest to equine owners because if it is done properly, composting kills parasite eggs, insect larvae, pathogens, and destroys weed seeds in manure. If the compost is later land-applied on pastures, the possibility of re-infection is reduced. Composting also reduces manure odor and can decrease the size of the pile by as much as 50 percent. **Figure 3** depicts a multiple bin composting system. Finished compost can be used as a slow-release fertilizer for pastures, as mulch, or as a growing medium for plant nurseries, mushroom growers, and worm farms.

Figure 3

The microorganisms that are active in composted manure and other wastes need food, water, and air to survive and reproduce. The goal of composting is to provide the ideal environment and the proper

Table 1. Carbon-to-Nitrogen Ratios for Typical Compost Materials

Material	% Carbon	% Nitrogen	C:N Ratio
Blood meal	43	13.0	3.3:1
Cottonseed meal	42	6.0	7:1
Legume hay, dry	40	2.0-2.5	20:1
Grass hay, dry	40	1.0-1.5	40:1
Fresh manure, cow	20-30	0.6-1.0	20-30:1
Fresh manure, horse	20-35	0.5-1.0	20-70:1
Fresh manure, laying chickens	11-20	1.5-3.0	3-15:1
Fresh manure, broiler chickens	20-33	1.3-2.0	15:1
Wheat or oat straw, dry	48	0.5	96:1
Grass clippings, fresh	10-15	1-2	7-15:1
Peanut hulls, dry	50-60	1-2	40-50:1
Fallen leaves	20-35	0.4-1.0	20-75:1
Newspaper or cardboard, dry	40	0.1	400:1
Wood chips, shavings or sawdust	25-50	0.1	250-500:1

balance of nutrients needed by the microorganisms to encourage a rapid rate of decomposition of the manure. Key considerations affecting the rate of decomposition are moisture content and the carbon-to-nitrogen (C:N) ratio.

The moisture content of the composting material should be maintained at approximately 50% for the growth of microorganisms in the compost. During the composting process, heat will be generated. This will result in a loss of moisture from the compost, so water may need to be added periodically. When composting, aerate materials adequately (through turning or via passive aeration systems) and monitor internal temperature.

In general, a high C:N ratio immobilizes nitrogen, while a low C:N ratio results in a rapid release of nitrogen. A high proportion of carbon (C:N ratio greater than 30:1) can immobilize or tie up nitrogen in the material/compost pile, and may even immobilize available nitrogen in the soil if the material is land-applied prematurely. **Table 1** above presents carbon and nitrogen concentrations and ratios found in typical compost materials.

Bedding practices can affect C:N ratios. Below is some guidance on the use of bedding in composting.

- **Use less bedding** – Large quantities of bedding mixed with manure can slow the composting process by contributing excess carbon and upsetting the ideal C:N ratio. Be conservative with the amount of bedding in your stalls, and make an effort to remove only soiled material when cleaning.
- **Straw or hay bedding material** – The porous, spongy consistency of straw or hay usually provides close to the right amount of free air space within the pile. However, the large particle size might delay the composting of straw. If a shredder or chipper is available, consider processing straw or hay bedding before adding it to the compost pile. Adding nitrogen to stall waste containing straw or hay may be necessary to promote proper composting if large amounts of bedding are used.
- **Wood chips or sawdust bedding** – Wood bedding products, such as pine chips, shavings, or sawdust contain very little nitrogen and a lot of carbon. Therefore, it is usually necessary to add supplemental nitrogen to promote proper composting, particularly when large amounts of bedding are used. Wood shavings or chips are less likely to compact the pile, compared to finer sawdust. If you bed on sawdust, you may need to add other bulking materials to improve aeration during composting. The advantage that sawdust has over straw and wood shavings or chips is its smaller particle size. In fact, if managed properly, sawdust will compost faster than coarser bedding materials.

Composting System Design

There are several ways to design an on-farm composting system; no one approach is appropriate for all sizes and types of equine facilities. You can tailor your composting system to meet your needs depending on how many horses you have, the space and equipment available, and how intensively you plan to manage the pile.

Free-Standing Piles

Free-standing piles are usually the least costly option for composting because they do not require special structures or equipment. A free-standing pile works well for one- or two-horse operations. When the pile gets too big, additional piles can easily be created. Frequent turning of the pile and the addition of supplemental nitrogen will hasten the composting process and help reduce parasites and weed seeds. However, some prefer the less labor-intensive approach of building a new pile once or twice a year, turning the pile two or three times, then letting it take a year or so to mature. In this case, parasites and weed seeds may not be adequately destroyed. To prevent contamination of water resources, free-standing piles will require more space and labor, and careful consideration of their location. These considerations can be addressed through the use of setbacks. Unless covered or under-roof, the surface below the pile should be impervious material, such as a concrete slab or well-compacted soils high in clay.

Windrow Composting

Manure and bedding can be formed into long, horizontal piles (or windrows) for composting. The windrow pile is typically about 5 to 6 feet tall and 6 to 10 feet wide. Materials are added at the end of the pile until it grows to a pre-determined length. The piles are generally turned with front-end loaders or specially equipped tractors, although they can also be turned by hand. Windrow composting works well for large operations with adequate space.

Multiple-Bin Composting

Placing materials in bins or some other type of

enclosure may result in better decomposition and more efficient use of space than stacking manure in a pile or windrow. At least two bins are recommended for small operations that support just a few horses, or for those with no mechanical equipment. The first bin is filled to capacity and periodically turned and mixed with a shovel or pitchfork to promote decomposition. When the first bin is full, materials can be added to the second bin. Larger facilities or those equipped with a small tractor or front-end loader should consider building three or more bins. A series of bins accommodates the containment of waste at different stages of the composting process.

Table 2. Bin-Size Calculation Formulas

Calculation	Amount
Waste volume calculated	ft^3/horse/day x No. of horses = X ft^3/day
Storage Required	ft^3/day x 120 days * = total ft^3
Calculate bin volume based on total ft^3	Bin volume (length x width x height)

** 120 days is the standard length of time for composting*

For more information on composting systems, see: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex7956 and http://cwmi.css.cornell.edu/composting.htm

Utilization and Marketing

For some operations, more manure is produced annually than can be used on-site. If you do not have the available land to use the manure and stall waste your horses produce, you should make other arrangements to use the manure beneficially or dispose of it properly. Depending on the amount of manure produced, a number of options are available, including:

- **Commercial Users** – Many large equine operations have formed agreements with professional landscapers, organic farmers, land reclamation and road construction companies, or other commercial users to remove their manure. You may choose to enter into one of these agreements on your own or sell the manure to an intermediate party that already has a contract.
- **Packaged Product** – You may choose to package the product and sell it locally. A less labor-intensive option is to have potential buyers shovel their own compost. If you choose the former, check with local garden centers to find out the price of packaged compost.
- **Centralized facility** – You may be able to work with county government staff or equestrian community residents to plan and develop a centralized manure handling facility.
- **Home gardens or nurseries** – Composted manure is a valuable fertilizer product for gardeners. The nutrient composition in manure is particularly suited to rose gardening. Marketing to rose gardeners and other recreational gardening enthusiasts is a viable option for most equine owners.
- **Mushroom farms** – Mushroom growers are particular about the quality of the product; they want manure mixed with straw bedding only and with no foreign material. If you are interested in this option, but do not have a large, dependable supply, consider forming agreements with neighbors to store their straw-bedded manure for a one-stop pickup by the mushroom farm.
- **Donating** – Small farmers or home garden enthusiasts may be able to use the manure pile. Having someone remove and dispose of the excess manure can be well worth the donation.
- **Disposal** – Check with your local landfill to see if they will accept this product.

Note: *Equine owners/operators who will market manure as commercial fertilizer must apply for a Fertilizer License pursuant to Chapter 576, F.S. If owner/operators are selling their manure as a "soil amendment" with no guarantee of fertilizer analysis, then this license is generally not required. There are also regulations that may apply if selling composted material off-site. FDEP Rule 62-709.530, titled,* Criteria for the Production and Use of Compost made from Solid Waste *should be referenced if these conditions apply. For more information about buying, selling, and/or trading manure, go to FDACS "Florida Market Bulletin" at: www.Florida-agriculture.com; or www.Agriseek.com.*

Waste to Energy Options

Horse farm wastes and other sources of organic matter can be processed to produce energy. The processes that are most likely to be applicable to horse farm wastes are anaerobic digestion, thermal gasification, and incineration (direct combustion). Other processes, such as fermentation to produce ethanol, are not very applicable to horse farm wastes at the current time.

Anaerobic Digestion

This process utilizes an airtight chamber, referred to as a digester, where microbes thrive in an anaerobic environment. The digester uses manure, urine, and other organic materials or wastes as feedstock, and converts them into biogas (a mixture of primarily methane and carbon dioxide) and a stabilized effluent. **Figure 4** shows a small digester. The anaerobic digestion process kills most pathogens and lowers the oxygen demand. However, most of the nutrients remain in the effluent (solids and liquid) from the digester. The effluent can be used for its fertilizer value and for its value as a soil amendment. The solids can also be removed from the effluent and used as a component in the growing media used in the plant nursery industry. The biogas can be used much like natural gas. It can be burned for space or water heating, and it can be burned in internal combustion engines to produce shaft power for electrical generators or water pumps. It can also be used to produce steam to drive a turbine to produce electricity in larger-scale operations. To help spur the advancement of this technology, the U.S. EPA established the "AgSTAR" program in 1994. It is a voluntary outreach and educational program that promotes the recovery and use of methane from animal manure. For more information on AgSTAR and on anaerobic digestion, go to http://www.epa.gov/agstar/.

Figure 4

Thermal Gasification

This process involves burning a carbonaceous material (such as coal, peat, or biomass) in a reactor with a limited supply of oxygen or air. It has been around since the late 18th century, and early applications of this technology were designed to process wood, peat, or coal into a gas for lighting and heating. The gases that were produced were sometimes referred to as "town gas." There are several variations of the gasification process (updraft, down-draft, fluidized bed, entrained flow, etc.). Depending upon the process and how it is controlled, the composition of the gases and the residue (ash, char, etc.) will vary. The gas is usually called synthesis gas, producer gas, or low-Btu gas, and it is a mixture of mostly carbon monoxide, hydrogen, methane, and carbon dioxide. Gasification can be used in a variety of applications, including generation of electricity and synthesis of commodity chemicals and fuels. A solid byproduct is also produced and can be used as a fertilizer material. More advanced treatment systems can produce "biochar," a mostly solid charcoal-like carbon residue. The addition of biochar to soils is gaining new popularity, in part because of biochar's ability to retain nutrients in the soil and prevent runoff. Currently, there is research being conducted on the use of biochar to limit greenhouse gas emissions and to evaluate this product as a potential agent to absorb pesticides and other agrichemicals in order to prevent them from leaching. To learn more about gasification technologies, go to http://www.gasification.org.

Incineration

Incineration is a type of thermal treatment process which involves the combustion or burning of a material. The products are flue gas, heat, and ash. Incineration can be practiced with or without heat recovery. The heat can be used for space heating or for heating water. In larger installations, the heat from incineration can be used to generate steam and electricity. The ash can be used as fertilizer in most cases, and incineration reduces the quantity of material which must be handled. The gaseous and particulate pollutants must be removed from the flue gases before they can be discharged into the atmosphere. This may require environmental permitting and testing. In many places there is still a lot of community resistance to incineration of any material.

Packaged incineration or bio-burner units vary in size and can handle the waste from a minimum of 20 horses up to 1,500 horses. Manure and used bedding can be fed directly into a bio-burner. A control system on the bio-burner regulates how much waste is fed into the burner at a time. The material going into the bio-burner must contain no more than 50% moisture, so more dry material, such as used shavings, can be added if necessary. Horse manure is normally about 45% moisture. For more information about incineration technologies, go to http://en.wikipedia.org/wiki/Incineration.

Choosing a System

Implementing a waste to energy facility on your equine operation requires the consideration of many factors that may be unique to your operation. The system that you see at another equine operation may not be the best choice for your operation. Also, a system may be feasible, but it may not be

the best or optimal choice. You should carefully answer several questions:

1. Does the proposed system address the problem(s) that you are trying to solve?
2. Is the system compatible with the surrounding neighbors and community?
3. Is the system economically feasible? Consider initial cost, maintenance costs, and operating costs, including labor.
4. Can you utilize or sell the energy which is produced?
5. Can you utilize or sell the residues or effluent from the process?
6. Do you have the skills needed (or can you hire someone) to operate a waste to energy system?
7. Do you have enough waste or other biomass (in the right form) to fuel the system? Many of these systems operate more efficiently on a large scale, so collecting material from several farms for conversion to energy at a larger facility should be considered.
8. What types of permits, approvals, testing, or reporting will be required?

A more detailed discussion of the factors to consider in deciding whether to implement a waste to energy system and the type of system to use, go to http://www.puco.ohio.gov/emplibrary/files/util/biomass/publications/TurningManuretoGold.pdf

Manure Management BMPs

2.1 On-site Manure Management and Off-site Transport

Level I BMPs

✓ **1.** Collect manure from confined areas (e.g., small paddocks and feeding areas) and riding trails at least monthly, and properly store the manure pending appropriate use or disposal. In the comments section of the BMP checklist describe how you utilize or dispose of collected manure and stall clean-out material.

✓ **2.** If composting, use the appropriate on-site composting system (free-standing pile, windrow, or bin system), based upon the amount of manure generated on-site. Using the information in **Table 1**, estimate the carbon-to-nitrogen ratio of manure and other materials to be composted, so that the pile will properly decompose. Ensure that adequate water sources are available to maintain pile moisture.

✓ **3.** Locate manure storage areas to protect surface and groundwater sources in accordance with the setback distances listed in **Appendix 3**.

✓ **4.** If using a commercial hauler to transport manure material offsite, maintain records (e.g. bill of lading) to document that the manure has been transported off-site.

Refer to the section on Utilization and Marketing for information on other ways to manage manure.

References:

1. USDA-NRCS, Waste Storage Facility Code 313, Composting Facility Code 317, Waste Utilization Code 633, Manure Transfer Code 634, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg/
2. Alberta Agriculture Food and Rural Development, Manure and Pasture Management for Horse Owners. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex7956
3. UF-IFAS, Utilization of Organic Wastes in Florida Agriculture, SS-AGR-166. http://edis.ifas.ufl.edu/AG113
4. Extension, Business Arrangements for Manure Offsite Transfer. http://www.extension.org/pages/Business_Arrangements_for_Manure_Offsite_Transfer
5. Rutgers Equine Science Center, Best Management Practices for Horse Manure Composting on Small Farms, Bulletin E307. http://www.esc.rutgers.edu/publications/stablemgt/E307.htm

Note: *See Appendix 7 for list of record-keeping requirements and example record-keeping forms.*

3.0 SEDIMENT AND EROSION CONTROL

Sediment and erosion control measures *are permanent or temporary practices to prevent sediment loss from fields, slow water flow, and/or trap and collect debris and sediments in runoff water.*

Runoff containing sediments with nutrients and pesticides attached can adversely affect surface waters or ground water. Site characteristics such as clay-type soils and/or sloped terrain can significantly increase the risk of erosion and off-site sediment transport. The first principle of erosion control is to maintain vegetation to hold soil and decrease the velocity of runoff water. Removal of natural vegetation and topsoil increases the potential for soil erosion, which can change runoff characteristics and result in loss of soil and increased turbidity and sedimentation in surface waters.

Erosion Control

Examples of erosion control BMPs are critical-area planting, ***prescribed grazing***, and filter strips, where appropriate. Filter strips are areas of permanent vegetation between production areas and natural waterbodies. Their main purpose is to decrease the velocity of runoff water and remove sediment particles before they reach surface waters.

Controlling off-site sediment transport involves the use of BMPs to limit the movement of sediments downstream. Examples of these types of BMPs include sediment traps and diversions/terraces. The installation of these types of BMPs usually requires technical assistance.

Erosion-control devices should be used progressively, beginning with the more passive erosion-control devices first (e.g., re-vegetation, prescribed grazing, filter strips), and subsequently employing more aggressive measures as the need arises (e.g., sediment traps to capture sediment-laden water to allow enough time for larger particles to settle out). Collectively, these practices will reduce the mass load of sediment reaching a waterbody, which will minimize water quality impacts.

Construction Activities

Erosion control during construction is critical, since areas under construction will be especially prone to sediment loss. When constructing, pens, barns, roads, trails, or other infrastructure, minimize the amount of land that is cleared of vegetation, and incorporate the use of silt screens, as needed. Whenever feasible, clearing vegetation to develop new pastures should be conducted during the dry season, and re-vegetation with forage should occur as quickly as possible.

Sediment and Erosion Control BMPs

3.1 Road and Trail Construction and Maintenance

Minimize the amount of vegetation that is cleared when constructing roads, buildings, etc. Use silt fences when protection from sedimentation during sheetflow conditions is needed for up to 6 months during construction activities. Properly trench in, backfill, and compact silt fences in accordance with the Florida Stormwater, Erosion, and Sediment Control Inspector's Manual referenced below.

Level I BMPs:

✓ **1.** Stabilize access roads or trails that cross streams and creeks, using rock crossings, culverts, or bridges.

✓ **2.** Maintain vegetative cover on road banks.

✓ **3.** When constructing above-grade access roads, follow USDA-NRCS FOTG Conservation Practice No. 560, and locate the road(s) a minimum of 25 feet from regulated wetlands. Check with your water management district to see whether a permit is needed.

Level II BMPs:

If your answer to the following question is "yes," implement Level II BMP 3.1.4:

Question: *Under normal wet-season weather conditions, have you ever had a road with a culvert "blow out" due to high water levels?* ❑ *Yes* ❑ *No*

✓ **4.** Install a new culvert of the appropriate size, if the existing culvert is not functional. Contact USDA-NRCS or FDACS for technical assistance and/or structure- design guidance.

References:

1. USDA-NRCS, Access Road Code 560, Heavy Use Protection Area Code 561, Recreation Trail and Walkway Code 568, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg

2. FDEP, The Florida Stormwater, Erosion, and Sediment Control Inspector's Manual. http://www.dep.state.fl.us/water/nonpoint/erosion.htm

3. USDA-ARS, Revised Universal Soil Loss Equation, Version 1.06 http://www.ars.usda.gov/Research/docs.htm?docid=5974

4. USDA-NRCS, Recreational Trail and Walkway Code 568, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg

5. USDA-NRCS, Grade Stabilization Code 410; Structure for Water Control Code 587, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg

4.0 PASTURE MANAGEMENT

Pasture Management *involves managing the harvest of vegetation by grazing and/or browsing livestock.*

Pasture Management

Poor pasture management can lead to loss of groundcover and soil erosion, and increased use of pesticides as a result of weed growth. These problems ultimately can lead to degradation of water resources. All too often, pastures suffer from neglect or overuse. Overstocked and overgrazed pastures typically result in bare ground, soil compaction, and/or weed infestations that create a loss of forage. Bare spots or denuded areas can quickly be churned to dust and mud, causing health risks such as respiratory disease, sand colic, and thrush. At the very least, overgrazed pastures present an eyesore and can cause a strain on neighbor relations.

Good pasture management will decrease feeding expenses, help maintain healthy horses, and reduce environmental impacts. Healthy pastures allow grass roots to increase the soil's absorption of rainfall and slow the rate of stormwater runoff. Slowing the rate and reducing the amount of runoff from hillside pastures will reduce erosion and drainage problems.

Good pasture management may involve adjusting stocking rates, utilizing rotation and rest periods, confining horses to ***sacrifice areas*** or stalls during periods of drought or extreme wet conditions, managing manure, maintaining soil fertility, and/or mowing the pasture to even out under-grazed areas and control weed populations. For more information on pasture management, see: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex8017

Stocking Rate

Equine owners frequently ask how many animals a particular piece of property will support. The answer depends on available acreage, forage species, use of supplemental feed, soil and climatic factors, grazing management techniques, livestock activity municipal restrictions, and other factors. The following equation can be used as preliminary guidance to estimate a reasonable ***stocking rate***.

$$\text{Pasture Acres Required} = \frac{\text{(\# horses) x (average body weight in pounds) x (.03) x (\# grazing days)}}{\text{Average forage production, in pounds per acre}}$$

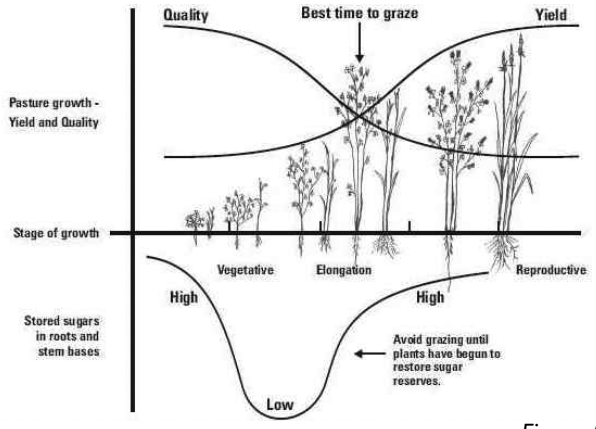


Figure 5

Forage Growth

Pasture plants have three distinct growth stages: vegetative, elongation, and reproductive. The nutritional quality of pasture forage varies with the plant's growth stage. Plants in the vegetative stage are the most nutritious, but they are also the most fragile and susceptible to damage by grazing or trampling (See **Figure 5**). Therefore, pasture plants are best grazed when they enter the elongation phase, to ensure the plants will survive livestock grazing pressure.

During the growing season, forages should be grazed to an appropriate height, and then allowed to re-grow before returning horses to the pasture. Heights may vary according to forage type. **Table 3** below lists general guidelines for grazing of selected forages.

Owners/operators should manage grazing so that a cover of dry residual vegetation protects the soil from the first rains that occur with the onset of the rainy season. Soil compaction due to grazing should be minimized. A porous soil improves plant health by allowing the infiltration of water, air, and nutrients. Hoof impact and heavy equipment operation on saturated soils will likely compact soil particles and cause loss of porosity.

Information on the various types of warm season perennial grasses, summer annual grasses, winter annual grasses, and summer and winter legumes can be obtained from *Pasture and Forage Crops for Horses* found at: http://edis.ifas.ufl.edu/AA216

Grazing Pressure

Close cropping of pasture plants, trampling, and selective grazing can seriously affect the productivity of a pasture. Intensive, repeated grazing of areas with short, new growth causes the plants to become unhealthy or die. As the desirable species of forage are grazed out or trampled, weeds tend to invade the pasture. Thus, horses can quickly turn a pasture into a weed patch or dry lot.

Horses are instinctively selective grazers, basing their forage choice on palatability, as well as availability. Since young forage is more digestible and palatable than older forage, the horses start to "spot graze," and will graze some areas of a pasture down to the bare ground. Horses will not graze in areas where they defecate, so pasture plants around manure piles become mature and less palatable. They seldom graze pastures to a uniform height unless the stocking rate is very high. Mowing the pasture to a uniform height helps control weeds and other undesirable plants, promotes uniform re-growth of forage for the next grazing cycle, and helps break up manure piles.

Grazing pressure can also be managed by establishing paddocks (pens) as "sacrifice areas" to preserve pastures. Doing this reduces churning and compaction of saturated soils, and eliminates overgrazing when pastures require rest. If feasible, locate these paddocks or other high-intensity areas at least 200 feet from wetlands, streams, and other watercourses. Also, maintain a vegetated border around them to help filter runoff that may carry pollutants.

Table 3. General Guidelines for Forage Grazing Heights*

	Average Height (inches)	
Forage	***Begin Grazing***	***End Grazing***
Bahiagrass	6	1-2
Bermudagrass	6	2-4
Clovers	6	3
Indiangrass	14	6-10
Limpograss	24	10
Pearl Millet	14	6
Rhodesgrass	18	8
Rhizoma Peanut	12	4
Ryegrass, annual	6	3-4
Stargrass	12-18	6-8
Small Grains (oats, wheat, rye)	6	4

** Table adapted from UF-IFAS Publication SS-AGR-133 (http://edis.ifas.ufl.edu/AG268)*

Prescribed Grazing

Horses can be persuaded to eat pasture forage that they might otherwise choose to avoid. Prescribed grazing prevents over-grazing and gives them more pasture use for a longer time. Prescribed grazing may be done continuously or rotationally.

Continuous Grazing

With ***continuous grazing***, horses graze the same pasture for extended periods of time, perhaps for the entire season. This requires less fencing to subdivide large pastures and less time and labor to handle horses. However, the major challenge is to match the stocking rate to the forage growth rate. If the pasture cannot supply enough forage for the horses, supplemental feed is usually needed to prevent over-grazing.

Rotational Grazing

With ***rotational grazing***, horses move from pasture to pasture during the grazing season. This allows the pasture forage to recover and re-grow, which helps prevent erosion and weed infestation. Large pastures are fenced, either temporarily or permanently, into smaller units. Horses are confined in one area until the forage has been grazed down to the desired stubble height; then are moved into the next area and the process repeated. The length of the grazing period in each area depends on the stocking rate and forage growth rate. Rotational grazing helps maintain quality pastures. Also, internal parasite infective larvae and/or eggs contained in manure are not as likely to survive when horses are periodically removed from a pasture, because this breaks the life cycle.

The advantages of rotational grazing include:

- Increases the amount and quality of grazing forage.
- Allows for a greater number of animals to be supported on the same acreage.
- Allows for more complete use of pasture forage.
  - *Reduces or eliminates spot grazing*
  - *Minimizes areas where horses will not graze*
- Promotes the growth of desired species over undesirable species and weeds.
- Helps control parasites and discourages some animal diseases.
- Permits harvesting of excess forage in spring and stockpiling forage for the fall.
- Provides better manure distribution and nutrient recycling.

Fence Installation

Fences are usually installed around the perimeter of pasture lands and across them, to allow for rotation and resting of grazing lands. They are also used to define paddocks, runs, turn-out areas, and riding arenas, and to separate horses in different production stages. For instance, bred mares are usually separated from open mares, and growing horses or yearlings are separated from mature horses.

Use fencing material compatible with the site's soil and water properties, and construct fences or barriers so that they are structurally adequate for their intended purpose. The location and construction of all fences should comply with local, state and federal laws. Consult with water management district staff and USDA-NRCS prior to conducting land-clearing activities and associated fencing projects in surface waters or wetlands, to ensure that proper authorization is obtained, if needed.

High-intensity Areas

High-intensity areas (HIAs) are areas of an equine operation that are used repeatedly by livestock for short periods of time and become denuded of ground cover. HIAs are common in many equine operations, but they usually comprise a small amount of the total land area. They are often referred to as "sacrifice" areas because they are generally planned to be devoid of vegetation in order to support their intended high-impact uses. Wash racks, round pens, and riding arenas are typical examples of HIAs. Shaded or covered shelter areas may also qualify as HIAs. For purposes of this manual, HIAs do not include watering troughs and supplemental feeding and mineral stations. However, any denuded areas around these sites should be addressed, as needed.

Confining livestock or allowing them to congregate for extended periods of time can adversely impact both the environment and the animals' health. Proper management of HIAs will help alleviate environmental concerns, improve livestock health, and improve the overall aesthetics of the equine operation.

Pasture Management BMPs

4.1 Forage management

Level I BMPs:

Manage the intensity, frequency, duration, and season of grazing in a manner that will promote

a stable, desirable plant community, and will give concentrated areas time for re-growth. Graze riparian areas seasonally, when soils are dry enough to withstand trampling. Stocking rates of one mature animal on less than 2 acres may require additional measures such as using supplemental feed and temporarily confining animals in sacrifice areas or stalls.

✓ **1.** Manage grazing of pastures based on established forage stubble heights (See **Table 3** for guidelines) to maintain plant vigor and prevent soil erosion.

✓ **2.** To ensure uniform grazing, subdivide larger pastures using fencing.

✓ **3.** Minimize denuded areas by establishing sacrifice areas for exercise, feeding (e.g., salt, mineral, and hay), and other non-forage production activities.

✓ **4.** Seed and mulch denuded areas, as needed, to promote healthy pastures.

✓ **5.** Use temporary exclusion fencing on denuded areas to allow for the re-growth of vegetation.

References:

1. USDA-NRCS Fence Code 382; Use Exclusion Code 472; Pasture and Hay Planting Code 512; Prescribed Grazing Code 528, Range Planting Code 550, Livestock Shade Structure Code 717, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
2. EPA, National Management Measures for the Control of Nonpoint Pollution from Agriculture, Chapter 4E, EPA 841B03004. http://www.epa.gov/nps/agmm/
3. Alberta Agriculture Food and Rural Development, Manure and Pasture Management for Horse Owners. http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex7956
4. UF-IFAS, Pasture and Forage Crops for Horses, SS-AGR-65. http://edis.ifas.ufl.edu/AA216
5. UF-IFAS, Forage Planting and Establishment Methods, SS-AGR-161. http://edis.ifas.ufl.edu/AG107

4.2 High-Intensity Areas (HIAs)

Level I BMPs:

✓ **1.** Route runoff around all HIAs using ***berms*** or ***swales***, and direct it away from watercourses, wetlands, or sinkholes into a grassed area.

✓ **2.** When there is evidence of ***sheetflow*** from an HIA, construct berms or swales downgradient of the HIA to slow the movement of water and reduce the transport of sediments.

✓ **3.** Inspect HIAs after severe weather events to ensure that associated runoff diversion mechanisms are functioning properly. Make any necessary repairs.

✓ **4.** Apply appropriate aggregate materials (such as shell) in and around HIAs, watering troughs, or other denuded areas with excessive mud or erosion.

Level II BMPs

If your answer to the following question is "yes," implement Level II BMP 4.2.5.

Question: *Under normal* ***hydrologic*** *conditions, have you observed a sandbar or significant gully erosion where your drainage ditches/canals meet, or at a point where runoff leaves your property?*

☐ *Yes* ☐ *No*

✓ **5.** Contact the USDA-NRCS County Office for assistance in correcting existing ditch or field erosion and preventing future erosion.

References:

1. USDA-NRCS, Filter Strip Code 393; Heavy Use Area Protection Code 561, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
2. San Francisco Bay Resource Conservation and Development Council, Horse Keeping: A Guide to Land Management for Clean Water http://www.californiarcandd.org/Horse%20Keeping.pdf
3. FDEP, The Florida Stormwater, Erosion, and Sediment Control Inspector's Manual. http://www.dep.state.fl.us/water/nonpoint/erosion.htm

5.0 STORMWATER MANAGEMENT

Stormwater management *is the on-site management of rainfall and associated runoff through the use of nonstructural and structural BMPs to provide flood protection and water quality protection.*

Alteration of the land (e.g., construction of impervious surfaces such as roads, driveways, parking lots, urban and agricultural structures) increases stormwater runoff. Lack of appropriate stormwater management can lead to on-site and off-site flooding, increased pollutant loading to surface and ground waters, and erosion and sedimentation.

Construction of a stormwater management system (e.g., retention or detention pond) may alter on-site hydrology, and therefore may require an ERP or other WMD surface water management permit. Check with your water management district before beginning construction of any stormwater management system.

There may be individual farm circumstances that create the need for specific stormwater management practices. Some operations may already have an ERP or other WMD surface water management permit that requires on-site stormwater management requirements. However, if stormwater problems exist that are not addressed by a WMD permit, it is important to develop and implement a stormwater management plan suited to the operation's unique circumstances.

Stormwater BMPs

5.1 Stormwater Conveyance Systems

Level I BMPs:

✓ **1.** Install gutters and downspouts on all buildings adjacent to HIAs, and divert this water away from the HIA toward pastures or other vegetated areas.

✓ **2.** Operate and maintain all stormwater management conveyances (swales, ditches, and canals) to ensure that they operate as designed.

✓ **3.** If you have an existing operation that does not have an ERP or other WMD surface water permit and has a history of downstream flooding issues, develop and implement a written stormwater management plan that provides specific responses to various types and levels of rainfall, as feasible. The goal of the plan should be a reduction in volume of off-site discharge while maintaining a healthy rooting environment. Evaluate the plan's effectiveness, and make adjustments as needed.

In developing a stormwater management plan:

- Contact your local NRCS District Conservationist to obtain information about the soil types for the proposed or existing farm location. The District Conservationist can identify soil types that are

historically prone to flooding or standing water. Evaluate the storage capacity, size, and elevations of existing ditches, ponds, creeks, rivers, and wetlands, and the size, layout, and elevations of the fields. You should also contact your county or water management district to obtain maps (FEMA, FIRM) or other information related to flooding issues at the proposed or existing location. You can access this information via the web at http://www.fema.gov/hazard/map/firm.shtm.

- Consult with a public or private agricultural engineer to discuss your stormwater management needs and considerations, especially if you are on poorly drained lands. Find an engineer qualified to provide an appropriate stormwater runoff analysis for your site.
- Determine the maximum storm size for which you want to provide flood protection. The flood control design storm addressed by WMD ERP regulations varies from a 25-year, 24-hour storm to a 100-year, 3-day storm. For example, a 25-year, 24-hour storm produces from 8 to 10 inches of rainfall in a 24-hour period. Generally, the larger the design storm event used, the more extensive the stormwater management system needs to be. Factors that will affect this decision include land availability, the existence of internal natural features such as creeks, rivers, ponds, or wetlands, the potential to flood downstream property owners, and costs.
- Include both nonstructural pollution prevention BMPs and structural BMPs, as needed.

References:

1. USDA-NRCS, Runoff Management System Code 570, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
2. Water Management Districts, ERP Stormwater Quality Applicant's Handbook.
3. ANSI/ASAE, Design and Construction of Surface Drainage Systems on Agricultural Lands in Humid Areas, EP302.4. http://www.asabe.org/standards/index.html

6.0 WATER RESOURCES PROTECTION

Water Resources *are distinct hydrologic features, including wetlands, springs, streams, and aquifers.*

Wetlands, Springs, and Streams Protection

Under Florida Law, wetlands are areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Florida wetlands generally include swamps, marshes, bayheads, bogs, cypress domes and strands, sloughs, wet prairies, riverine swamps, hydric seepage slopes, tidal marshes, mangrove swamps and other similar areas. Florida wetlands generally do not include longleaf or slash pine flatwoods with an understory dominated by saw palmetto.

Chapter 62-340, Florida Administrative Code, entitled *Delineation of the Landward Extent of Wetlands and Surface Waters*, contains the methodology that must be used by all state and local governments in Florida to determine the boundary between wetlands and uplands and other surface waters. The National Food Security Act manual is used by USDA-NRCS to determine wetlands boundaries on agricultural lands. In most cases, both methodologies produce the same or nearly the same determinations.

Springs are defined by the Florida Geological Survey as a point where underground water emerges to the earth's surface. They flow naturally from underlying aquifers and are classified based on their magnitude, or amount of flow coming from the spring vent. Springs and spring runs attract wildlife, provide over-wintering habitat for endangered manatees, contain unique biological communities, and are important archeological sites.

The area within ground water and surface water basins that contributes to the flow of the spring is a spring's recharge basin, also called a "springshed," as depicted in **Figure 6**. This area may extend for miles from the spring, and the size of the area may fluctuate as a result of underground water levels. First magnitude springs discharge 64.6 MGD (100 cubic feet per second) or more; second magnitude springs discharge between 6.46 to 64.6 MGD (10 to 100 cubic feet per second).

Figure 6

Wetlands and springs are impor-

tant components of Florida's water resources. Wetlands often serve as spawning areas and nurseries for many species of fish and wildlife, perform important flood-storage roles, cycle nutrients in runoff water, contribute moisture to the hydrologic cycle, and add plant and animal diversity. They can also provide limited grazing opportunities. Both wetlands and springs offer valuable recreational opportunities for the public and can provide an economic benefit to the surrounding communities.

Rivers and streams are naturally flowing watercourses. There are approximately 51,000 miles of rivers and streams in Florida. They are generally classified as sand-bottom, calcareous, swamp and bog, alluvial, or spring-fed systems. There are three measurable components that contribute to stream flow: base flow, interflow, and surface runoff. Surface runoff is most affected by rainfall (stormwater runoff) and contributes most to peak flow. Rivers and streams can readily transport pollutants received in stormwater runoff to wetlands, lakes, estuaries, and other water bodies. Consequently, it is important to minimize pollutant discharges to rivers and streams.

Riparian Buffers and Fencing

Riparian buffers are the single-most effective means to protect rivers and streams from bank erosion and runoff. They are areas of trees and/or shrubs located adjacent to streams, which help to reduce the amounts of sediment, organic material, nutrients, and pesticides in surface water sheetflow. Riparian buffers are most effective on highly sloped lands.

Riparian buffers should be inspected periodically, and restored as needed in order to maintain their intended purpose. Riparian buffers and filter strips should not be fertilized except as necessary to maintain vegetative cover. Any use of fertilizers, pesticides, or other chemicals should be done so as to not compromise the intended purpose of the buffer. Proper grazing management practices will ensure the long-term integrity of buffers. Any roller-chopping activities should be conducted in accordance with USDA-NRCS guidelines. Prescribed burns should be conducted, as necessary, in accordance with Florida Forest Service guidelines, to maintain the native vegetation and discourage the establishment of nuisance vegetation.

Fences may be required to keep livestock out of waterbodies, such as perennial streams. This helps reduce the streambank erosion and the incidence of animals standing in water, both of which can contribute to water quality degradation. It is important for producers to contact FDEP before installing permanent fence structures across rivers, creeks, or streams that are navigable, as this activity may result in a violation of state law. In most cases, a solution can be reached to meet the producer's needs without obstructing navigability.

Aquifer Protection

With the majority of Florida's water supply originating from underground sources (***aquifers***), it is extremely important that equine operations make every effort to protect these water sources. Sinkhole and wellhead protection are critical to maintaining ground water quality and protecting humans from accidental contamination. Sinkhole protection includes maintaining setbacks, buffers, and, if necessary, fencing. Wellhead protection is the establishment of protection zones and the implementation of safe land use practices around wells to protect them from contamination.

Successful wellhead protection includes complying with regulatory requirements and using commonsense measures that address well placement and agricultural practices near wells. For existing wells, the focus should be on management activities near the wellhead, aimed at reducing the potential for contamination. For new-well construction, the initial focus should be on well location and following sound well-construction practices, followed by proper maintenance. It is a good idea to test drinking water wells annually for coliform bacteria contamination.

Water Resources Protection BMPs

6.1 Wetlands Protection

Do not dredge or fill in wetlands. Consult with the water management district and the USDA-NRCS prior to conducting activities in or near wetlands to ensure that you are complying with any permitting or USDA program eligibility requirements.

Minimize adverse water quality impacts to receiving wetlands by progressively applying measures until the problem is adequately addressed. Practices such as filter strips, conservation buffers, swales, or holding water on-site may preclude the need for more aggressive treatment measures.

Note: *Use a USDA county soil survey map to help identify the location of wetlands, hydric soils, or frequently flooded areas. If you do not have an environmental resource permit (which provides a wetlands delineation), seek technical assistance*

from the water management district or NRCS to determine the landward boundary of wetlands on your operation.

Level I BMPs:

✓ **1.** Install and/or maintain a minimum 25-foot non-fertilized ***vegetated buffer*** upland of the landward boundary of all wetlands, unless you have an existing water management district permit (ERP, MSSW) that specifies a different buffer.

✓ **2.** For existing operations without an ERP that are unable to meet the 25-foot vegetated buffer, submit to FDACS a description of the alternative measures you will take to protect the wetlands from water quality impacts (see BMP checklist).

✓ **3.** When installing fences in wetlands, minimize the use of mechanical equipment and keep the cleared area no wider than 12 feet on either side of the fence. Perform all fence installation work in wetlands during the dry season when there is no standing water present.

Level II BMPs:

If your answer to the following question is "yes," implement Level II BMP 6.1.4:

Question: *Do you have ditches that discharge directly into wetlands?* ☐ *Yes* ☐ *No*

✓ **4.** Use spreader swales (or other means as needed) to intercept water discharging from the ditch(es), in order to reduce flow velocities and provide sheetflow through vegetative buffers prior to reaching the wetlands. Provide to FDACS a written description of the means you will use (see BMP checklist).

References:

1. USDA-NRCS, Wetland Enhancement Code 659, Nutrient Management Code 590, Filter Strip Code 393, Diversion Code 362, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
2. EPA, National Management Measures for the Control of Nonpoint Pollution from Agriculture, EPA 841B03004. http://www.epa.gov/nps/agmm/chap4c.pdf

6.2 Streams Protection

Level I BMPs:

✓ **1.** Install and/or maintain a ***riparian*** buffer along ***perennial streams*** on production areas that exceed 1-percent slope and discharge directly to the streams. Contact FDACS, NRCS, or a Technical Service Provider for assistance in properly designing the riparian buffer in accordance with USDA-NRCS Codes 390 and/or 391 in Reference (1) below.

✓ **2.** Locate and size any stream crossings to minimize impacts to riparian buffer vegetation and function. Refer to USDA-NRCS Stream Crossing, Code 578 for design criteria.

✓ **3.** Provide adequate alternative water sources, such as watering troughs.

✓ **4.** In pastures where animals have access to perennial streams, ensure that stream banks are stabilized. If you have difficulty stabilizing your stream banks, use exclusion fencing or contact NRCS for technical assistance.

References:

1. USDA-NRCS, Riparian Herbaceous Cover Code 390; Riparian Forest Buffer Code 391, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
2. EPA, National Management Measures for the Control of Nonpoint Pollution from Agriculture, EPA 841B03004. http://www.epa.gov/nps/agmm/

6.3 Protection for First- and Second-Magnitude Spring Recharge Basins

Level I BMPs:

✓ **1.** Establish and/or maintain a 100-foot non-fertilized vegetated buffer upland of the landward boundary of springs and spring runs.

✓ **2.** Establish and/or maintain a 50-foot non-fertilized vegetated buffer around sinkholes and other karst features.

✓ **3.** If you have a sinkhole on your property, never use it to dispose of used pesticide containers, manure, carcasses, spent sharps, or other materials.

References:

1. Florida Department of Community Affairs, Protecting Florida's Springs: Land Use Planning Strategies and Best Management Practices. www.dca.state.fl.us/fdcp/DCP/publications/Files/springsmanual.pdf

6.4 Nutrient and Manure Management Setbacks

Level I BMPs:

✓ **1.** Do not apply fertilizer or composted manure within 50 feet of watercourses, lakes, wetlands, drinking water wells, or sinkholes.

✓ **2.** Do not apply uncomposted manure within 100 feet, of watercourses, lakes, wetlands, drinking water wells, or sinkholes.

✓ **3.** Ensure that there is no discharge from manure storage areas into watercourses, lakes, wetlands, drinking water wells, or sinkholes. Possible measures include distance setbacks and/or constructing an impervious base (concrete or compacted clay), using a berm upgradient of the manure pile, and/or covering with a tarp or other waterproof material. Provide to FDACS a written description of the measures you are using or will use (see BMP checklist).

✓ **4.** Manure storage areas located in a karst area must be covered with a tarp or other waterproof material to prevent leaching.

References:

1. USDA-NRCS, Nutrient Management Code 590, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg

6.5 Equine Activity Setbacks

Level I BMPs:

✓ **1.** Locate new HIAs as far from watercourses, lakes, wetlands, or sinkholes as practicable for the operation. Try to achieve a distance of at least 200 feet from these resources.

✓ **2.** For HIAs within 200 feet of watercourses, lakes, wetlands, or sinkholes, maintain or install diversion or treatment mechanisms, such as berms, vegetated filter strips, or sediment basins, or other treatment or prevention measures, between the HIA and these resources. If using filter strips (**Figure 7**) or sediment basins, design them in accordance with USDA-NRCS specifications contained in Reference 1 below.

✓ **3.** Place watering troughs and ***supplemental feeding*** and mineral stations as far from watercourses, lakes, wetlands, and sinkholes as practicable for the operation. Try to achieve a distance of at least 100 feet.

Figure 7

✓ **4.** Exclude horses within a 100-foot radius of the wellheads of drinking water wells. This radius can be reduced to 25 feet if well-construction records show well-casing depths that extend through ***confining layers***.

✓ **5.** Locate riding trails a minimum of 25 feet from watercourses, lakes, wetlands, and sinkholes.

6.6 Well Operation and Protection

Level I BMPs:

If you are constructing a new well, contact your regional water management district to see whether the well requires a consumptive use or water use permit. Potable water wells as defined by Chapter 62-521, F.A.C, must follow the requirements of that rule.

Agricultural operations located in South Miami-Dade County should refer to and follow Rule 40E-30.302, F.A.C., for general well permitting information and to determine whether they are subject to special regulations for this region. Consult Reference 4 below for more information.

Locate new wells up-gradient as far as possible from likely pollutant sources, such as petroleum storage tanks, septic tanks, chemical mixing areas, or fertilizer storage facilities. Use a licensed Florida water well contractor, and drill new wells according to local government code and water management district well construction permit requirements.

✓ **1.** Use backflow prevention devices at the wellhead to prevent contamination of the water source.

✓ **2.** Inspect wellheads and pads at least annually for leaks or cracks, and make any necessary repairs.

✓ **3.** Cap or valve wells in accordance with water management district requirements.

✓ **4.** Retrofit existing functional wells with a fence or a minimum one-foot concrete collar extending from the casing, to protect them from damage.

✓ **5.** Maintain records of new well construction and modifications to existing wells.

References:

1. UF-IFAS, Farm-A-Syst Program. http://www.flagsafe.ufl.edu/snn/snn-04-09.html#F7

2. USDA-NRCS Water Well Code 642, Well Plugging Code 755, and Diversion Code 362, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg

3. Water Well Permitting and Construction Requirements, FDEP Rule 62-532, F.A.C. http://www.dep.state.fl.us/legal/Rules/rulelistnum.htm

4. General Permits for Water Wells within SFWMD; Thresholds for South Dade County, Chapter 40E-30.302, F.A.C., https://my.sfwmd.gov/pls/portal/docs/PAGE/PG_GRP_SFWMD_ENVIROREG/PORTLET_RULESSTATUTESAND/TAB383534/40E-30.PDF

5. Florida Water Permits. http://flwaterpermits.com/

Notes:

*See **Appendix 3** for a reference table containing the setbacks in this chapter.*

*See **Appendix 7** for list of record-keeping requirements and example record-keeping forms.*

7.0 EQUINE WATERING REQUIREMENTS AND SOURCES

Equine Watering Sources *are strategically located freshwater sources that provide adequate drinking water to livestock.*

Watering Requirements

It is important to calculate your livestock's water needs and compare this to the landscape's existing water resources and their ability to provide year-round water supply to livestock. On average, a horse's estimated intake of freshwater is between 6 and 10 gallons a day, depending upon the diet, time of year and whether lactating mares are present. However, horses can consume as much as 18 to 24 gallons of water a day, or more under hot conditions and heavy exercise, so it is advisable to provide at least 20 gallons of water a day per animal. A horse's stomach can only hold approximately 3 to 4 gallons of water at a time, so horses need constant access to water.

Water Sources

Careful evaluation and site-specific decision making regarding equine water sources can have a significant role in protecting water quality, and can preclude or minimize the need to install costly exclusion fencing adjacent to natural waterbodies. Equine operators should educate themselves as to whether any water sources being considered have documented water quality impairment(s) as a result of fecal coliform bacteria loading. Fencing should be used to keep horses away from flowing water features that leave the site.

As much as possible, horses should be kept from natural water sources to avoid bank erosion, excessive muddy conditions, and waterbody pollution. Horses' hooves can destroy the grasses at the water's edge, especially when the ground is already wet, thereby reducing its filtering capacity. Manure and urine on the banks can also filter into the water much more readily, which can create both on-site and downstream water quality and health hazards.

If no alternative water sources are available, livestock may gravitate towards deep-water wetland habitats, such as swamps and marshes, or to canals that have standing water present during most of the year. Some of these wetlands and canals may be connected hydrologically to downstream ***watercourses***.

Providing fresh water in troughs and/or tanks helps keep livestock out of waterbodies and reduce health risks associated with consumption from stagnant surface water sources. Troughs and tanks should be checked daily for the presence of dead rodents or other small animals, to avoid the risk of botulism. Rodents can also introduce *Leptospira* bacteria into water supplies, which can cause illness in horses and abortion in mares.

Existing water uses may require a permit from your regional water management district. If you already have a permit, determine whether the permitted amount is adequate for your current stocking rate and other associated uses. Also, determine whether the permit is current and when it will need to be reviewed or renewed.

Washing Horses

Washing horses can result in a concentration of chemicals in one spot and/or muddy, unsanitary conditions. Whether the wash area is inside or outside the barn, sanitation, safety, proximity to water sources and environmental impacts are key factors to be considered. It is important to obtain material safety data sheets (MSDS) for all detergents, shampoos, pesticides, and other animal cleaning products. Use cleaning products sparingly, and select ones that are the most environmentally friendly, using the MSDS sheet for guidance.

Watering Source BMPs

7.1 Equine Watering Source BMPs

Level I BMPs:

Conduct an inventory of existing water sources and average number of horses to estimate water use (daily intake of water) to ensure that an adequate supply of water is always available. Take into account additional water needs based on excessive temperatures and exercise levels. It is a good idea to maintain records of water use on the operation to provide a basis for permit modifications or renewals,

✓ **1.** Install a shut-off device on all troughs. Do not allow troughs to overflow, and turn the water off when not in use.

✓ **2.** Maintain all tanks, troughs, wells, and associated structures in good working order. Inspect the distribution system and watering troughs for leaks at least weekly, and make any necessary repairs.

References:

1. USDA-NRCS, Pond Code 378, Watering Facility Code 614, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
2. North Dakota State University, Livestock and Water, AS-954. http://www.ag.ndsu.edu/pubs/ansci/livestoc/as954w.htm
3. University of Delaware Cooperative Extension, Horse Health Depends on Water. http://ag.udel.edu/extension/agnr/pdf/eq-13.pdf

7.2 Horse-Washing BMPs

Level I BMPs:

If constructing a permanent wash rack, a concrete slab with a rough finish is ideal. Rubber mats or poured rubber particle finishes can also be used on top of the concrete, if desired. Slab drains can be designed to discharge to a small on-site holding pond or filter strip. If a drain in the slab is not constructed, the slab should be pitched so that the water gently runs off. A trench filled with gravel can then be incorporated into the design to receive water from the lowest point of the slab.

✓ **1.** If not using a permanent wash rack, rotate horse washing sites, using established turf areas to prevent mud and sedimentation problems. If necessary, portable rubber mats can be used to prevent denuding of turf areas.

✓ **2.** Whether permanent or temporary washing areas are used, locate them at least 50 feet away from waterbodies, wells, and domestic septic tank drain fields. Direct runoff to a well-vegetated area.

References:

1. Pervious Concrete as a Flooring Material for Horse Handling Areas Higgens et al. 2007 UKY Ext. ID161. http://www.uky.edu/Ag/AnimalSciences/pubs/id161.pdf.

8.0 PESTICIDE/PHARMACEUTICAL USE

Pesticide Use *combines the monitoring of pest and environmental conditions with the judicious use of cultural, biological, physical, and chemical controls to manage pest problems.*

Pest Management

Integrated Pest Management (IPM) combines proper plant selection, correct cultural practices, the monitoring of pest and environmental conditions, the use of biological controls, and the judicious use of pesticides to manage pest problems. The term "pests" includes any organism that is damaging to livestock, crops, humans, or land fertility.

The basic steps of an IPM program are as follows:

- Identify key pests.
- Determine the pest's life cycle, and know which life stage to target (for an insect pest, whether it is an egg, larva/nymph, pupa, or adult).
- Use cultural, mechanical, or physical methods to prevent problems from occurring (for example, prepare the site and select resistant plant cultivars), reduce pest habitat (for example, practice good sanitation), or promote biological control (for example, provide nectar or honeydew sources for natural enemies).
- Decide which pest management practice is appropriate and carry out corrective actions. Direct the control where the pest lives or feeds. Use properly timed preventive chemical applications only when your professional judgment indicates that they are likely to control the target pest effectively, while minimizing the economic and environmental costs.
- Determine whether the methods used actually reduced or prevented pest populations, were economical, and minimized risks. Record and use this information when making similar decisions in the future.

Pesticide Selection and Use

The EPA and the FDACS regulate the use of pesticides in the U.S. The term pesticide is defined by EPA as any substance or mixture of substances intended for *preventing, destroying, repelling, or mitigating* any pest. Pesticides include insecticides, herbicides, fungicides, rodenticides, etc.

Pesticides should be used only when necessary. To minimize the potential for pollution of water resources, base pesticide selection on the characteristics of the pesticide (solubility, toxicity, degradation, etc.) and the site (geology, depth to water table, proximity to surface water, etc.). Use pesticides that have the least effect on beneficial organisms.

Choosing the proper pesticide in this class also requires familiarity with product labels and performance. **Always follow the label directions**.

The label is the single most important document in determining the correct use of a pesticide, and state and federal pesticide laws require strict adherence to label directions.

Proper records of all pesticide applications should be kept according to state and federal requirements. These records help to establish proof of proper use, facilitate the comparison of results of different applications, or find the cause of an error. Sample record keeping forms can be found at the FDACS Bureau of Compliance Monitoring at: http://www.freshfromflorida.com/onestop/forms/13340.pdf.

Pesticide Application Equipment Calibration

Controlling application rates and calibrating pesticide equipment reduce the potential for pollutant loading to ground and surface waters. To apply the precise amount of pesticide to targeted pests, pesticide application equipment must be properly calibrated. Application rates must be in accordance with the label in order to prevent contamination to the environment.

Equipment calibration should take place away from wells, sinkholes, or waterbodies, and should be done with clean water. Calibrate sprayers every time a nozzle is replaced, and compensate periodically for wear in pumps, nozzles, and metering systems.

Pesticide Mixing and Application

Avoid mixing pesticides and loading or rinsing sprayers immediately adjacent to wells or waterbodies, since spills in these areas can easily contaminate water supplies. If the farm does not have a permanent or temporary mixing and loading facility, use nurse tanks and mix at random sites to prevent a buildup of contamination in the soil. If this is not possible, run a long hose (100 to 200 feet) away and preferably downhill from the supply well to the mix-and-load area and guard against accidental spills. Install anti-siphon devices or ensure that there is an air gap between the hose and the tank when sprayers are filled.

Minimize field applications of pesticides just prior to periods of anticipated heavy or sustained rainfall to prevent surface water contamination, accelerated leaching to ground water, and/or ineffective control of target pests. If applying restricted-use pesticides, the applicator must be fully trained and licensed in accordance with Rule 5E-9.024, Florida Administrative Code, or must hire someone appropriately certified. Applicators must read and follow all label directions and the directions on the Material Safety Data Sheets.

Pesticide Waste

Pesticide equipment wastewater should be minimized and contained as much as possible. If economically feasible for large operations, an impermeable floor with a curb can be constructed to handle the mixing and loading of pesticides, and the washing of pesticide residues from equipment. The equipment only needs to be washed when changing from one pesticide to another, instead of after every application. This practice will reduce the amount of ***rinsate***, which can be collected and used in accordance with the label during the next application.

Pesticide spills should be cleaned up immediately following an incident. Barriers and absorbent materials are generally used to contain spills. Soil contaminated by a spill should be collected, stored in a special container, and re-used during subsequent applications. Spill clean-up equipment and trained emergency responders should be used when handling spill incidents. The quick containment and clean-up of pesticide spills will help protect the environment and minimize your liability.

For additional information, refer to *Best Management Practices for Agrichemicals and Farm Equipment Maintenance* which can be accessed online at: http://www.floridaagwaterpolicy.com/BestManagementPractices.html

Pharmaceutical Use

The use and misuse of pharmaceuticals, such as antibiotics and hormones, can have a negative impact on water quality. This is an issue nationwide, as sampling has revealed detectable amounts of antibiotics, hormones, sterols and other substances in surface waters from various sources. Because of this, it is very important to use these products responsibly. Follow all state and federal regulations and properly dispose of spent needles, expired or unused pharmaceuticals, and pharmaceutical containers.

The proper disposal of unused pharmaceuticals is necessary for environmental, livestock, and human health. Expired medications often can be returned to the supplier/manufacturer or some veterinary offices. Check with your local municipality to see if they will accept pharmaceuticals during household hazardous waste disposal events.

Figure 8

Proper disposal of spent needles, referred to as "sharps," is regulated by EPA. These regulations require that needles be disposed of in a biomedical container designed for collection of sharps. See: www.epa.gov/osw/nonhaz/industrial/medical/disposal.htm Spent needles should be collected in these containers to avoid accidental needle sticks of farm workers or animals. Local veterinary offices should be able to provide these containers, labeled "Biohazard," as indicated in **Figure 8**. Many county solid waste departments will take the sharps containers and properly dispose of them for a small fee, and some counties provide this service for free. Contact the local solid waste office for more information. Operators should check with their county extension office to see whether local ordinances apply.

Follow pharmaceutical label instructions for disposal of unused product. Do not pour unused product down a sink or drain. Instead, dispose of it in household trash, using the following guidelines:

- Pour product into a sealable plastic bag. If it is a solid (pill, liquid capsule, etc.), crush it or add water to dissolve it.
- Add kitty litter, sawdust, or coffee grounds to the plastic bag. Seal the plastic bag and put it in the trash.
- Remove and destroy identifying personal information (prescription label) from all containers before recycling them or throwing them away.

Pesticide and Pharmaceutical BMPs

8.1 Storage, Handling, and Application

Practice IPM and use all pesticides in accordance with the label. Rinse, recycle, or dispose of empty pesticide containers following federal, state, and local regulations. When applying a pesticide close to a stream, canal, pond, or other waterbody, choose a pesticide with an active ingredient that has a lower toxicity to aquatic organisms.

Level I BMPs:

✓ **1.** Store pesticides in a roofed structure with a lockable door, at least 100 feet from wells, surface waters, and sinkholes.

✓ **2.** When mixing pesticides in the field, conduct loading activities at random locations. Use a check valve or air gap separation to prevent backflow into the tank when filling a sprayer.

✓ **3.** Dispose of spent needles and unused pharmaceutical products by using an approved biomedical container, or by following other guidance approved by the EPA.

References:

1. FDACS and FDEP, Best Management Practices for Agrichemical Handling and Farm Equipment Maintenance. http://www.floridaagwaterpolicy.com/BestManagementPractices.html

2. UF-IFAS, Use Management Practices to Protect Groundwater from Agricultural Pesticides, UF-IFAS, PI 1. http://edis.ifas.ufl.edu/PI001

3. UF-IFAS, Management Practices to Protect Surface Water from Agricultural Pesticides, PI 22. http://edis.ifas.ufl.edu/PI014

4. USDA, Core 4 Conservation Practices Training Guide, Part III. www.nrcs.usda.gov/technical/ECS/agronomy/core4.pdf

5. USDA-NRCS, Agrichemical Handling Facility Code 702, Pest Management Code 595, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg

9.0 ANIMAL MORTALITY MANAGEMENT

Animal mortality management *involves the proper transport, storage, and disposal of dead animals to avoid impacts to water quality and livestock and human health.*

Animal carcasses contain microorganisms, some of which may be pathogenic (disease-causing) to animals and/or humans. Proper management of animal mortalities will prevent the movement of these organisms to surface or ground water and will, therefore, reduce the risk of transmitting diseases to healthy livestock. Proper management of mortalities will also protect surface waters from organic loads that can lower dissolved oxygen levels and kill fish. In addition, odor problems can be prevented.

Viable mortality management methods include rendering, incineration, composting, burial, or hauling the carcass to a county landfill that is approved to accept animal carcasses. Many of these methods are detailed in the guidance document, *Florida Animal Producer Guidance for Routine Disposal of Animal Carcasses,* which can be found at: http://www.flsart.org/ACMWG/documents/documents.htm. FDEP Chapter 62-701, F.A.C., Solid Waste Management Facilities, may apply if operators are faced with catastrophic death of livestock and dispose of the carcasses on-site.

Sanitation and Disease Control Measures

Identify appropriate means for off-site disposal, since some operations have limited resources for on-site burial. Contact your county government to inquire about disposal regulations for carcasses.

Each of the following pests or diseases is declared to be a dangerous, transmissible pest or disease of animals and to constitute an animal and/or public health risk. Any person who has knowledge of, or suspects, the existence of any of these diseases or pests, or a newly emerging disease that might result in unusually high animal loss, must immediately report suspicions or findings to the State Veterinarian (during office hours: (850) 410-0900; fax: (850) 410-0915; after hours: (800) 342-5869; email: rad@freshfromflorida.com).

- African Horse Sickness
- Anthrax
- Brucellosis (B. abortus, B. suis)
- Southern Cattle Tick Infestation (Boophilus)
- Contagious Equine Metritis
- Dourine
- Equine Encephalitis (Eastern, Western, Venezuelan, or West Nile Virus)
- Equine Herpes Virus (Neurological Disease)
- Equine Infectious Anemia
- Equine Piroplasmosis (Horse Tick Fever)

- Equine Viral Arteritis
- Glanders
- Rabies
- Screwworm Infestation
- Strangles (Equine)
- Tropical Horse Tick Infestation (Demacentor nitens)
- Tuberculosis
- Vesicular Exanthema
- Vesicular Stomatitis

While transporting carcasses, keep them contained in a sanitary manner to prevent spreading infection. Clean and disinfect any mechanical equipment surfaces that were in contact with the carcasses, especially if you suspect a virulent disease organism to be the cause of death.

If one is available, use a licensed rendering or incineration facility. Ensure that the facility has received all applicable permits. If animals have been euthanized with barbiturates, bury, incinerate, or otherwise dispose of the carcasses in a sanitary manner to prevent access by wildlife or pets, as consumption may be fatal. Stabilize soil until vegetation has re-established on top of burial sites. Inspect burial sites on a regular basis for integrity and to ensure vegetative cover is maintained.

If composting animal carcasses, remember that they are very high in nitrogen and have an average C:N ratio of 5:1. Because of this, they will likely require a supplemental carbon source to decompose properly.

Mortality Management BMPs

9.1 On-Site Carcass Disposal Practices

Level I BMPs:

✓ **1.** For below-ground burial, locate any burial site at least 100 feet from adjacent property and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes. Burial sites should be at least 2 feet above the seasonal high ground water table and should allow for at least 2 feet of cover. Identify burial sites on a map and keep it available for future reference.

✓ **2.** For above-ground burial, move dead horses to an upland area at least 100 feet from adjacent property and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes. Cover with 6 inches of compacted soil and at least 2 feet of additional soil.

Contact your county government to inquire about disposal regulations for carcasses.

References:

1. USDA-NRCS, Agricultural Waste Management Field Handbook http://www.wsi.nrcs.usda.gov/products/W2Q/AWM/handbk.html
2. USDA-NRCS, Animal Mortality Facility Code 316; Composting Facility Code 317, FOTG-Section IV. http://www.nrcs.usda.gov/technical/efotg
3. Minnesota Department of Agriculture, Composting Animal Mortality, http://www.mda.state.mn.us/news/publications/animals/compostguide.pdf
4. FDACS, Florida Animal Producer Guidance for Routine Disposal of Animal Carcasses. http://www.flsart.org/ACMWG/documents/documents.htm

APPENDICES

APPENDIX 1: ACRONYM LIST AND GLOSSARY

AFO: Animal Feeding Operation.

Aquifers: Soil or rock formations that contain ground water and serve as a source of water that can be pumped to the surface.

AUP: Agricultural Use Plan.

Berm: A ridge of compacted soil located at the top or base of a sloped, disturbed area.

Best Management Practice (BMP): A practice or combination of practices determined by the coordinating agencies, based on research, field-testing, and expert review, to be the most effective and practicable on-location means, including economic and technological considerations, for improving water quality in agricultural and urban discharges. Best Management Practices for agricultural discharges shall reflect a balance between water quality improvements and agricultural productivity.

Biosolids: The solid, semisolid, or liquid residue generated during the treatment of domestic wastewater in a permitted domestic wastewater treatment facility.

BMAP: Basin Management Action Plan.

BOD: Biochemical Oxygen Demand.

CAFO: Concentrated Animal Feeding Operation.

CFR: Code of Federal Regulations.

C:N: Carbon to Nitrogen Ratio.

Composite Sample: A single water quality sample that is prepared by combining numerous single or "grab" samples intended to produce a typical or average sample for analysis.

Confining Layer: A layer of earth material, usually clay, which does not readily transmit water, and thereby restricts the vertical movement of water into and out of an aquifer.

Continuous Grazing: The grazing of a specific unit by livestock throughout the year or for that part of the year during which grazing is feasible.

CREP: Conservation Reserve Enhancement Program.

CRP: Conservation Reserve Program.

CSP: Conservation Security Program.

Cyanobacteria: Cyanobacteria are autotrophic bacteria capable of producing their own food through photosynthesis, much like algae.

ECP: Emergency Conservation Program.

EDIS: Electronic Document Information System.

EPA: Environmental Protection Agency.

EQIP: Environmental Quality Incentives Program.

ERP: Environmental Resource Permit.

ESTL: Extension Soils Testing Laboratory.

Enhanced-Efficiency Fertilizers: Products that minimize the potential for nutrient losses to the environment. They include slow or controlled-release, stabilized nitrogen, nitrification inhibitor, and urease inhibitor fertilizer products.

F.A.C.: Florida Administrative Code.

FDACS: Florida Department of Agriculture and Consumer Services.

FDEP: Florida Department of Environmental Protection.

FDOH: Florida Department of Health.

FEMA: Federal Emergency Management Agency.

Filter Strip: A strip of permanent herbaceous vegetation between farm production areas and downstream environmental features. Filter strips are designed to treat runoff via overland flow.

FIRM: Flood Insurance Rate Maps.

FOTG: Field Office Technical Guide.

F.S.: Florida Statutes.

FSA: Farm Services Agency.

FWRA: Florida Watershed Restoration Act.

High-intensity areas (HIA's): Areas of an equine operation that have been denuded of ground cover due to repeated use by livestock (e.g., sacrifice areas, arenas, round pens, hotwalkers, etc.). For purposes of this manual, HIAs do not include watering troughs and supplemental feeding and mineral stations

Hydrologic: Relates to the movement, distribution, and quality of the earth's water.

IPM: Integrated Pest Management.

Karst: Landforms or terrain caused by the dissolution of soluble rock (limestone or dolostone) characterized by springs, sinkholes, and caves.

MSDS: Material Safety Data Sheet.

MSSW: Management and Storage of Surface Waters.

NOI: Notice of Intent.

N-P-K: Nitrogen, Phosphorus and Potassium.

NPS: Nonpoint Source.

Perennial Streams: Streams or rivers that flow in a well-defined channel throughout most of the year under typical climatic conditions.

Petioles: The stalk by which a leaf is attached to a stem, also referred to as a leafstalk.

PPM: Parts per Million.

Prescribed Grazing: The controlled harvest of vegetation with grazing or browsing animals managed with the intent to achieve a planned objective(s).

PVC: Polyvinyl Chloride.

Rinsate: The solution remaining after rinsing something.

Riparian: Vegetated ecosystems along a watercourse, characterized by a high water table and subject to periodic flooding and influence from the adjacent watercourse.

Rotational Grazing: The grazing of two or more subdivisions of pasture in sequence, followed by a rest period for recovery and re-growth.

Sacrifice Areas: A sacrifice area, a type of high-intensity area, is a fenced subdivision (paddock or pen) used for exercising horses in order to minimize denuding of primary pasture areas. The sacrifice area can also be used when pastures are overgrazed or require maintenance.

Sheetflow: The flow of water in a thin layer across the land surface, initiated by a rain event.

Sinkhole: For the purposes of this manual, a sinkhole is an opening in the ground resulting from the collapse of overlying soil, sediment, or rock into underground voids created by the dissolution of limestone or dolostone.

Springs: A point where underground water emerges to the earth's surface (including the bottom of the ocean).

Stocking Rate: The number of animals or the animal live weight assigned to a grazing unit on a seasonal basis.

Swale: A manmade, vegetated trench that has a top width-to-depth ratio of 6:1 or greater, or side slopes of 3 feet horizontal to 1 foot vertical or greater. A swale treats standing or flowing water following a rainfall event.

Supplemental Feeding: Supplying feed to livestock when available forage is too limited to meet their minimum daily requirement.

SWCD: Soil and Water Conservation District.

TMDL: Total Maximum Daily Load.

UF-IFAS: University of Florida, Institute of Food and Agricultural Sciences.

USDA-NRCS: United States Department of Agriculture, Natural Resources Conservation Service.

USGS: United States Geological Survey.

Vegetated Buffer: An area covered with vegetation suitable for nutrient uptake and soil stabilization, located between a production area and a receiving water or wetland.

Watercourse(s): Any natural or man-made (ditch or canal) water feature that flows continuously or intermittently. For the purposes of this manual, watercourses do not include wetlands.

Watersheds: Described as drainage basins or regions of land where water drains downhill into a specified body of water.

Wetlands: As defined in section 373.019(25), Florida Statutes, wetlands means those areas that are inundated or saturated by surface water or ground water at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Soils present in wetlands generally are classified as hydric or alluvial, or possess characteristics that are associated with reducing soil conditions. The prevalent vegetation in wetlands generally consists of facultative or obligate hydrophytic macrophytes that are typically adapted to areas having soil conditions described above.

WHIP: Wildlife Habitat Incentive Program.

WMDs: Water Management Districts.

WRP: Wetland Reserve Program.

APPENDIX 2: ADDITIONAL BMP REFERENCES

1. On-Farm Composting Handbook

This handbook, developed by the Natural Resource, Agriculture, and Engineering Service, presents a thorough overview of farm-scale composting and explains how to produce, use, and market compost. Topics covered include benefits and drawbacks, the composting process, raw materials, methods, operations, management, site and environmental considerations, using compost, marketing, economics, and other options for waste management. The handbook can be found at: http://www.nraes.org/nra_order.taf?_function=detail&pr_booknum=nraes-54#description

2. Calculating Manure and Manure Application Rates

This guide, developed by Purdue University, contains comprehensive nutrient and mineralization/availability values for all types of manure. It also includes information for manure spreader calibration. The guide can be found at: http://www.ces.purdue.edu/extmedia/AY/AY-277.html

3. Horse Keeping: A Guide to Land Management for Clean Water

This document, developed by the San Francisco Bay Resource Conservation and Development Council, contains a method for equine to evaluate their property for sediment and/or nutrient impacts. It also advocates development of a written manure management plan, and a water quality monitoring program if adjacent to creeks or streams. The document can be found at: http://www.mcstoppp.org/acrobat/Horse%20Keeping%20Guide.pdf

4. Small Farm Environmental Issues

This website resource is a compendium of extension articles geared to the smaller equine operation. Focus articles have been developed for manure storage, barnyard and open lot management, as well as pasture management. The articles can be found at: http://www.extension.org/pages/Small_Farm_Environmental_Issues_Articles

5. Manure and Pasture Management of Horse Owners

This document, developed by Alberta Agriculture Food and Rural Development is an excellent resource on manure and pasture management practices for water quality protection. It can be found at: http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex9377

APPENDIX 3: BUFFERS AND SETBACKS

Reference Table for Setbacks			
BMP #	**Practice**	**Setback (Feet)**	**Hydrologic Feature Type**
2.1.3	Manure storage areas	100	Private potable wells
2.1.3	Manure storage areas	200	Watercourses, sinkholes
2.1.3	Manure storage areas	300	Public Potable wells
3.1.3	Access roads	25	Wetlands
6.1.1	Vegetated buffer	25	Wetlands
6.3.1	Vegetated buffer	100	Springs, spring runs
6.3.2	Vegetated buffer	50	Sinkholes
6.4.1	Fertilizer application	50	Watercourses, lakes, wetlands, sinkholes
6.5.1	High-intensity areas	200	Watercourses, lakes, wetlands, sinkholes
6.5.3	Water troughs, supplemental feed and mineral	100	Watercourses, lakes, wetlands, sinkholes, drinking water wells
6.5.4	Riding trails	25	Watercourses, lakes, wetlands, sinkholes
6.6.5	Livestock exclusion	75	Drinking water wells
7.2.2	Horse washing areas	50	Waterbodies, wells, drainfields
8.1.1	Pesticide Storage	100	Wells, surface waters
9.1.1	Burial sites	200	Watercourses, streams, wetlands, wells, sinkholes

APPENDIX 4: SOIL AND TISSUE TESTING INFORMATION

Soil Testing

The soil testing process comprises four major steps, and understanding each one clearly will increase the reliability of the process tremendously. The steps in the soil testing process are:

- soil sampling
- sample analysis
- interpretation of test results
- nutrient recommendations

Soil Sampling: Soil samples need to be representative of the field and soil types and the soil analysis results will be only as good as the submitted sample is. Samples collected from areas that differ from typical characteristics of the farm should be submitted separately and should not be consolidated with the primary samples. Using a management zone (area on the farm that is managed similarly) as a guiding factor to collect and consolidate samples is strongly recommended to optimize resources. Consult the UF-IFAS Extension Fact Sheet SL181 for further information on soil sampling strategies and/or to obtain the appropriate soil test sheet which can be found at: http://soilslab.ifas.ufl.edu/ESTL%20Tests.asp

Sample Analysis: The soil samples that are submitted to the testing laboratories undergo a series of physical and chemical processes that are specific to the soil types, crops, and management regimes. Once the soil samples are homogenized through grinding and/or sieving, a precise volume of the sample will be extracted for plant nutrient through an extraction procedure. The following standard methods are followed at the UF-IFAS Soil Testing Laboratories for different soils in Florida:

a. Mehlich-1 extraction – this method is performed on all acid-mineral soils up to a soil pH of 7.3.

b. AB-DTPA extraction – this method is performed on alkaline (calcareous) soils with a pH of 7.4 and above.

c. Water extraction – this method is used for extraction of P in all organic soils.

d. Acetic acid extraction – this method is performed on all organic soils for extraction of K, Mg, Ca, Si, and Na..

It is extremely important that procedures used at the laboratories are well understood before submitting the samples since most BMPs are tied to the standardized procedures used by the labs at the land-grant universities in the state such as UF-IFAS. Similarly, it is also very important to note that the UF-IFAS laboratory does not offer any test for N since there is no reliable test for plant available N under Florida conditions. N recommendations are based on crop nutrient requirements found in the research literature. More information regarding the procedures used at the UF-IFAS Extension Soil Testing Laboratory in Gainesville can be found in the extension publication, Circular 1248.

Interpretation of Test Results: The primary goal of state laboratories in offering the soil testing service is to provide interpretation of the soil test results based on soil test-crop response trials and field calibration of the test results with the optimum economic yields of the various plant species. Economic yield increases resulting from added nutrients cannot be obtained once the test results are interpreted as 'High' resulting in no recommendation for that particular nutrient. The interpretations provided are specific to the soil and plant species. Current interpretation tables can be obtained from SL 189 UF-IFAS extension fact sheet.

Nutrient Recommendations: To reiterate, nutrient recommendations based on soil test results are formulated based on the optimum economic crop response to an added nutrient to the soil.

Tissue Testing

Tissue testing is the analysis and diagnosis of the plant's nutritional status based on its chemical composition. It is commonly performed as analyses on dried blades, leaves or dried ***petioles*** or on sap from fresh petioles, with results compared to recommended nutrient ranges.

Efficient fertilizer management is important to reduce costs, conserve natural resources, and to minimize potential impacts on the environment. These goals can be achieved through optimum management of the fertilizer component. Timely tissue testing is an important tool used in fertilizer management through monitoring the plant's nutritional status, and such testing is also used in diagnosing suspected problems like nutritional deficiency, toxicity or imbalance. As a management tool, tissue testing can increase your return by preventing deficiencies that can reduce yield(s), market quality, and profitability.

Methodology: Begin sampling soon after the crop is established and continue at regular intervals (weekly or biweekly). Individual plants, even side-by-side, may have different nutritional status. Therefore, by sampling a sufficiently large number of plants, the effect of this error due to inherent variability should be minimized. It is preferable to include a soil sample together with a tissue sample when submitting samples to a diagnostic lab, since the soil sample may indicate other factors – such as pH – that may influence crop growth, nutrient availability, and uptake. Avoid plant tissue testing if the field has received foliar nutrient sprays containing micronutrients or nutrient-containing pesticides. Also, avoid sampling plants damaged by pests, diseases, or other chemicals when trying to monitor the nutritional status of the sod.

Whole-leaf sampling will be most useful early in the season, while later in the season, it can help to point to changes in fertilization practices that are needed for the next season. Fresh petiole sap testing for N and K, practiced regularly throughout the season, can help manage the current crop as well as provide guidance for the next crop. Sample a recently matured leaf blade. Collect enough leaf material so that the sample is representative of the crop stand, and that the sample is large enough to perform the required analyses.

If a deficiency is suspected, collect one ***composite sample*** from the area exhibiting the disorder and a second sample from an otherwise "normal" section for comparison when trying to diagnose a nutrient deficiency. Separate and properly label the "disorder" sample and the "normal" sample in order to make a valid comparison after analyses. Keep notes on condition of the sod and stage of growth, weather, and other variables for future reference.

Be careful not to crush or damage samples during cleansing. Avoid using tap water to rinse blade samples, since it can be high in nutrients such as calcium, iron, magnesium, or sulfate sulfur. Use distilled water instead. In most situations, cleansing is not needed. Blot the samples dry with absorbent paper after rinsing, and air-dry the samples several hours before shipment. Wrap the samples in absorbent paper and place them in a large envelope if a plant analysis kit is not available, and mail immediately.

Select a reputable laboratory that provides interpretations and recommendations based upon test results, which are appropriate for your growing region. Interpretation guidelines should be based on actual field research, not on "typically observed" or historical lab databases. The laboratory should be reliable and accredited and also offer a routine turnaround of less than 48 hours.

For more information please see SL 131, Plant Tissue Information Sheet, Soil and Water Science Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Last revised July 2005. http://edis.ifas.ufl.edu/SS182.

References:

1. Sartain, J.B. 2001. Soil Testing and Interpretation for Florida Turfgrasses. SL181. Soil and Water Science, Cooperative Extension Service. IFAS, p. 2. http://edis.ifas.ufl.edu/SS317.
2. Mylavarapu, R.S. and E.D. Kennelley. 2002. UF-IFAS Extension Soil Testing Laboratory Analytical Procedures and Training Manual. Soil and Water Science, Circular 1248, Cooperative Extension Service, IFAS, http://edis.ifas.ufl.edu/SS312.
3. Mylavarapu, R.S. 2002. The Process of Standardized Nutrient Recommendation Development for Successful Crop Production and Environmental Protection. SL 189, Soil and Water Science, Cooperative Extension Service, IFAS. http://edis.ifas.ufl.edu/SS401.

APPENDIX 5: NUTRIENT BUDGET WORKSHEET

Note: *Use a separate worksheet for each crop or fertilization plan*

Equine Owner/Operator:	County:	Date:
Prepared by:	Field # :	

Table 1 – Field Conditions and Nutrient Recommendations

Type of Crop	**Use**	**Expected # of cuttings (for hay only)**
Current Soil/Tissue Test Levels		
P	**K**	**pH**	**Tissue P (bahiagrass)**
Recommended Nutrients/Amendments (lb/acre)		
N	**P_2O_5**	**K_2O**	**Lime**

Table 2 – Nutrient Sources and Amounts

	N	**P_2O_5**	**K_2O**
Residual Nutrients	**Pounds per acre**		
1. Nitrogen residual from previous legume crop			
2. Residual from long-term land application of manure			
3. Residual from long-term biosolids (sewage sludge) application			
4. Atmospheric deposition	**3**	**Negligible**	**Negligible**
5. Other Sources			
6. Total Residual Nutrients			
Residual Nutrient Status			
7. Nutrients recommended (from table 1 above)			
8. Nutrient status (subtract line 7 from line 6)			
If line 8 is 0 or a positive number, the residual nutrients meet or exceed the crop requirements. You do not need to apply additional nutrients. Stop here.			
If line 8 is a negative number, this is the amount of additional nutrients needed to meet the crop recommendation. Below, show the planned applications to meet the crop recommendation.			

Planned Fertilizer Applications	N	P_2O_5	K_2O
9. Land application of manure			
10. Biosolids (Sewage Sludge)			
11. Commercial fertilizer			
12. Total amount of planned applications *(not to exceed the negative number in line 8)*			
13. Method, form, and timing of application:			

Instructions to Complete the Nutrient Budget Worksheet

1. Table 1. Field Conditions and Nutrient Recommendations

- Enter the current crop (Ex: Bermudagrass hay or bahiagrass grazed) by Field #.
- For hay, enter expected # of cuttings (Ex: 3 cuttings/yr).
- Enter current soil test levels (ppm). These test levels should be derived from a method approved by the UF-IFAS soil testing lab. A current soil test is one that is no more than 1 year old at the time of planned fertilizer application.
- Enter recommended amount(s) of nutrients/amendments. Use UF-IFAS Circular SL-129 – *Standardized Fertilization Recommendations for Agronomic Crops* to determine the amount(s). Recommendations for phosphorus, lime, and potassium will be based on soil test results.

2. Table 2. Nutrient Sources and Amounts

- **Line 1:** Enter estimated N residual (lb/acre) from a previous legume crop (i.e., clovers, perennial peanut, soybeans). Estimated N values can be obtained from UF-IFAS research publication, *Nitrogen Fixation and Inoculation of Forage Legumes, SS-AGR-56* at: http://edis.ifas.ufl.edu/AG152
- **Line 2:** Enter estimated N and P residual (lb/acre) from long-term manure applications. This is manure that has been land-applied, and not the manure deposited by the horse while grazing. The amount of N and P that becomes available depends on the rate of mineralization or decay which is based on the type of manure, its analysis, and the length of time that it is on the field. For N, horse manure that is incorporated into the soil has a decay rate of 0.50; 0.35; 0.10. This means that 50 percent of the incorporated nitrogen becomes available the first year, 35 percent of the remaining nitrogen becomes available in the second year, and 10 percent of the remainder in the third year. For P, the decay rates are 0.80; 0.10; 0.05. Remember to sum all of the residual values over a three-year period before entering the number on Line 2. Book values for decay rates of other manures can be found in the USDA-NRCS Agricultural Waste Management Field Handbook, Chapter 11 at: http://policy.nrcs.usda.gov/viewerFS.aspx?hid=21430
- **Line 3:** Enter estimated N residual from long-term biosolids application. Calculate this amount using information from the permitted domestic wastewater treatment plant residuals analysis. For N, biosolids have a decay rate of 0.40; 0.20; 0.10. This means that 40 percent of the incorporated nitrogen becomes available the first year, 20 percent of the remaining nitrogen becomes available in the second year, and 10 percent of the remainder in the third year. Remember to sum all of the residual values over a three-year period before entering the number on Line 3.
- **Line 4:** The amount of nitrogen from atmospheric deposition is already entered. This is a statewide average (about 3 lb of N). Amounts for P_2O_5 and K_2O are negligible.
- **Line 5:** Enter amounts from other sources.
- **Line 6:** Enter the total amount of residual nutrients (add lines 1-5).

- **Line 7:** Enter the recommended amounts of nutrients to meet the expected yield from Table 1.
- **Line 8:** Subtract line 7 from line 6. If this number is 0 or positive, then the available nutrients meet or exceed the crop requirements. To avoid over-fertilization, do not apply additional nutrients. If this number is negative, then additional nutrients may need to be applied to meet the crop recommendation. If the number in Line 8 is negative, complete Lines 9 – 14.
- **Line 9:** Enter the nutrient amounts from manure material. This is manure that has been land-applied, and not the manure deposited by the horse while grazing. Calculate these amounts using the analysis of the manure from a certified lab, which must be performed twice a year for operations that exceed 20 stalls. Operations below this threshold can use the following values: 8 lb/ton N; 2.5 lb/ton P; and 8 lb/ton K to obtain average nutrient content. Remember to convert all values to lb/acre before recording them on the worksheet.
- **Line 10:** Enter the nutrient amounts from biosolids application, if applicable. Calculate this amount using information from the permitted domestic wastewater treatment plant's lab analysis.
- **Line 11:** Enter the nutrient amounts from commercial fertilizer.
- **Line 12:** Enter the total amount of the nutrients to be applied (add lines 9-12).
- **Line 13:** Enter a description of the application method (i.e., broadcast with a spreader, applied through an irrigation system), form of the fertilizer (i.e. liquid, granular, or manure), and the timing of the application (i.e. date of application, growth stage of the crop).

APPENDIX 6:
INCENTIVE PROGRAMS FOR QUALIFYING FARMS

The implementation of Best Management Practices can reduce non-point sources of pollution, conserve valuable soil and water resources, and improve water quality. The implementation of these management practices can also be expensive and, in some cases, may not be economically feasible for agricultural producers. To reduce the financial burden associated with the implementation of selected practices, several voluntary cost-share programs have been established. These programs are designed to conserve soil and water resources and improve water quality in receiving watercourse. The narrative below is intended to provide basic information regarding the primary federal, state, and regional cost-share programs. Sources of additional information have also been included, and growers are encouraged to contact the identified agencies or organizations for current information about each program.

I. Programs Administered by USDA – Farm Services Agency (FSA)

Conservation Reserve Program (CRP): This program encourages farmers to convert highly erodible cropland or other environmentally sensitive lands to vegetative cover including grasses and/or trees. This land use conversion is designed to improve sediment control and provide additional wildlife habitat. Program participants receive annual rental payments for the term of the contract in addition to cost share payments for the establishment of vegetative cover. CRP generally applies to highly erodible lands and is more applicable to North Florida.

Conservation Reserve Enhancement Program (CREP): CREP uses a combination of federal and state resources to address agricultural resource problems in specific geographic regions. This program (which is not limited to highly erodible lands) is designed to improve water quality, minimize erosion, and improve wildlife habitat in geographic regions that have been adversely impacted by agricultural activities.

Emergency Conservation Program (ECP): The ECP provides financial assistance to farmers and operators for the restoration of farmlands on which normal farming operations have been impeded by natural disasters. More specifically, ECP funds are available for restoring permanent fences, terraces, diversions, irrigation systems, and other conservation installations. The program also provides funds for emergency water conservation measures during periods of severe drought.

For further information on CRP and CREP, including eligibility criteria, please contact your local USDA Service Center. Information is also available on the Internet at www.fsa.usda.gov.

II. Programs Administered by USDA – NRCS

Conservation Plans

Conservation planning is a natural resource problem-solving and management process, with the goal of sustaining natural resources. Conservation Plans include strategies to maintain or improve yields, while also protecting soil, water, air, plant, animal, and human resources. They are particularly well-suited to livestock operations and farming operations that produce multiple commodities.

Conservation Plans are developed in accordance with the USDA-NRCS FOTG. Because not all the specific BMPs in this manual may be contained in the FOTG, Conservation Plans developed under this manual must also include the applicable Level I and II BMPs. Assistance in developing a plan can be obtained through the local Soil and Water Conservation District (SWCD), the USDA-NRCS, the Cooperative Extension Service, and private consultants who function as technical service providers. However, the decisions included in the Conservation Plan are the responsibility of the owner or manager of the farm. Conservation Plans are usually required to receive cost share for any of the programs described below.

Environmental Quality Incentives Program (EQIP): EQIP provides financial assistance for the implementation of selected management practices. Eligibility for the program requires that the farm have a NRCS approved conservation plan. Practices eligible for EQIP cost share are designed to improve and maintain the health of natural resources and include cross-fences, water control structures, brush manage-

ment, prescribed burning, prescribed grazing, nutrient management and other erosion control measures.

Conservation Security Program (CSP): CSP is a voluntary conservation program that supports ongoing stewardship on private lands. It rewards farmers and operators who are meeting the highest standards of conservation and environmental management. Its mission is to promote the conservation and improvement of soil, water, air, energy, plant and animal life.

Wetlands Reserve Program (WRP): WRP is a voluntary program designed to restore wetlands. Program participants can establish easements (30-year or perpetual) or enter into restoration cost-share agreements. In exchange for establishing a permanent easement, the landowner usually receives payment up to the agricultural value of the land and 100 percent of the wetland restoration cost. Under the 30-year easement, land and restoration payments are generally reduced to 75 percent of the perpetual easement amounts. In exchange for the payments received, landowners agree to land use limitations and agree to provide wetland restoration and protection.

Wildlife Habit Incentives Program (WHIP): The Wildlife Habitat Incentives Program provides financial incentives for the development of fish and wildlife habitat on private lands. Program eligibility requires that landowners develop and implement a Wildlife Habitat Development Plan. Participants enter multiyear (5 to10 year) agreements with USDA-NRCS.

For further information on these programs, including eligibility criteria, please contact your local USDA Service Center. Information is also available on the Internet at the following web site: www.nrcs.usda.gov.

III. Programs Administered by State and Regional Entities

Office of Agricultural Water Policy: In order to assist agricultural producers in the implementation of BMPs, the Florida Department of Agriculture and Consumer Services/Office of Agricultural Water Policy contracts with several of the state's Soil and Water Conservation Districts and Resource Conservation and Development Councils to provide cost share, as funding is available.

Water Management District Cost-Share Programs: Some of the water management districts may have agricultural cost share programs in place for eligible producers.

For further information on these programs, including eligibility criteria, please contact your Soil and Water Conservation District, the Water Management District, or the Florida Department of Agriculture and Consumer Services. Information and links to other sites are also available on the Internet at the following web site: www.floridaagwaterpolicy.com.

APPENDIX 7: EXAMPLE RECORD-KEEPING FORMS

Operators are required to keep accurate records to document BMP implementation. Record keeping also aids in operating and maintaining BMPs, and is required for the following BMP Groups:

1.1.2 Base fertilization rates for P and micronutrients on soil test

1.1.6 Keep records of all nutrient applications. Include, at a minimum: date of application, total amount applied, acreage covered, fertilizer analysis or grade, rate per acre, and application method

6.6.5 Maintain records of new well construction and modifications to existing wells

The tables below correspond to of all the record-keeping requirements contained in this manual. They serve as a set of templates to develop your own record-keeping system. You may maintain your records as hard copies or in an electronic format, depending on your preference. You may use these tables, develop your own, or choose commercially available record-keeping software suited to your commodity.

Soil Sample Records				
Date	**Pasture Location**	**# of Samples**	**Name of Lab**	**Records Location**

Tissue Sample Records				
Date	**Pasture Location**	**# of Samples**	**Name of Lab**	**Records Location**

Manure Sample Records				
Date	**Batch**	**Analysis[3]**	**Name of Lab**	**Records Location**

Fertilization/Nutrient Records							
Date	Location	Acreage Covered	Type[1]	Formulation[2]	Analysis[3]	Rate (Lb/Acre)	Ag Use Plan[4]

Well Records					
Location	Year Constructed	Constructed By	Last Modified	Modified By	Records Location

[1] Organic, Inorganic, Residuals, etc.
[2] Granular, Water Soluble, Liquid, etc.
[3] e.g. 10-10-10
[3] e.g. 10-10-10

APPENDIX 8: CONTACT INFORMATION

Emergency Information

Emergency Reporting Numbers

Florida State Watch Office	24 hours	(850) 413-9900 1-800-320-0519
DEP Emergency Response	Monday – Friday, 8:00 am – 5:00 pm	(850) 245-2010

Non-Emergency Information

Florida State Agency Numbers

Toll Free

Department of Agriculture and Consumer Services **www.freshfromflorida.com**

Office of Agricultural Water Policy (OAWP) ..... (850) 617-1700

For assistance with BMP enrollment/implementation ..... **(850) 617-1727**

Division of Agricultural and Environmental Services ..... (850) 488-3731

Bureau of Pesticides ..... (850) 487-0532

Bureau of Compliance Monitoring ..... (850) 488-8731

Division of Animal Industry ..... (850) 410-0900

Department of Environmental Protection **www.dep.state.fl.us**

Nonpoint Source Management Section ..... (850) 245-7508

Hazardous Waste Management Section ..... (850) 245-8707

Northwest District Office (Pensacola) ..... (850) 595-8300

Northeast District Office (Jacksonville) ..... (904) 256-1700

Central District Office (Orlando) ..... (407) 897-4100

Southeast District Office (West Palm) ..... (561) 681-6600

Southwest District Office (Tampa) ..... (813) 632-7600

South District Office (Ft. Myers) ..... (239) 344-5600

Water Management Districts **www.flwaterpermits.com**

Northwest Florida (Tallahassee) ..... (850) 539-5999

Suwannee River (Live Oak) ..... (386) 362-1001 1-800-226-1066

St. John's River (Palatka) ..... (904) 329-4500 1-800-451-7106

Southwest Florida (Brooksville) ..... (352) 796-7211 1-800-423-1476

South Florida (West Palm) ..... (561) 686-8800 1-800-432-2045

Other Helpful Numbers – *Main offices, call to obtain local contact information*

USDA-NRCS – Florida Main Office (Gainesville) ..... (352) 338-9500

UF-IFAS Extension Administration ..... (352) 392-1761

Association of Florida Conservation Districts
Soil and Water Conservation Districts ..... (407) 321-8212

APPENDIX 9: RULE 5M-14

CHAPTER 5M-14
WATER QUALITY/QUANTITY BEST MANAGEMENT PRACTICES FOR FLORIDA EQUINE OPERATIONS

5M-14.001 Purpose.

The purpose of this rule is to effect pollutant reduction through the implementation of agricultural Best Management Practices (BMPs) that may be determined to have minimal individual or cumulative adverse impacts to the water resources of the state.

Rulemaking Authority: 403.067(7)(c)2., 570.07(10), 570.07(23), F.S. Law Implemented: 403.067(7)(c)2., F.S. History – New _____.

5M-14.002 Approved Best Management Practices.

The manual titled *Water Quality/Quantity Best Management Practices for Florida Equine Operations* (2011 Edition), DACS P-01531, is hereby adopted and incorporated by reference. Copies of the manual may be obtained from the University of Florida Cooperative Extension Service county office or from the Florida Department of Agriculture and Consumer Services (FDACS), Office of Agricultural Water Policy, 1203 Governor Square Boulevard, Suite 200, Tallahassee, FL, 32301 or accessed online at https://www.flrules.org/Gateway/reference.asp?No=Ref-00772.

Rulemaking Authority: 403.067(7)(c)2., 570.07(10), 570.07(23), F.S. Law Implemented: 403.067(7)(c)2., F.S. History – New _____.

5M-14.003 Presumption of Compliance.

Pursuant to section 403.067(7)(c)3., F.S., agricultural operations that implement BMPs, in accordance with FDACS rules, that have been verified by the Florida Department of Environmental Protection as effective in reducing pollutants addressed by the practices are presumed to comply with state water quality standards, and are released from the provisions of section 376.307(5), F.S., for those pollutants. In order to meet the requirements for a presumption of compliance and release from section 376.307(5), F.S., the producer must:

(1) Submit a Notice of Intent to Implement, as provided in Rule 5M-14.004, F.A.C., that identifies the applicable BMPs;

(2) Implement all applicable BMPs in accordance with the timeline requirements in Rule 5M-14.004; and

(3) Maintain records to document the implementation and maintenance of the identified BMPs, in accordance with Rule 5M-14.005.

Rulemaking Authority: 403.067(7)(c)2., 570.07(10), 570.07(23), F.S. Law Implemented: 403.067(7)(c)2., F.S. History – New _____.

5M-14.004 Notice of Intent to Implement.

A Notice of Intent to Implement (NOI) and the accompanying BMP Checklist, both of which are in the Appendix of the manual referenced in Rule 5M-14.002, F.A.C., shall be submitted to the FDACS Office of Agricultural Water Policy, 1203 Governor Square Boulevard, Suite 200, Tallahassee, Florida 32301. The Notice of Intent to Implement Water Quality/Quantity BMPs for Florida Equine Operations (DACS-01549, Rev. 06/10), hereby adopted and incorporated by reference, may be obtained from FDACS or accessed online at https://www.flrules.org/Gateway/reference.asp?No=Ref-00772.

(1) The NOI shall include:

(a) The name of the property owner, the location of the property, and the property tax ID number(s) or other property identification information;

(b) The amount of acreage on which BMPs will be implemented;

(c) The name and contact information of a person to contact;

(d) The signature of the land owner, lease holder, or an authorized agent; and

(e) A BMP Checklist with a schedule for implementation, as contained in the manual. The producer shall select the applicable BMPs by following the instructions in the manual. Except as provided in the manual, all applicable Level I BMPs must be implemented as soon as practicable, but no later than 18 months after submittal of the Notice of Intent to Implement.

(2) Submittal of the NOI enables the producer to receive assistance with BMP implementation.

Rulemaking Authority: 403.067(7)(c)2., 570.07(10), 570.07(23), F.S. Law Implemented: 403.067(7)(c)2., F.S. History – New _____.

5M-14.005 BMP Record Keeping.

Participants must keep records as directed in the manual to document implementation and maintenance of the practices submitted to FDACS. Records must be retained for at least 5 years. All records are subject to inspection.

Rulemaking Authority: 403.067(7)(c)2., 570.07(10), 570.07(23), F.S. Law Implemented: 403.067(7)(c)2., F.S. History – New _____.

APPENDIX 10

Notice of Intent and BMP Checklist

ADAM H. PUTNAM
COMMISSIONER

Florida Department of Agriculture and Consumer Services
Office of Agricultural Water Policy

FDACS-OAWP
1203 Governor's Sq. Blvd.
Suite 200
Tallahassee. FL 32301

NOTICE OF INTENT TO IMPLEMENT
WATER QUALITY / QUANTITY BEST MANAGEMENT PRACTICES FOR FLORIDA EQUINE OPERATIONS

Rule 5M-14.004, F.A.C.

- **Complete all sections of the Notice of Intent** (NOI). Each NOI may list only properties that are within the same county and are owned or leased by the same person or entity, and on which applicable BMPs will be identified and implemented under this manual.
- Submit the **NOI**, along with the **BMP Checklist**, to the Florida Department of Agriculture and Consumer Services (FDACS), at the address below.
- **Keep a copy of the NOI and the BMP checklist in your files** as part of your BMP record keeping.

You can visit http://www.freshfromflorida.com/onestop/forms/01549.pdf to obtain an electronic version of this Notice of Intent to Implement (NOI) form.

If you would like assistance in completing this NOI form or the BMP Checklist, or in implementing BMPs, contact FDACS staff at (850) 617-1727 or AgBmpHelp@freshfromflorida.com.

Mail this completed form and the BMP Checklist to: **FDACS Office of Agricultural Water Policy**
1203 Governor's Square Boulevard, Suite 200
Tallahassee, Florida 32301

Person To Contact

Name: _____

Business Relationship to Landowner/Leaseholder: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____ FAX: _____

Email: _____

☐ **Landowner or** ☐ **Leaseholder Information** *(check all that apply)*

NOTE: If the Landowner/Leaseholder information is the same as the Contact Information listed above, please check: ☐ **Same as above**. If not, complete the contact information below.

Name: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone: _____ FAX: _____

Email: _____

Complete the following information for the property on which BMPs will be implemented under this NOI. You may list multiple parcels if they are located within the same county and are owned or leased by the same person or entity.

Operation Name: _____

County: _____

Tax Parcel Identification Number(s) from County Property Appraiser

Please submit a copy of your county tax bill(s) for all enrolled property, with owner name, address, and the tax parcel ID number(s) clearly visible. **If you cannot provide a copy of the tax bill(s), please write the parcel owner's name and tax parcel ID number(s) below in the format the county uses**. Attach a separate sheet if necessary *(see form provided)*.

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

☐ Additional parcels are listed on separate sheet. *(check if applicable)*

Total # of acres of all parcels listed ***(as shown property tax records)***: _____

Total # of acres on which BMPs will be implemented under this NOI: _____

In accordance with section 403.067(7)(c)2, Florida Statutes, I submit the foregoing information and the BMP Checklist as proof of my intent to implement the BMPs applicable to the parcel(s) enrolled under this Notice of Intent.

Print Name: _____

(check all that apply) ☐ **Landowner** ☐ **Leaseholder** ☐ **Authorized Agent** *(see below)**

**Relationship to Landowner or Leaseholder:* _____

Signature: _____ Date: _____

Name of Staff Assisting with NOI:

NOTES:

1. You must keep records of BMP implementation, as specified in the BMP manual. All BMP records are subject to inspection.
2. You must notify FDACS if there is a full or partial change in ownership with regard to the parcel(s) enrolled under this NOI.
3. Please remember that it is your responsibility to stay current with future updates of this manual. Visit the following website periodically to check for manual updates: www.floridaagwaterpolicy.com

Additional Tax Parcel Listings

Operation Name: _____

County: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

Parcel No.: _____ Parcel Owner: _____

FLORIDA EQUINE OPERATIONS
WATER QUALITY/QUANTITY BMP CHECKLIST

Checklist Instructions

Note: Before you fill out this checklist, follow the section on BMP Enrollment and Implementation, which begins on page 6 of this manual. Read the text and the BMPs in Sections 1.0 - 9.0 before filling out the checklist, in order to know what the practices entail. The checklist summaries are for identification purposes only.

1. Check "In Use" for each BMP that you are currently practicing and will continue to practice.

2. For the applicable BMPs you do not implement currently but will implement, enter the month and year you plan to implement them in the "Planned" column. FDACS rule requires that applicable Level 1 BMPs in the manual be implemented as soon as practicable, but not later than 18 months after submittal of the NOI. However, if you need more time to implement practice 6.2.1, you must provide justification in the section provided at the end of the checklist.

3. If you are using or will be using a practice similar to a BMP in the checklist, you may enter AMU (alternative measures used) under the "In Use" or "Planned" column. Be sure to include an implementation date (month/year) in the "Planned" column. Explain in the comments section what alternative measure(s) you are or will be implementing. If applicable, include the NRCS FOTG number associated with the practice.

4. For BMPs you will not implement, check all of the following that apply under "Will Not Implement."
- **NA** = Not Applicable (you do not have a resource concern that requires use of the BMP).
- **TNF** = Technically Not Feasible.
- **ENF** = Economically Not Feasible.
- **Other** = You must explain your reason in the comments section at the end of the checklist.

5. Make sure you follow the record-keeping requirements. BMPs that include record keeping are marked by the following pencil icon: 

6. Mail this BMP checklist with your NOI form to FDACS, and keep a copy of both documents in your files.

		In Use	Planned	Will not implement *(check reason below)*			
BMP #	**BMP Group** (See body of manual for full description of practices)	**Check/ or AMU**	**Month/ Year**	**NA**	**TNF**	**ENF**	**Other**
	1.0 Nutrient Management						
	1.1. Level I – Soil and Tissue Testing						
	1. Comply with recommended rates in UF-IFAS Circular SL-129 (revised April, 2009) for the forage grown.						
	2. Base fertilization rates for P and micronutrients on soil test-based recommendations from a lab that uses a method used by the UF-IFAS Extension Soil Testing Laboratory. For bahiagrass, a tissue sample must be submitted along with the soil sample. See Appendix 4 for more information on soil and tissue testing. Keep a copy of your soil and tissue test results.						
	3. If land applying manure or biosolids, or incorporating leguminous forage into the soil, use the Nutrient Budget Worksheet in Appendix 5 to account for these nutrient inputs, and adjust your fertilization program accordingly. Keep a copy of your worksheet(s).						

BMP #	BMP Group (See body of manual for full description of practices)	In Use	Planned	Will not implement *(check reason below)*			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other
	4. Follow spill application recommendations in UF-IFAS Circular SL-129 (revised April 2009) for your particular forage and fertilization regime to maximize nutrient uptake and minimize leaching and runoff potential. As an alternative, use enhanced-efficiency fertilizers as practicable for your operation.						
	5. Avoid applying nutrients when the soil is saturated or inundated with water, or when heavy rain is forecasted.						
	6. Keep records of all nutrient applications. Include, at a minimum: date of application, total amount applied, acreage covered, fertilizer analysis or grade, rate per acre, and application method.						
	2.0 Manure Management						
	2.1. On-Site Manure Management and Off-Site Transport						
	1. Collect manure from confined areas (e.g., small paddocks and feeding areas) and riding trails at least monthly, and properly store the manure pending appropriate use or disposal. In the comments section of the BMP checklist describe how you utilize or dispose of collected manure and stall clean-out material.						
	2. If composting, use the appropriate on-site composting system (free-standing pile, windrow, or bin system), based upon the amount of manure generated on-site. Using the information in Table 1, estimate the carbon-to-nitrogen ratio of manure and other materials to be composted, so that the pile will properly decompose. Ensure that adequate water sources are available to maintain pile moisture.						
	3. Locate manure storage areas to protect surface and groundwater sources in accordance with the setback distances listed in Appendix 3.						
	4. If using a commercial hauler to transport manure material offsite, maintain records (e.g. bill of lading) to document that the manure has been transported off-site.						
	3.0 Sediment and Erosion Control Measures						
	3.1. Level I – Road and Trail Maintenance						
	1. Stabilize access roads or trails that cross streams and creeks, using rock crossings, culverts, or bridges.						
	2. Maintain vegetative cover on road banks.						
	3. When constructing above-grade access roads, follow USDA-NRCS FOTG Conservation Practice No. 560, and locate the road(s) a minimum of 25 feet from regulated wetlands. Check with your water management district to see whether a permit is needed.						

BMP #	BMP Group (See body of manual for full description of practices)	In Use	Planned	Will not implement *(check reason below)*			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other
	4. Level II – Crossing Retrofits						
	Install a new culvert of the appropriate size, if the existing culvert is not functional. Contact USDA-NRCS or FDACS for technical assistance and/or structure-design guidance.						
	4.0 Pasture Management						
	4.1. Level I – Forage Management						
1.	Manage grazing of pastures based on established forage stubble heights (See Table 3 for guidelines) to maintain plant vigor and prevent soil erosion.						
2.	To ensure uniform grazing, subdivide larger pastures using fencing.						
3.	Minimize denuded areas by establishing sacrifice areas for exercise, feeding (e.g., salt, mineral, and hay), and other non-forage production activities.						
4.	Seed and mulch denuded areas, as needed, to promote healthy pastures.						
5.	Use temporary exclusion fencing on denuded areas to allow for the re-growth of vegetation.						
	4.2. Level I – High-Intensity Areas (HIAs)						
1.	Route runoff around HIAs using berms or swales, and direct it away from watercourses, wetlands, or sinkholes into a grassed area.						
2.	When there is evidence of sheetflow from an HIA, construct berms or swales downgradient of the HIA to slow the movement of water and reduce the transport of sediments.						
3.	Inspect HIAs after severe weather events to ensure that associated runoff diversion mechanisms are functioning properly. Make any necessary repairs.						
4.	Apply appropriate aggregate materials (such as shell) in and around HIAs, watering troughs, or other frequently denuded areas when excessive mud and/or erosion impacts are evident.						
	5. Level II – Ditch Retrofits Associated with HIAs						
	Contact the USDA-NRCS County Office for assistance in correcting existing ditch or field erosion and preventing future erosion.						
	5.0 Stormwater Management						
	5.1. Level I – Stormwater Management						
1.	Install gutters and downspouts on all buildings adjacent to HIAs, and divert this water away from the HIA toward pastures or other vegetated areas.						
2.	Operate and maintain all stormwater management conveyances (swales, ditches, and canals) to ensure that they operate as designed.						

BMP #	BMP Group (See body of manual for full description of practices)	In Use	Planned	Will not implement *(check reason below)*			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other
	3. If you have an existing operation that does not have an ERP or other WMD surface water permit and has a history of downstream flooding issues, develop and implement a written stormwater management plan that provides specific responses to various types and levels of rainfall, as feasible. The goal of the plan should be a reduction in volume of off-site discharge while maintaining a healthy rooting environment. Evaluate the plan's effectiveness, and make adjustments as needed.						
	6.0 Water Resources Protection						
	6.1. Level I – Wetlands Protection						
	1. Install and/or maintain a minimum 25-foot non-fertilized vegetated buffer upland of the landward boundary of all wetlands, unless you have an existing water management district permit (ERP, MSSW) that specifies a different buffer.						
	2. For existing operations without an ERP that are unable to meet the 25-foot vegetated buffer, submit to FDACS a description of the alternative measures you will take to protect the wetlands from water quality impacts (see BMP checklist).						
	3. When installing fences in wetlands, minimize the use of mechanical equipment and keep the cleared area no wider than 12 feet on either side of the fence. Perform all fence installation work in wetlands during the dry season when there is no standing water present.						
	4. Level II – Channelized Discharge to Wetlands						
	Use spreader swales (or other means as needed) to intercept water discharging from the ditch(es), in order to reduce flow velocities and provide sheetflow through vegetative buffers prior to reaching the wetlands. Provide to FDACS a written description of the means you will use in the comments section of the checklist.						
	6.2. Level I – Streams Protection						
	1. Install and/or maintain a riparian buffer along perennial streams on production areas that exceed 1-percent slope and discharge directly to the streams. Contact FDACS, NRCS, or a Technical Service Provider for assistance in properly designating the riparian buffer in accordance with USDA-NRCS Codes 390 and/or 391.						
	2. Locate and size any stream crossings to minimize impacts to riparian buffer vegetation and function. Refer to USDA-NRCS Stream Crossing, Code 578 for design criteria.						
	3. Provide adequate alternative water sources, such as watering troughs.						
	4. In pastures where animals have access to perennial streams, ensure that stream banks are stabilized. If you have difficulty stabilizing your stream banks, use exclusion fencing or contact NRCS for technical assistance.						

BMP #	BMP Group (See body of manual for full description of practices)	In Use	Planned	Will not implement *(check reason below)*			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other
6.3.	**Level I – Protection for First-and-Second Magnitude Springs Recharge Basins**						
1.	Establish and/or maintain a 100-foot non-fertilized vegetated buffer upland of the landward boundary of springs and spring runs.						
2.	Establish and/or maintain a 50-foot non-fertilized vegetated buffer around sinkholes and other karst features.						
3.	If you have a sinkhole on your property, never use it to dispose of used pesticide containers, manure, carcasses, spent sharps, or other materials.						
6.4.	**Level I – Nutrient and Manure Management Setbacks**						
1.	Do not apply fertilizer or composted manure within 50 feet of watercourses, lakes, wetlands, drinking water wells, or sinkholes.						
2.	Do not apply uncomposted manure within 100 feet of watercourses, lakes, wetlands, drinking water wells, or sinkholes.						
3.	Ensure that there is no discharge from manure storage areas into watercourses, lakes, wetlands, drinking water wells, or sinkholes. Possible measures include distance setbacks and/ or constructing an impervious base (concrete or compacted clay), using a berm upgradient of the manure pile, and/or covering with a tarp or other waterproof material. Provide to FDACS a written description of the measures you are using or will use in the comments section of the checklist.						
4.	Manure storage areas located in a karst area must be covered with a tarp or other waterproof material to prevent leaching.						
6.5.	**Level I – Equine Activity Setbacks**						
1.	Locate new HIAs as far from watercourses, lakes, wetlands, or sinkholes as practicable for the operation. Try to achieve a distance of at least 200 feet from these resources.						
2.	For HIAs within 200 feet of watercourses, lakes, wetlands, or sinkholes, maintain or install diversion or treatment mechanisms, such as berms, vegetated filter strips, or sediment basins, or other treatment or prevention measures, between the HIA and these resources. If using filter strips (Figure 7) or sediment basins, design them in accordance with USDA-NRCS specifications.						
3.	Place watering troughs and supplemental feeding and mineral stations as far from watercourses, lakes, wetlands, and sinkholes as practicable for the operation. Try to achieve a distance of at least 100 feet.						
4.	Exclude horses within a 100-foot radius of the wellheads of drinking water wells. This radius can be reduced to 25 feet if the well-construction records show well-casing depths that extend through confining layers.						
5.	Locate riding trails a minimum of 25 feet from watercourses, lakes, wetlands, and sinkholes.						

BMP #	BMP Group (See body of manual for full description of practices)	In Use	Planned	Will not implement *(check reason below)*			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other
6.6. Level I – Well Operation and Protection							
1.	Use backflow prevention devices at the wellhead to prevent contamination of the water source.						
2.	Inspect wellheads and pads at least annually for leaks or cracks, and make any necessary repairs.						
3.	Cap or valve wells in accordance with water management district requirements.						
4.	Retrofit existing functional wells with a fence or a minimum one-foot concrete collar extending from the casing, to protect them from damage.						
5.	Maintain records of new well construction and modifications to existing wells.						
7.0 Equine Watering Requirements and Sources							
7.1. Level I – Equine Watering Source BMPs							
1.	Install a shut-off device on all troughs. Do not allow troughs to overflow, and turn the water off when not in use.						
2.	Maintain all tanks, troughs, wells, and associated structures in good working order. Inspect the distribution system and watering troughs for leaks at least weekly, and make any necessary repairs.						
7.2. Level I – Horse Washing BMPs							
1.	If not using a permanent wash rack, rotate horse washing sites, using established turf areas to prevent mud and sedimentation problems. If necessary, portable rubber mats can be used to prevent denuding of turf areas.						
2.	Whether permanent or temporary washing areas are used, locate them at least 50 feet away from waterbodies, wells, and domestic septic tank drain fields. Direct runoff to a well-vegetated area.						
8.0 Pesticide / Pharmaceutical Use							
8.1. Level I – Storage, Handling, and Application of Pesticides							
1.	Store pesticides in a roofed structure with a lockable door, at least 100 feet from wells, and/or surface waters, and sinkholes.						
2.	When mixing pesticides in the field, conduct loading activities at random locations. Use a check valve or air gap separation to prevent backflow into the tank when filling a sprayer.						
3.	Dispose of spent needles and unused pharmaceutical products by using an approved biomedical container, or by following other guidance approved by the EPA.						

BMP #	BMP Group (See body of manual for full description of practices)	In Use	Planned	Will not implement *(check reason below)*			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other
9.0 Animal Mortality Management							
9.2.	Level I – Carcass Disposal Practices						
1.	For below-ground burial, locate any burial site at least 100 feet from adjacent property and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes. Burial sites should be at least 2 feet above the seasonal high ground water table and should allow for at least 2 feet of cover. Identify burial sites on a map and keep it available for future reference.						
2.	For above-ground burial, move dead horses to an upland area at least 100 feet from adjacent property and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes. Cover with 6 inches of compacted soil and at least 2 feet of additional soil.						

Equine Checklist Comments Section

BMP #	Describe Alternative Measures Used
6.1.2	
6.1.4	
6.4.3	
BMP #	
BMP #	
BMP #	
BMP #	
BMP #	Justification for additional time to implement specified Level I BMP
6.2.1	
BMP #	Enter "Other" reasons for not implementing BMPs