Spring Ranchers Forum Proceedings

a program by the

Central Florida Livestock Agents Group

Thursday, March 20, 2014

Yarborough Ranch

1355 Snow Hill Rd.

Geneva, Florida

UF IFAS Extension UNIVERSITY of FLORIDA

Brevard - Citrus - Flagler - Hernando - Lake - Marion

CFLAG

Central Florida Livestock Agents' Group

Orange - Osceola - Pasco - Seminole - Sumter - Volusia

Spring Ranchers Forum
March 20, 2014
Proceedings

Central Florida Livestock Agents Group

Agents

Jonal Bosques-Mendez (Marion)
Megan Brew (Lake)
Jamie Cohen (Marion)
Ashley Fluke (Osceola)
Sharon Fox-Gamble (Volusia)
Ed Jennings (Multi-County Livestock)
Dennis Mudge (Multi-County Livestock)
Mark Shuffit (Marion)
Joe Walter (Brevard)
Mark Warren (Flagler)

Sponsored by the

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SPRING RANCHERS FORUM

a program by the
Central Florida Livestock Agents Group
THURSDAY, MAY 20, 2014
YARBOROUGH RANCH
1355 Snow Hill Road, Geneva

AGENDA

8:30 **Arrival and Registration**

9:00 **Small Ruminant Hoof Trimming / Dehorning (Live Animals)**
Jonal Bosques-Mendez, Livestock Extension Agent, UF/IFAS Extension Lake County, CFLAG
Sharon Fox-Gamble, Livestock Extension Agent, UF/IFAS Extension Volusia County, CFLAG
Joseph Walter, Livestock Extension Agent, UF/IFAS Extension Brevard County, CFLAG

10:00 **Selecting Bulls on the Hoof (Live Animals)**
Dr. Matt Hersom, Beef Cattle Specialist, UF/IFAS Extension Animal Sciences

11:00 **Trade Show Break**
Official Welcome & Introductions
Dennis Mudge, Chair, 2014 Spring Ranchers Forum, CFLAG, UF/IFAS Extension Agent, Multi-County
Hosts: Imogene Yarborough, and Lynn Hanshew, Yarborough Ranch

12:00 **Steak Lunch and Trade Show Break**

12:45 **Recognition and Allied Give-Aways—Dennis Mudge**

1:15 **Selecting Bulls on Paper—EPDs**
Dr. Matt Hersom, Beef Cattle Specialist, UF/IFAS Extension Animal Sciences

1:40 **Equine Farm Manure Management & BMPs**
Jamie Cohen, Extension Agent, UF/IFAS Extension Flagler County, CFLAG

2:05 **Basin Management Action Plans—Water Pollution—How it Affects You**
Jody Lee, Environmental Manager, Agricultural Water Policy, Florida Department of Agriculture and Consumer Services

2:30 **Equine Manure Disposal & Mortality Composting**
Dr. Carissa Wickens, Animal Sciences, UF/IFAS Extension Equine Specialist

3:00 **Evaluation and Final Give-Aways—Dennis Mudge**

Goat Foot Care and Disbudding in Small Ruminants

Bosques J., J. Walter and S.F. Gamble

Foot Care - Hoof care is important for goat production. Depending on genetics, metabolic condition and management practices, this issue can be more of a problem in some herds than others. For example, animals in rocky terrain will need less hoof care than those living in smooth soil.

Regardless of your situation, a regular hoof check can prevent issues before they hurt the performance of your herd. Our goal when trimming hooves is to flatten the bottom of this area at an angle that provides balance and comfort to the animal while at the same time, removing the excess horn tissue. When trimming hooves we can also prevent or correct illnesses, such as foot rot or scald on our animals.

Disbudding - Horn removal has various advantages such as increased marketability of the animals, human safety and to avoid animals from getting tangled in fences. A goat's horn buds should be removed before two to three weeks of age, as they can be felt when these structures start growing and become noticeably painful to remove. The earlier we take care of this issue, the less chances of infection. Horn buds can be removed two ways: using a bud cauterizer or dehorning paste. In both methods goat producers attempt to kill horn-producing cells at an early age in order prevent these structures from developing.

Dehorning your goat herd will add value to your herd by reducing the occurrence of animal and human injuries. It will also reduce bullying from animals with horns against the ones with smaller or no-horns. By doing this you will promote better weight gains.

Production practices such as hoof trimming and dehorning are essential for the viability of your herd. Providing our goat herd with safe and stress-free management practices can result in increased weight gain, which in turn will result in greater profits.

Proper hoof trimming provides balanced footing for our animals to stand on.

Disbudding goat kids should be performed at two to three weeks of age.

UF UNIVERSITY of FLORIDA
IFAS Extension

AN218

Considerations for Selecting a Bull[1]

Martha Thomas and Matt Hersom[2]

Introduction

Limited land resources are increasingly putting pressure on beef cattle producers to optimize and even maximize production on a given land resource. Because of limited land access, many cattle ranches are deciding to produce terminal calves and buy pregnant replacement heifers to maintain the cow herd. As a result of this decision, producers need to consider utilizing bulls that will produce calves that will meet industry carcass standards. Opportunities to capture increased value and revenue may be missed if beef cattle producers do not routinely examine their production system with an eye towards improving the uniformity and marketability of the calves they produce. The goal of every cattle rancher should be to generate a profit from their cattle, which means increasing the marketable pounds in the annual calf crop.

Factors to Consider

There are a number of considerations when selecting a bull to purchase. The differential emphasis on any of the following criteria is dependent upon the needs and opportunities that a producer may experience on their individual operations.

1. Structural Soundness

Structural soundness and conformation is an important factor because the bull must be physically able to service cows during breeding. Therefore sound feet and legs, particularly hind legs, are critical for a long service life of the bull.

2. Performance Records/Pedigree

If the bull is purchased through a bull test sale, how well did he perform? What is the performance or record of the bull's siblings or half-siblings? This information can be gathered by examining his pedigree.

3. Expected Progeny Differences

Expected Progeny Differences (EPD) predicts the differences expected in performance of future progeny of two or more sires of the same breed when mated to animals of the same genetic potential. Many cattle producers routinely use EPDs to select sires to meet their production goals. The EPD's that should be considered most highly when selecting a bull to produce terminal calves are calf growth and potential carcass traits. Growth trait EPDs include calf weaning and yearling weight. Carcass trait EPDs that are often considered are carcass weight, backfat thickness, ribeye area, marbling, and retail yield. Carcass traits are important because they are used to determine the value of a carcass. Growth traits are important because in many situations beef cattle producers' revenue is based upon the pounds of calf weaned and marketed or pounds of calf marketed after some extended growth phase. Likewise the ability to produce a calf crop that is capable of garnering a greater price per pound would be an important consideration when purchasing a bull. For beef cattle producers that are retaining ownership, growth traits are important during the post-weaning phase. Similarly carcass traits, primarily carcass weight, but also marbling and yield grade potential are important considerations. When selecting a bull look

1. This document is AN218, one of a series of the Animal Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date June 2009. Reviewed June 2012. Visit the EDIS website at http://edis.ifas.ufl.edu.

2. Martha Thomas, former Extension agent, Lake County Extension; Matt Hersom, associate professor, Department of Animal Sciences; Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

for a breeder that measures carcass traits in his herd and selects cattle with superior growth and carcass traits.

4. Acclimation to the Environment

Find a bull that is acclimated to your ranch's climate and management conditions. Often bulls that are brought to Florida from other states do not tolerate the hot, humid weather and lower-quality forage. The lack of adaptation leads to poor performance of bulls both physically and during the breeding season. Evaluate the need of the bull for additional feed supplemental feed prior to breeding season. However during the off-season they should be able to maintain their condition without additional supplementation. Bull nutrient requirements and feeding recommendations can be found in the EDIS publications Nutritional Management of Bulls http://edis.ifas.ufl.edu/AN211, and Feedstuff Considerations for Feeding Bulls http://edis.ifas.ufl.edu/AN210).

5. Other Selection Considerations

Temperament is also an important trait because it can be a highly heritable trait. Calves should be calm and even tempered so that they will not be concerned with human interaction or equipment in their environment. Nervous cattle become stressed, eat less, are more prone to sickness, and perform poorer.

It is important to consider the cow's mature bodyweight and frame size and the desired calf characteristics when selecting a bull. The bull needs to compliment the cow herd to produce calves with a sensible frame size and still maintain acceptable growth attributes and carcass characteristics.

Breed type is an important consideration for the bull and the resulting mating with the cow herd. One way to produce heavier calves with improved carcass traits is through hybrid vigor. Hybrid vigor is the increased performance or expression of a trait that results from cross-breeding. The F1 (Brahman x Angus) cows mated to a terminal sire-type bull are the most productive cattle breeding programs in terms of cattle reproduction and calf weaning weight (Cross Breeding Systems in Beef Cattle, AN165).

Planning for the Breeding Season

When planning a breeding program it is critical to make sure you have enough bulls to service all of the cows in the herd. An important step is to evaluate the bull's potential to get a cow pregnant. This assessment is accomplished by a breeding soundness evaluation (BSE). A BSE is a quick and relativity inexpensive way of assessing a bulls fertility potential. A BSE should be conducted on a yearly basis by a qualified veterinarian. Bulls should be examined at least 60 days prior to the beginning of the breeding season. This allows for re-testing and replacement of bulls failing the examination. All purchased bulls should have passed a BSE prior to sale.

A BSE consists of four basic steps:

1. Visual assessment of the feet, legs, eyes, teeth and external genitalia;
2. Palpation of the accessory sex glands (prostrate and seminal vesicles);
3. Measurement of the scrotum as well as palpation of the testis and epididymis; and
4. Collection and microscopic evaluation of a semen sample.

If the bull scores very low or fails the BSE, the bull should be re-checked in 60 to 80 days. This time period allows adequate time for the process of new sperm creation, which takes approximately 70 days. A number of issues could cause a bull to fail a BSE including injury to the testes or illness which can cause abnormal or low sperm formation.

In order to know how many bulls a beef producer will need for a breeding season, the service capacity of the bull needs to be considered. Service capacity is the number of cows a bull can adequately detect in estrus and potentially breed during the defined breeding season. The general service capacity or bull to cow ratio is based on the age of the bull. Table 1 provides guidelines for service capacity of bulls.

Table 1. Relationship of bull age to service capacity during the breeding season.

Bull Age	Bull to Cow Ratio
12- 18 months	1:15-20
2 years	1:30-35
3- Aged (7 plus years)	1:35-40

Conclusion

When cattle producers purchase and turn the bull out, they have made one of the largest decisions dictating carcass merit for the subsequent calves. Carcass merit and the genetic change associated with improving carcass merit are not single trait characteristics, so bull selection needs to be made to optimize all growth and carcass merit characteristics. Cattle producers can pursue genetic change for particular carcass characteristics by selecting and utilizing the appropriate genetic sources. Therefore, selecting and

implementing a genetic program with specific goals is important. All management processes performed after the genetic choices are done to optimize the genetic potential of the resulting calf.

References

Hansen, G. 2006. Cross Breeding Systems in Beef Cattle. University of Florida, IFAS EDIS document. http://edis.ifas.ufl.edu/AN165

Hersom, M. and T. Thrift. 2009. Feedstuff considerations for feeding bulls. University of Florida, IFAS EDIS document. http://edis.ifas.ufl.edu/AN210

Hersom, M. and T. Thrift. 2008. Nutritional management of bulls. University of Florida, IFAS EDIS document. http://edis.ifas.ufl.edu/AN211

Bull Selection and EPDs

Dr. Matt Hersom, Extension Beef Cattle Specialist, UF/IFAS Dept. of Animal Sciences

What is an EPD?

- Abbreviation for Expected Progeny Difference
- An indicator of genetic value of one animal as a parent compared to another animal of the same breed.
- Predict differences in performance of offspring when each is mated to animals of the same genetic merit.
- It is a tool for genetic decision making and selection; maximums and minimum may not be optimum choice.
- Reported in the unit of measure for the particular trait.

What EPD Can Not Do?

- Predict actual outcome of calf performance
- Compare animals from different breeds
- Zero does not mean breed average
- Remain constant; as information is added the ability to predict performance improves
- Make up for poor management

Growth and Maternal Traits

- Birth Weight – pounds, higher number = greater birth weight.
- Weaning Weight – pounds, higher number = greater weaning weight at 205 days of age, excludes maternal influence.
- Yearling Weight – pounds, higher number = greater yearling weight at 365 days of age, excludes maternal influence.
- Maternal Milk – pounds, predicts milking ability of bull's daughters expressed as calf WW.
- Calving Ease – index, percentage of unassisted births, higher number = greater ease.
- Scrotal Circumference – centimeters, higher number = daughters that reach puberty earlier and semen quality.
- Stayability – percentage, likelihood that daughters will remain in herd (commonly 6 yrs).

Carcass Traits

- Carcass Weight – pounds, greater number = heavier hot carcass weight
- Marbling – USDA marbling degree, greater number = higher marbling scores
- Ribeye Area – square inches, greater number = larger ribeye area
- Fat Thickness – inches, greater number = greater fat thickness
- Yeild Grade – greater number = less retail product

- Percent Retail Product – percentage, difference in cutability, greater number = higher % of retail cuts.

Indexes

- Multi-trait selection indexes which combine EPDs for multiple traits into a single economic value. Interpreted like EPD in that differences between index value indicated differences dollar value of offspring.
- Calculated some breeds: Angus, Gelbvieh, Hereford, Limousin, Simmental, SimAngus

Determine What Type of Bull is Needed

- What type of cows do you have - breed, age, size, fertility, milk production
- What type of breeding system –rotational vs terminal
- What is your plane of nutrition - this translates to milk production and growth potential
- How and when will calves be marketed – weaning, yearlings, slaughter

Bull Selection Considerations for Maternal and Terminal Bulls

	Maternal Bulls		Terminal Bulls
Trait	For Heifers	For Cows	For Cows
Scrotal Circumference	Large	Large	Med – Large
Pelvic Area	Large	Large	Not important
Calving Ease	High	High	High
Birth Weight	Low	Medium	Medium
Weaning Weight	Match	Match	High
Milk	Match	Match	Not important
Total Maternal	Match	Match	Not important
Yearling Weight	Match	Match	High
Carcass Quality	High	High	High

Matching Bull to Nutritional Resource Availability

		Resource Availability		
Mature Size	Milk Level	Low	Medium	High
Small	Low	~	+	+
Small	Medium	-	+	+
Small	High	-	~	+
Medium	Low	-	+	+
Medium	Medium	-	~	+
Medium	High	-	-	+
Large	Low	-	~	+
Large	Medium	-	-	~
Large	High	-	-	~

"-" avoid this combination, production will suffer

"~" risky, extra feed may be necessary, fertility and production could suffer

"+" matching mature size and milk production with resources

What Are Today's Goals?

- Learn about BMPs, understand what they are and why they're needed for horse farms…and other industries
- Gain an understanding of FDEP Small Scale Horse Operation BMP Manual (see in handed out info.)
- Understand about the state FDACS Commercial equine operations BMP manual and the benefits it can offer the industry

BMPs are:

Common sense and science-based.

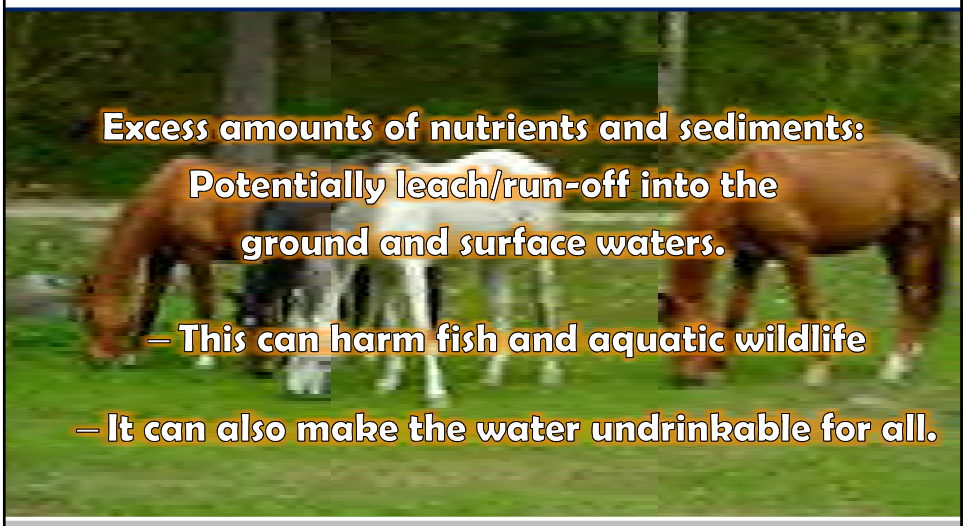
Field-tested practices.

Effective farm care that helps protect water quality.

Why are they needed?

These practices help protect
the ground and surface waters:
i.e...the aquifer and springs

Water Quality Concerns:



BMPs help prevent this problem

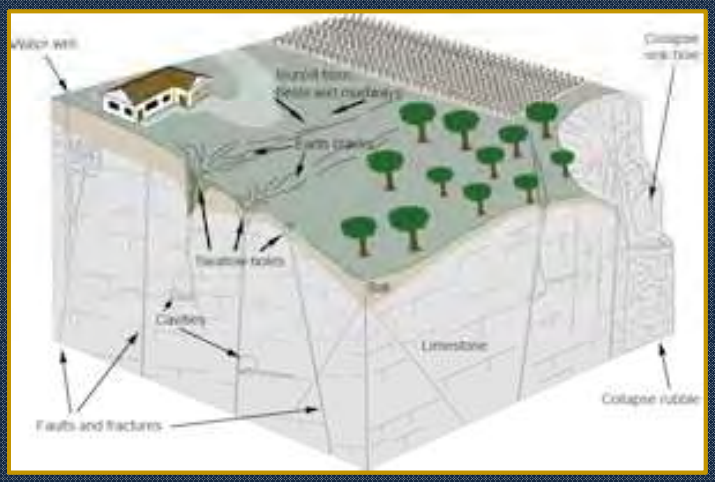
The state is surrounded by water,

Like freshwater springs, ponds, rivers…

***And,* our sand based soils**

are conducive to infiltration.

Karst topography–In Florida, it's the soluble limestone underneath our sandy soils which gets dissolved



This enables direct access to Floridian aquifers that hold our ground water

BUT…that water is what we ALL drink and use

90% of our drinking water comes from ground water!

A farm/home

Potable water

BMPs involve many industries:

Cow/calf

Nursery

Sod Operations

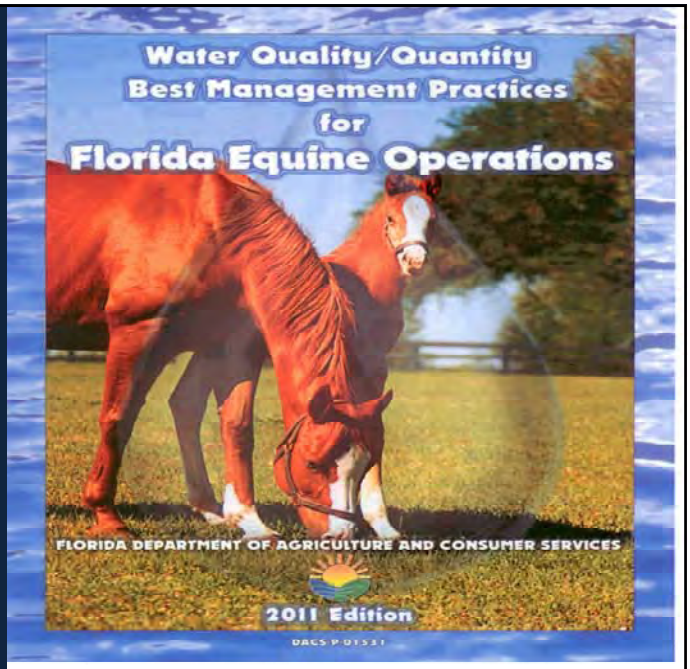
Silviculture

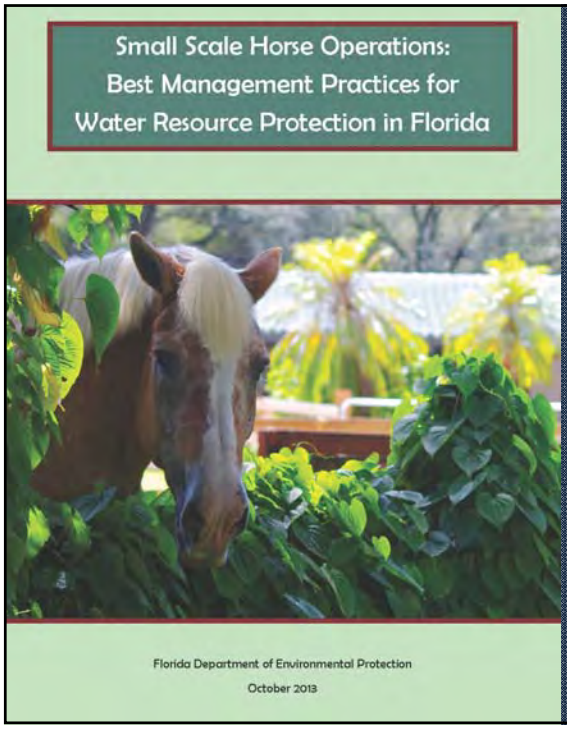
Citrus…
AND MORE!

FDACS Equine BMP Manual:

For Commercial Operations:

MANDATORY
When farm is in a BMAP area





Just released:
FDEP Small Scale Horse Operations BMP Manual

Meant for "non-commercial, or hobby operations"

VOLUNTARY

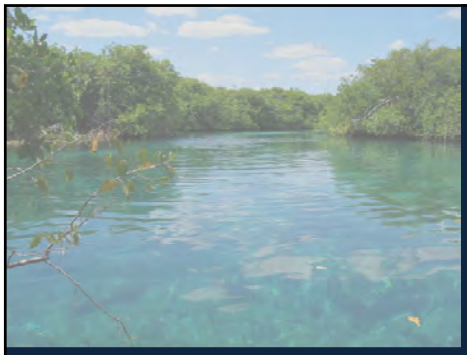
BMP Manuals:

Why sign up? Why implement BMPs? What's the benefit?

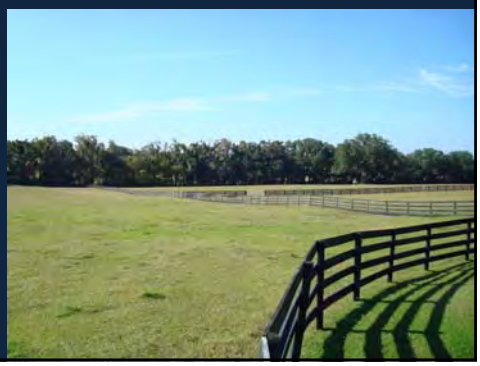
IT'S FOR EQUINE and AG. INDUSTRIES collectively

Why Should a Farm Implement BMPs?

- Demonstrates Environmental Stewardship
- Provides Presumption of Compliance with State Water Quality Standards
- Pre-empts Local Government Ordinances under Florida Right to Farm Act
- Pre-qualification for Cost-Share $$$
- Possible Exemption from Water Management District Permits
- Cheaper than Self-Monitoring Alternative



SO…WHAT ARE SOME BASIC BMPs?



OVER/IMPROPER FERTILIZATION

Adding too much, or the wrong type of fertilizer:

- **Prevents proper nutrient uptake by the grass, so…**
- **these nutrients can get into ground/surface waters**
- **Wrong pH of soil= Improper fertilizer utilization**

This means wasted $$$ and excess nutrients to the aquifer

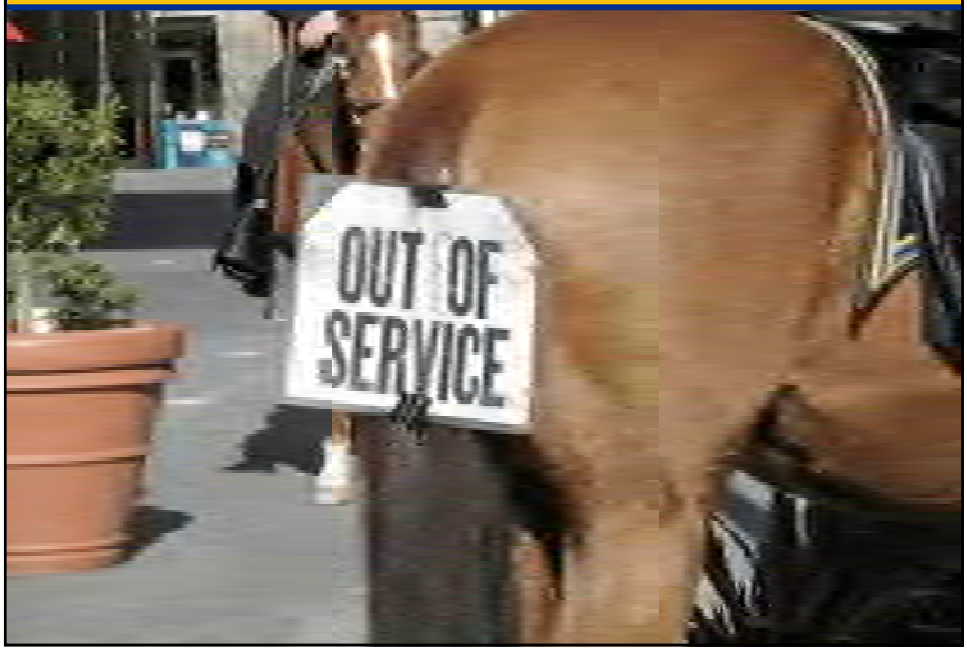
Additional Pasture Management Problems

- Lack of Routine Soil testing
- Insufficient weed control
- Improper mowing


OVERSTOCKING THE LAND


OVERSTOCKING THE LAND MEANS:
Little or no grass = nutrient excesses
Increased soil erosion :sediment excesses
Go to ground/surface waters
Decreased property value: PRETTY SELLS BEST!
Decrease land usefulness
Increases upkeep and $

WHAT ABOUT THE MANURE?



MANURE/URINE:

Nitrogen

from horse manure and urine,

can:

Increase algae growth, harming aquatic life

Potentially make the water undrinkable for ALL!

Always remember:
IF IT TOUCHES THE GROUND, IT WILL REACH THE AQUIFER.

So…DEVELOP A PLAN TO HANDLE THE MANURE

Spreading : use acceptable rates; *keep records*

Hauling away: farm accepts responsibility; *keep records*

Composting on-site: ideal soil addition
- **Easily set-up/managed**
- **Reduce worms & weed seeds**
- **A slow-release fertilizer**

For a farm: what is an ideal?

To go from this pile…

To this situation

FYI: Government web sites

FDACS – www.freshfromflorida.com Help with BMP manual

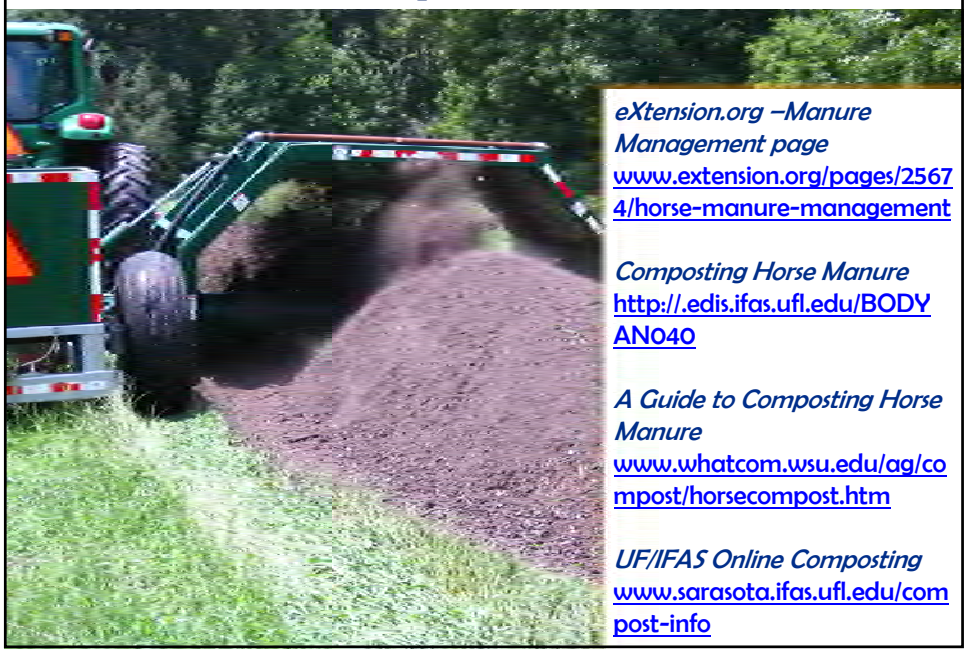
Office of Agriculture Water Policy www.floridaagwaterpolicy.com

FDEP –www.dep.state.fl.us Legislation/enforcement

NRCS – www.fl.nrcs.usda.gov Conservation assistance, cost-share

Check your Local County government web sites

And Some Composting information:



eXtension.org –Manure Management page
www.extension.org/pages/25674/horse-manure-management

Composting Horse Manure
http://.edis.ifas.ufl.edu/BODYAN040

A Guide to Composting Horse Manure
www.whatcom.wsu.edu/ag/compost/horsecompost.htm

UF/IFAS Online Composting
www.sarasota.ifas.ufl.edu/compost-info

Small Scale Horse Operations: Best Management Practices for Water Resource Protection in Florida

DRAFT

Florida Department of Environmental Protection

October 2013

Preface

This manual is intended for use by horse and pony owners who do not typically operate as a business and are characterized as “noncommercial.” It is an educational tool to provide guidance to small-scale, noncommercial horse owners on equine management practices that will help minimize nonpoint source pollution and protect Florida’s water resources. It may also help in complying with state and local regulations that apply in your area, as some state laws or local ordinances may require some of these practices. State and local regulations take precedence over this manual, and measures more restrictive than those contained in it may apply to specific situations.

Commercial agricultural horse operations are covered under an Equine Best Management Practices Program adopted by the Florida Department of Agriculture and Consumer Services (FDACS). You can find information about this program by going to http://www.floridaagwaterpolicy.com/BestManagementPractices.html.

Operations with a large number of horses or other animals (referred to as animal feeding operations and concentrated animal feeding operations, or AFOs and CAFOs) may require permits from the Florida Department of Environmental Protection (FDEP). Some other commercial equine operations, such as racetracks and large horse shows, are also regulated by FDEP. If you are unsure whether your operation is commercial or noncommercial, contact your county Cooperative Extension Service agent, who will assist you free of charge. You can read about county Extension Services on the web and locate an Extension Office by going to http://solutionsforyourlife.ufl.edu/map/. Contact information for the Extension Service and state agencies is also available in Appendix 4.

Boldface and highlighted words or acronyms in this manual are defined in Appendix 1.

Acknowledgments

The production of this manual was accomplished with the contributions of many individuals, including Jamie Cohen, University of Florida–Institute of Food and Agricultural Sciences (UF–IFAS) Marion County Extension Service; Carol Johnson, FDACS Office of Agricultural Water Policy; Saundra H. TenBroeck, UF–IFAS Department of Animal Sciences; Terry Pride, FDACS Office of Agricultural Water Policy; Clegg Hooks, FDACS Office of Agricultural Water Policy; Lori K. Warren, UF–IFAS Department of Animal Sciences; William C. Kennedy, FDEP Office of Ecosystem Projects; Mahan Farm of Tallahassee; Little Pond Farm of Tallahassee; Linda Lord, FDEP; and Greg Kennedy, FDEP Southeast District Office.

Small-Scale Horse Operations: Best Management Practices for Water Resource Protection in Florida

Florida Department of Environmental Protection

Water Quality Evaluation & TMDL Program
2600 Blair Stone Road - Mailstation 3575
Tallahassee, Florida 32399-2400
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October 2013

CONTENTS

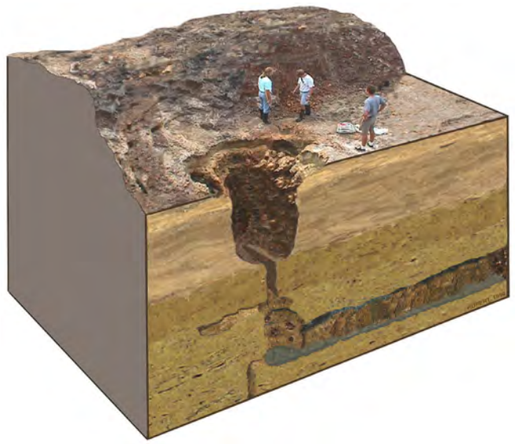
INTRODUCTION

Florida is home to thousands of horses on small-acreage farms and residential "ranchettes." The number of small horse farms continues to increase each year. Whether you have one horse or several, each horse owner has a responsibility to ensure that our water resources are protected from pollution. The proper management of horse manure and pastures helps to protect Florida's water resources, benefit your horses' health, and reduce costs. While the information in this manual is addressed specifically to horse owners, the methods described are also applicable for pony owners.

Understanding Water Quality Impacts to Florida's Water Resources

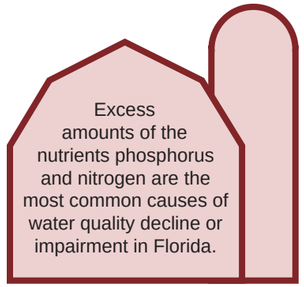
Many of Florida's water resources are particularly vulnerable to pollution because of the state's unique geology and climate. **Surface waters** such as lakes, rivers, and streams are susceptible even to small increases in pollution, which can cause widespread **ecosystem** changes that can make these waters unsuitable for fishing, drinking, or swimming. Along with their important ecological functions, surface waters offer valuable recreational opportunities for the public and can provide an economic benefit to the surrounding communities. Rivers and streams are naturally flowing surface waters; there are approximately 51,000 miles of rivers and streams in Florida! Rivers and streams can readily transport pollutants contained in **stormwater** runoff to **wetlands** or **estuaries**, which provide valuable and essential services at no cost. For example, these waters serve as spawning areas and nurseries for many species of fish and wildlife, store floodwaters, cycle nutrients, and add plant and animal diversity to ecosystems.

The majority of Florida's **potable** water supply, including your drinking water, originates from **ground water**. A large area of Florida comprises porous **karst** terrain where dissolved limestone creates features such as disappearing streams, **aquifers**, **springs**, and **sinkholes**. Because water rapidly flows underground in these karst areas, any pollutants on the land surface or in surface waters can easily be carried into ground water.

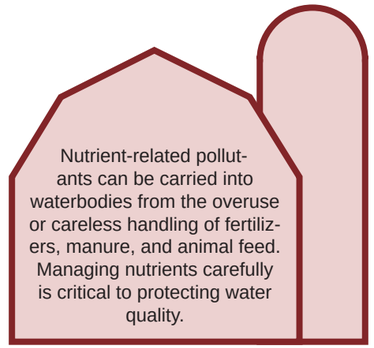


Elevated levels of nutrients, bacteria, and sediment all contribute to the decline of water quality in Florida's water resources. **Nonpoint source** pollution occurs when rainfall or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, estuaries, or ground water. Forms of nonpoint source pollution can include excess nutrients, bacteria, and sediments.

Nutrients



Phosphorus found in soaps and detergents, horse manure, and fertilizer can bind to soil particles and wash into water resources. Nitrogen is also found in horse manure and urine, fertilizer, and feed and can be carried by runoff into surface water or leached through the soil into ground water, thus contributing to water quality problems. High levels of these nutrients in surface waters may stimulate unwanted algal blooms and the overgrowth of invasive weeds and floating aquatic plants. All of these can block the sunlight necessary for photosynthesis in submerged aquatic plants, causing them to die and decompose. Decomposition uses up the available oxygen in the water, leaving little oxygen available for other forms of aquatic life. Algae can become so abundant that a layer of scum can form on the surface, shading the sunlight-dependent life below and disturbing the food chain. Contact with some types of algae can also cause skin, respiratory, and mucous membrane irritation.

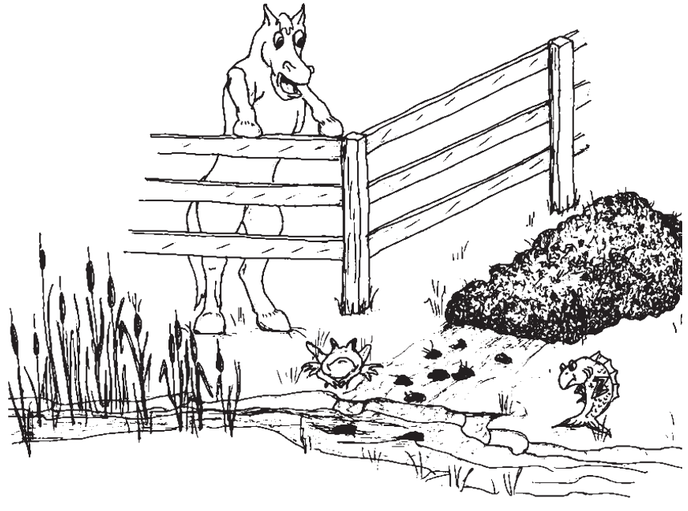


Bacteria

The presence of certain types of bacteria in waterbodies can pose a health hazard to animals, humans, and aquatic life. Some of these bacteria are found in horse manure. The risk of bacterial contamination of water resources by animals that are allowed direct access to a waterbody is high. Runoff from **high-intensity areas (HIAs)** and areas where fresh manure is spread may also contribute to elevated bacterial numbers in nearby water resources.

Sedimentation and Erosion

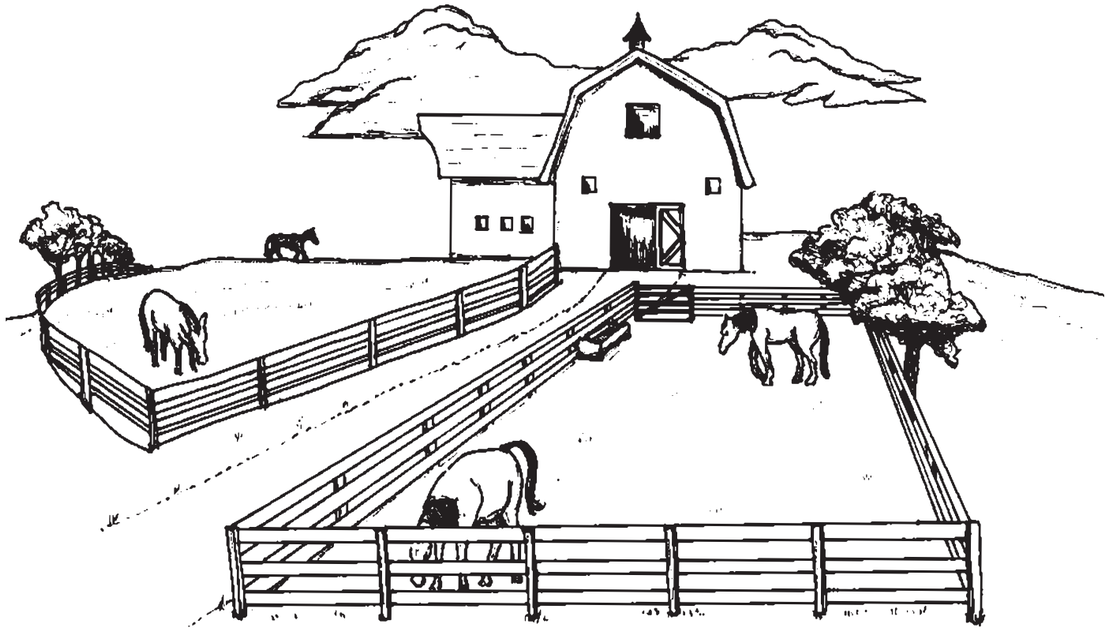
Overgrazed stream banks are susceptible to erosion. Sedimentation occurs when eroded soils are washed into surface waters, creating a buildup of solids on the bottom and **turbidity** in the water. Sediments can clog rivers, streams, and lakes, as well as ditches and canals. They can reduce fish and plant populations by limiting the amount of sunlight penetrating the water, clog fish gills, irritate the mucous membranes covering the eyes and scales, and smother fish eggs. Recreational use may also decline because of reduced fish populations, less visibility in the water, and the reduced desirability of downstream swimming areas. Many chemicals, including nutrients and some pesticides, may be transported or can accumulate in sediment.



BEST MANAGEMENT PRACTICES FOR MANAGING MANURE

The potential for horse farms to cause water quality problems through runoff or leaching of nutrients, bacteria, and sediments varies, depending on soil type, slope, drainage features, **stocking rate**, nutrient management practices, and activities in or near wetlands, surface waters, or sinkholes.

Best management practices (BMPs) are cost-effective and practicable management actions for protecting and improving water quality and conserving water. They are developed through research, field testing, and expert review. BMPs are typically used to prevent, reduce, or treat nonpoint source pollution. They can be structural (e.g., installing fencing or gutters) or nonstructural (e.g., managing fertilization and grazing practices). This manual describes BMPs for manure storage, manure composting, pasture management, and erosion control, and provides guidance on other important water resource protection issues such as using recommended **setbacks**, managing stormwater, managing horse washing, using pesticides correctly, disposing of unused pharmaceuticals, and handling animal mortality.



EVALUATING YOUR FARM

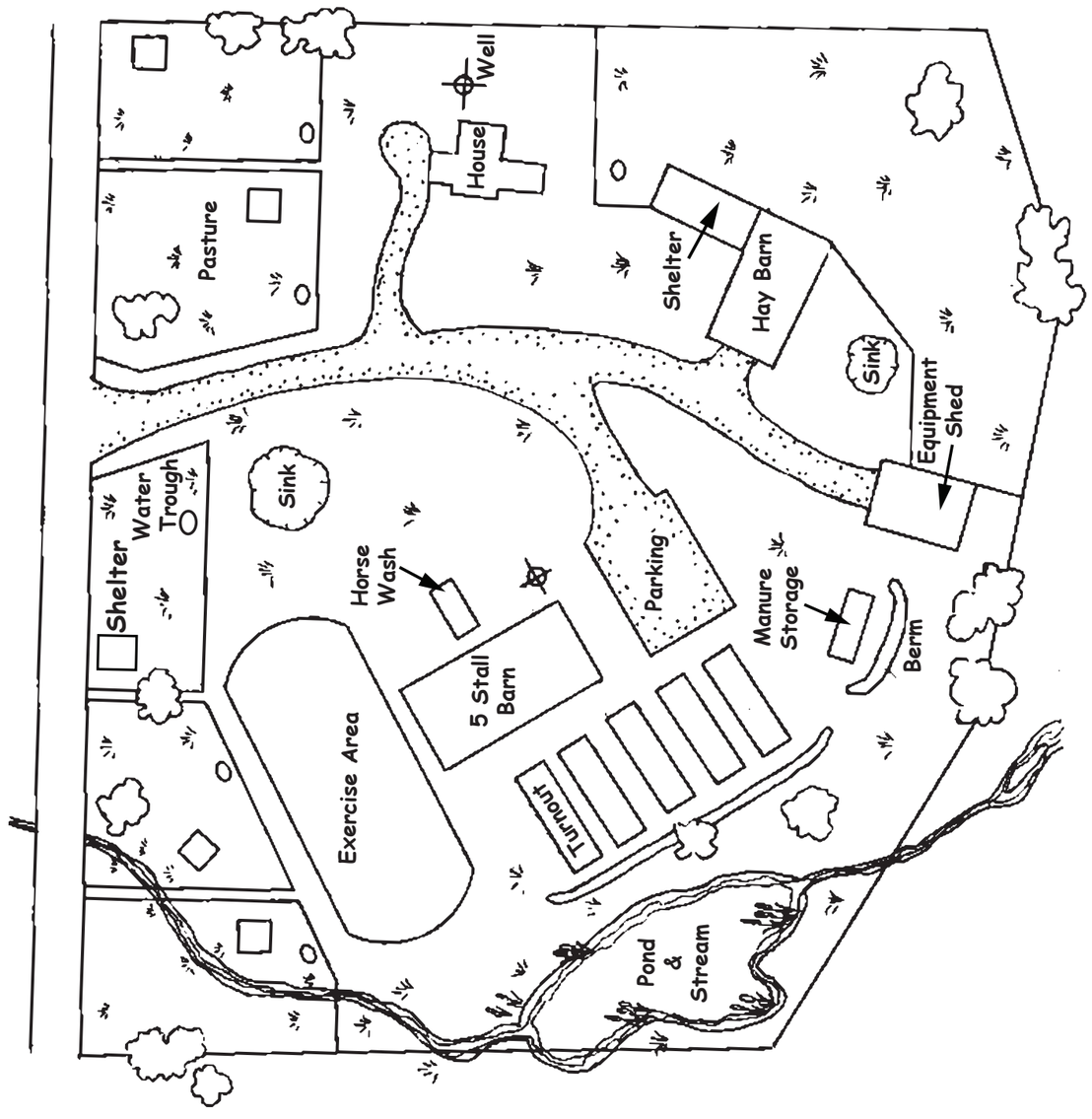
Implementing the BMPs described in this manual on your horse farm will help protect Florida's water resources, potentially save you money, and improve the efficiency of your farm operations overall. One way to select BMPs that will work best for your situation is to start by sketching your property. Include the property's structures and natural features on your sketch, such as:

Structures	Natural Features
• Corrals or riding rings • Horse washing stations • Pastures & paddocks • Manure storage areas/ compost piles • Well locations • Ditches and **swales** • Driveways, roads, and pathways • Houses, barns, & other buildings	• Rivers and streams • Wetlands • Springs • Sinkholes • Poorly drained areas • Hilly areas • Lakes and ponds

Use web resources (see Appendix 2) such as aerial photographs, soil maps, or rainfall records to help you understand the physical characteristics of your horse farm. Refer to your sketch as you read through this manual, and mark areas of your property on the sketch that may provide the greatest benefit from the BMPs described.

Look for this icon throughout the manual and see if the BMP sparks an idea that you can use.

A sample sketch is shown on the next page.



BMPS FOR MANURE STORAGE

A single 1,000-pound horse produces about 50 pounds a day of manure and stall waste. This adds up to nearly 10 tons (20,000 pounds!) each year. **Harrowing** pastures regularly helps to spread manure clumps and to distribute nutrients more evenly. However, the amount of horse manure produced will often be greater than the nutrient requirements of your pasture grass or crop. In that case, you may need to stockpile and store your horse manure for future use or move it off site.

For storing manure from one or two horses, building a free-standing pile is usually the least expensive option, but it can cause significant environmental and health problems if the pile is not located correctly or covered. **A poorly managed manure pile can become a nonpoint source of nutrients and bacteria when rain and runoff wash the manure into surface waters or sinkholes**. It can also create a breeding ground for flies and other insects, produce objectionable odors, and draw negative attention from neighbors and the public.

Free standing manure pile

Improperly stored manure can wash into nearby waterbodies

Properly locating and covering your manure storage pile are two basic and inexpensive management activities that will help to reduce its potential impact on the environment, including surface and ground water resources.

When selecting a location:

Do Locate The Storage Pile

- In a flat, dry place where there is minimal potential for runoff into surface waters or sinkholes, or onto roads.
- Near barns and other places where horses are housed and manure is generated.
- Out of sight of public places and neighboring residences.
- In a place where you have plenty of room to operate machinery around the storage pile, if needed.
- With an adequate setback from nearby water resources (see the guidelines for setbacks in Table 3, on page 23).

Don't Locate The Storage Pile

- Close to water resources such as rivers, streams, lakes, wetlands, springs, and sinkholes (see the guidelines for setbacks in Table 3, page 23).
- In hilly areas.
- In low-lying places where water tends to pool.
- In places where water drains after a rainstorm or in flood-prone areas.

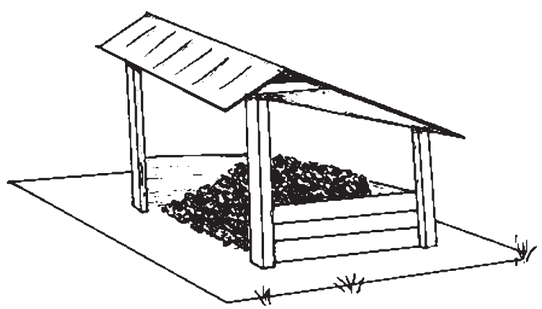
Leaving the storage pile open or uncovered may be suitable during the dry season but is not recommended year-round. Use a tarp or a piece of pressure-treated plywood to cover smaller piles, or construct a roof over the storage area to prevent rain from washing the manure away. Proper flooring material will help prevent nutrients and other contaminants in the compost from leaching into ground water. An **impervious** surface, such as a concrete slab or well-compacted soil high in clay, is suitable flooring material.

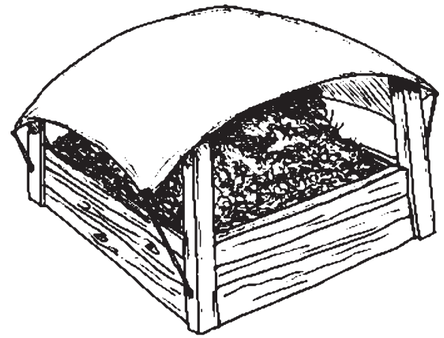
BMPS FOR MANURE COMPOSTING

With a bit of effort, your manure storage pile can be transformed into valuable compost. Composting is a method of managing your horses' manure to accelerate its decomposition. During the composting process, **microorganisms** break down manure into a nutrient-rich material that resembles soil. When done properly, composting kills the parasite eggs, insect larvae, and **pathogens** found in horse manure. It also reduces manure odor and can decrease the size of the pile by as much as 50 percent! Finished compost is so valuable as a soil amendment that it is sometimes referred to as "black gold." It can be used as slow-release fertilizer, as mulch, or as a growing medium for plants, mushrooms, and worm farms. When properly applied to pastures and other areas during the growing season, compost can also help reduce the use of commercial fertilizer.

Stockpiling manure does not ensure that composting will occur. Composting is a **process** that requires some effort to ensure the greatest efficiency and produce the best material.

Creating Composting Bins





For best results, create composting bins in your manure storage area. Bins with walls will better contain the manure pile and will facilitate the use of mechanical equipment. Concrete, tightly fitted wood planks, or cement blocks can be used for constructing walls. Plan to build at least two bins and fill the first one completely before adding material to the second bin. Two bins are recommended for farms with one to three horses, and more bins can be added as needed.

To determine the proper bin size, gather information on the volume of manure and stall waste generated and the length of time you will be storing the compost. The manure generated by a 1,000-pound horse will average 0.9 cubic feet per day (ft^3/day), (a pile measuring about 1 foot wide by 1 foot deep by 1 foot high per day). The addition of bedding can double or triple this volume. The number of horses, the type of feed, and the type and amount of bedding used will determine how much stall waste your farm produces. Plan to store your compost in bins for at least four to six months for the best product.

Table 1 provides a sample calculation for bin size based on four months of storage for two horses. The volume of manure for each horse is rounded up, and bedding is included.

Table 1. Sample Calculation for Bin Size

Description	Calculation
Number of horses	2
Volume of manure and bedding generated each day	2 ft^3/horse x 2 horses = 4 ft^3
Total storage capacity (number of months)	4 months (120 days)
Amount of manure generated	4 ft^3/day x 120 days = 480 ft^3
Number of bins	2
Size of each bin 480 ft^3/2 bins = 240 ft^3	240 ft^3= 8 ft X 8 ft X 4 ft

From: Managing Horse Manure by Composting, Lori K. Warren, Ph.D., University of Florida Department of Animal Sciences, Gainesville, FL. Available: http://training.ifas.ufl.edu/Equine2011/Equine11_Cohen_ManureMngt/Composting.pdf.

Use proper flooring material, such as a concrete slab or well-compacted soil high in clay, to help prevent contaminants in the compost from leaching into ground water. Cover your compost bins to prevent rainwater from saturating the materials and potentially washing nutrients or bacteria out of the pile. Compost that is too wet will have a bad odor and decompose very slowly. A tarp or piece of pressure-treated plywood will work, or construct a roof over larger piles.

Florida's Online Composting Center at http://sarasota.ifas.ufl.edu/compost-info/tutorial/compost-bins.shtml has more information on bin composting.

Understanding the Elements of Efficient Composting

The goal of composting is to provide the proper balance of food, water, and oxygen to the microorganisms to keep them reproducing and decomposing the manure pile. Keeping these three components balanced allows you to compost most effectively.

Food

Microorganisms in the compost use carbon and nitrogen to survive. Bedding materials such as straw, pine chips, sawdust, and leaves are high in carbon. Manure is high in nitrogen. A carbon-to-nitrogen ratio between 25:1 and 30:1 will provide the optimum environment for microorganisms. Horse manure alone is close to the ideal ratio, and so if you add bedding to your compost pile, you can end up with too much carbon and not enough nitrogen. Try using less bedding in your stalls and remove only soiled material when cleaning. This may help the manure pile to compost more quickly and save you money on bedding. To help speed up the composting process, use a shredder or chipper to process straw bedding before adding it to the compost pile. If you have too much bedding in your pile (and thus too much carbon), more nitrogen may need to be added in the form of manure or fertilizer to promote proper composting.

Water

A general rule of thumb is to keep the compost pile as damp as a wrung-out sponge—wet but not soggy. It is important to cover your compost during the rainy season, since too much water in the pile will prevent air flow, increase compaction, and slow or prevent decomposition. During the composting process, heat is generated, which will result in a loss of moisture from the compost. Water may need to be added to the compost periodically to keep the correct moisture level. **Use "old" water from the horses' water buckets to help conserve water.**

Oxygen

Because microorganisms need oxygen to survive, it is essential to maintain air flow through your compost pile. This can be accomplished by turning the pile regularly using a pitchfork or tractor bucket. Alternately, perforated PVC pipe may be inserted into the pile to circulate oxygen, but this method may take longer to compost manure than turning the pile manually. Aeration will help the pile reach the high temperatures needed for composting to occur and to kill unwanted parasite eggs and pathogens. For best results, monitor the interior of the pile with a thermometer and maintain a temperature between 130 and 160 degrees °F.

Keeping Records and Trouble-Shooting

In most situations, a well-managed manure pile takes anywhere between 60 and 120 days to compost. The finished compost will smell and look like rich soil and will no longer heat up. It may take some time to get the process down, and your management actions may need to shift with the seasons, the horses' diet, the bedding mix, and other factors. **Keep records of temperature, moisture, and how often the pile is turned.** Record keeping will help you troubleshoot and resolve issues. Table 2 provides some useful trouble-shooting tips.

Maintain a temperature of 130 to 160 degrees

Finished compost

Table 2. Troubleshooting Compost Operations

Symptom	Cause	Solution
Compost pile will not get hot	Pile may be too dry	Add water
Compost pile will not get hot	Pile may contain too much bedding (carbon)	Add fertilizer or manure to supply more nitrogen
Compost pile will not get hot	Pile may be too wet	Add more carbon (e.g., wood chips, corn stalks, yard waste, straw) and cover the pile from rain
Compost pile will not get hot	Pile may be too small	Build a bigger pile
Compost pile has a foul smell	Pile may be too wet	Add more carbon and turn the pile to allow moisture to evaporate
Compost pile has a foul smell	Pile may need more air	Turn the pile more often
Compost pile has a foul smell	Pile may contain a dead animal	Remove the carcass
Compost pile doesn't seem to be breaking down	Pile may be too dry	Add water
Compost pile doesn't seem to be breaking down	Pile may be too small; not holding heat	Build a bigger pile
Compost pile doesn't seem to be breaking down	Pile might not contain enough nitrogen	Add fertilizer or manure to supply more nitrogen

Adapted from: Managing Horse Manure by Composting, Lori K. Warren, Ph.D., University of Florida Department of Animal Sciences, Gainesville, FL. Available: http://training.ifas.ufl.edu/Equine2011/Equine11_Cohen_ManureMngt/Composting.pdf.

Using Compost

If you have sufficient land available, the application of composted manure on cropland or pasture is an option. Composted manure contains various important nutrients required for proper plant growth. It is also high in organic matter, which can enhance soil quality, especially in Florida's sandy soils. However, over-applying compost can add excess nutrients to the soil. Obtain a soil test kit from your county Extension Office to determine how much compost to apply. If you do not have the available land to use the compost, consider donating it to home gardens or nurseries. You may have neighbors without livestock who would appreciate this great soil amendment for their yards or landscapes. As a last resort, check with your local landfill to see if they will accept this product.

Obtain a soil test before applying compost to your pasture

BMPS FOR PASTURE MANAGEMENT

Good pasture management can decrease feeding expenses, help maintain healthy horses, and minimize environmental impacts. Healthy pastures allow grass roots to hold the soil in place, increase the soil's absorption of rainfall, and slow the rate of runoff—all of which help to minimize erosion, the development of bare spots, and weed infestations.

In contrast, overgrazed pastures typically result in bare ground, soil compaction, and weed growth that contribute to a loss of forage and preferred pasture grasses. Bare areas can quickly be churned to dust and mud, causing health risks to horses such as respiratory disease, sand colic, and thrush. In addition, soils are more easily eroded and washed away when vegetation and roots are not holding it in place. These problems ultimately can degrade water resources and become an eyesore, potentially straining neighbor relations.

Managing Stocking Rate

Good horse management requires that you recognize the limitations of your pasture area and stocking rate, which is the amount of land required for each horse. These limitations vary with the pasture species grown and its productivity; the size, age, and activity level of the horse; the amount of grain and other supplements fed; and the grazing plan in place for managing forage growth. Overstocking refers to the practice of allowing too many horses in a pasture so it becomes overgrazed. With some planning, you can adjust your stocking rate to improve your pasture forage supply and growth rates, prevent overgrazing and bare areas from developing, reduce weed growth, and improve your horse's health, all while protecting water resources.

Over-grazed pastures can be a risk to your horse and to water resources.

Typically, on less productive land one mature horse weighing 1,000 pounds may require 2 to 5 acres of pasture. On productive sites and well-managed pasture, 1 to 1.5 acres per horse is adequate during the summer. The number of horses in a pasture may be increased if more **supplemental feed** is provided or if horses are rotated through different pastures. Horses not receiving supplemental feed will consume about 1.5 to 2.5 percent of their body weight in forage per day. Thus, an average horse weighing 1,000 pounds would require a minimum of 15 to 25 pounds of dry forage or hay daily.

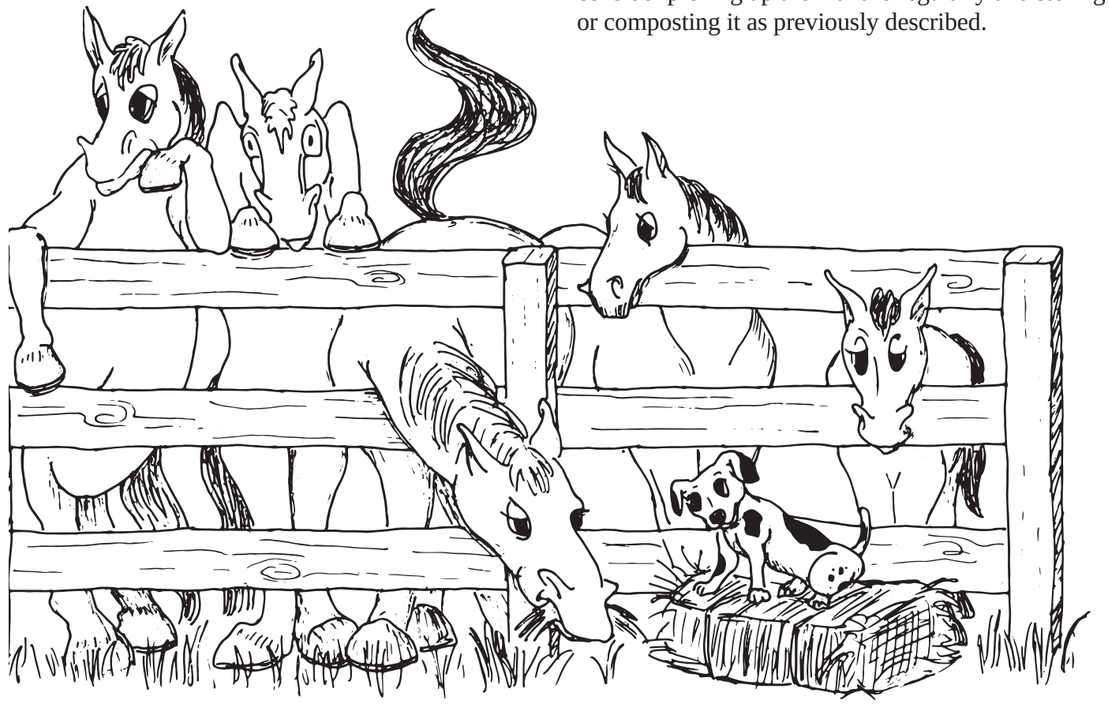
Managing Forage Growth

Horses instinctively are selective grazers. Young forage is more digestible and less fibrous than older forage, and so horses start to **spot graze**, or graze some areas of a pasture with young forage down to the bare ground. 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 the uniform regrowth of forage for the next grazing cycle, and helps break up manure piles. When mowing, a good rule of thumb is to leave five inches of stubble to encourage healthy forage growth and help prevent erosion.

Overstocking your pasture can create too much manure for plants to use, add excess nutrients to the soil, deplete the available forage, and potentially increase the amount of polluted runoff to water resources. Too much manure may also attract flies and create unpleasant odors. In addition, horses will not graze in areas where they defecate, or where fresh manure has been spread, and thus forage around manure piles becomes mature and less palatable.

Practices such as dragging (chain harrowing) manure piles in your pasture will distribute nutrients to the forage and help break up the piles. If your pasture is overstocked, consider picking up the manure regularly and storing or composting it as previously described.



Compost spreader

Dragging to break up manure in pasture.

Compost spreader

Your county Extension Agent can help you with soil testing to determine if your forage grass will benefit from added nutrients and the correct amount of nutrients needed. If your horse farm has adequate pasture space to spread manure, spread it at the rate recommended by the Extension Agent.

If you do not have enough manure to fertilize your pasture, then you may need to add commercial fertilizer.

Your Extension Agent can provide guidance on commercial fertilizer use. The over-application of commercial fertilizer can waste your money, cause damage to the pasture, and degrade water resources. **Use the following guidelines to help you spread manure and fertilizer correctly, save money on fertilizer costs, and protect water resources:**

- Apply manure or fertilizer when soils are not saturated with water.
- Do not apply manure or fertilizer if a rain event is forecast that may produce runoff to surface waters or sinkholes.
- Time your applications so that they coincide with periods of rapid plant growth and nutrient uptake.
- If using quick-release fertilizer, split the recommended amount into several small amounts (for example, 20 to 30 pounds N per acre twice instead of 60 pounds in a single application) over an extended period.
- Use controlled-release fertilizers near environmentally sensitive areas.
- Do not spread manure or fertilizer in or near surface waters or sinkholes.
- Do not apply manure or fertilizer within a 100-foot radius of a drinking water well because of potential contamination.
- Locate fertilizer mixing/loading sites away from water resources, where spills can contaminate the water.

Developing Grazing Plans

Good pasture management involves developing a grazing plan. The following are three common practices:

- In **continuous grazing**, which is the least labor-intensive method, horses are allowed to graze on the same pasture for extended periods. If you begin to notice bare spots and weeds in your continuously grazed pasture, you may want to consider an alternative grazing plan or reduced stocking rate.
- **Deferred grazing** (or "resting") involves saving a pasture for grazing during certain seasons or stages of forage growth, such as after seed production. Resting a pasture from grazing for an entire season or year may be needed for previously denuded pastures or pastures that require improvement.
- **Rotational grazing** is often used to encourage horses to eat plants that may be overlooked under a continuous grazing plan. A minimum of two pastures is required to implement a rotational grazing plan. **Inexpensive electric tape may be used to section off pieces of pasture from grazing.** In a two-pasture example, horses may be allowed to graze in the early and late growing seasons in alternating years to encourage seed production.

The best management of small grazing areas may mean selecting forage species (such as Bermudagrass) that are more tolerant of higher levels of grazing, or limiting grazing times by confining horses to a high-intensity area or **sacrifice area** during critical forage growth times. These are areas that become denuded and bare because they are used repeatedly by horses.

BMPS FOR EROSION CONTROL

The runoff of sediments containing nutrients and pesticides can adversely affect surface or ground water. Site characteristics such as clayey soils and sloped terrain can increase the risk of erosion and sediment runoff from your horse farm. The removal of natural vegetation and topsoil increases the potential for soil erosion and results in soil loss and increased sedimentation in surface waters.

The principle of erosion control is to maintain vegetation to hold soil in place and decrease the velocity of runoff water.

High-intensity areas or sacrifice areas are generally left devoid of vegetation in order to support their intended high-impact uses. Wash racks, round pens, and riding arenas are typical examples of high-intensity areas, as are shaded or covered shelters, watering locations, and supplemental feeding areas. Other practices and activities such as overgrazing, land clearing, ditch and canal maintenance, and pasture renovation can expose bare soil, making it susceptible to erosion. It is important to take appropriate erosion control measures during these activities.

Creating Buffers and Filter Strips

Buffers are the single most effective means to protect surface waters from bank erosion and runoff.

These are areas of trees or shrubs adjacent to water resources that help capture and prevent the sediment, organic material, nutrients, and pesticides in runoff from entering surface and ground water. In some cases, the root zone may also help to remove nutrients and other chemicals from shallow ground water flow. Buffers are extremely effective on sloped lands. Inspect buffers periodically and restore them as needed to maintain their effectiveness.

Filter strips are areas of permanent vegetation such as dense grass or forage between high-intensity areas and water resources. Their main purpose is to decrease the velocity of runoff water and remove sediment particles before they reach surface waters.

Do not fertilize buffers and filter strips unless absolutely necessary. Any use of fertilizers or pesticides should be done so as to not compromise the intended purpose. Proper grazing management practices will ensure the long-term integrity of the buffer. Table 3, page 23, lists the recommended setbacks for different types of water resources. These setbacks should include buffers and filter strips.

Managing Horse Watering Needs

Try to keep horses from natural water sources to avoid bank erosion and water pollution. Horses' hooves can destroy the grasses at the water's edge, especially when the ground is already wet, thus reducing their filtering capacity. Manure and urine on the banks can also enter the water easily, creating on-site and downstream water quality problems and health hazards.

The careful evaluation of drinking water sources for horses can reduce or eliminate the need to install exclusion fencing around surface waters. **Providing fresh water in troughs or tanks helps to keep the horses out of waterbodies and to reduce the health risks associated with drinking from stagnant surface water.** Water troughs require some maintenance:

- Check them daily for the presence of dead rodents or other small animals to keep the animals from being exposed to viruses and bacteria, which can potentially cause illness in horses and abortion in mares.
- Install a shut-off device on all troughs.
- Do not allow troughs to overflow, and turn the water off when not in use.

In some cases, fences may be needed to keep horses out of surface waters to help reduce streambank erosion and prevent them from standing in water. Both of these can contribute to water quality degradation. **Contact FDEP before installing permanent fences across navigable waterbodies such as rivers, creeks, or streams, as this activity may result in a violation of state law.** In most cases, a solution can be reached to meet your needs without obstructing navigability.

BMPS FOR OTHER WATER RESOURCE PROTECTION ISSUES

Using Recommended Setbacks

You can further protect water resources on your horse farm by maintaining a certain distance (or setback) between the resource and the activity or land use. Ideally, buffers or filter strips should be maintained within the setback area to prevent stormwater runoff or other contaminants from entering the water.

Table 3. Recommended Setbacks

Activity or Practice	Setback (feet)	Water Resource
Manure storage	100	Private potable wells
Manure storage	200	**Watercourses**, sinkholes
Manure storage	300	Public potable wells
Access roads	25	Wetlands
Fertilizer application	50	Watercourses, lakes, wetlands, sinkholes, springs
Fertilizer application	100	Drinking water well
High-intensity areas or sacrifice areas	200	Watercourses, lakes, wetlands, sinkholes, springs
Water troughs, supplemental feed and minerals	100	Watercourses, lakes, wetlands, sinkholes, potable wells, springs
Riding trails 25	25	Watercourses, lakes, wetlands, sinkholes, springs
Livestock exclusion	75	Potable wells
Horse washing	50	Waterbodies, wells, septic tank drainfields
Pesticide storage	100	Wells, surface waters
Burial sites	200	Watercourses, streams, wetlands, wells, sinkholes, springs

This table may not be practical for horse farms of less than five acres or in certain other cases. For instance, it may be necessary to fertilize pastures as close as ten feet to the water if there are slopes that may erode if vegetation is not fertilized, or on a two-acre suburban lot.

Managing Stormwater

Poor stormwater management can lead to on-site flooding, erosion, and increased runoff to water resources. Installing gutters on buildings and diverting water from feed storage and manure storage areas will help control stormwater runoff on your property and reduce potential contamination. If you have standing water or flooding issues following a one- to two-inch rainfall, your farm may benefit from a stormwater analysis from a qualified engineer.

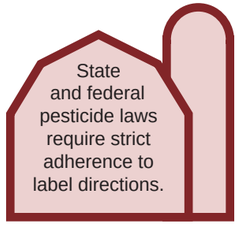
Gutters can help control stormwater runoff.

Managing Horse Washing

Whether the wash area is inside or outside the barn, sanitation, safety, proximity to water resources, and environmental impacts are key factors. Some important considerations include:

- Locating wash areas at least 50 feet away from waterbodies, wells, and septic tank drainfields. Direct the runoff to a well-vegetated area, such as a **swale** or **rain garden**.
- Picking up manure in wash areas.
- **Surrounding outdoor wash areas with vegetation that can capture sediment and nutrients in the wash water and prevent it from reaching water resources.**

Using Pesticides Correctly



Many horse diseases or problems are caused by insects or weeds, but pesticides should be used to control these only when necessary. To minimize the potential for polluting surface and ground water, avoid using pesticides close to water resources. Use pesticides that have the least effect on beneficial organisms and become familiar 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.

Research and consider nonpesticidal options such as:

- The introduction of natural predators.
- The planting of **trap crops**, or specific crops that attract pests away from pastures and horses.
- The use of light and pheromone traps, sticky traps, and bird perches to encourage the presence of insect- eating birds such as martins.

Disposing of Unused Pharmaceuticals

The proper disposal of unused pharmaceuticals used to treat horses is essential to preserving the health of the environment, animals, and people. Follow the pharmaceutical label instructions for disposing of unused products.

Managing Animal Mortality

Mortality management involves the proper transport, storage, and disposal of dead animals to avoid impacts to water quality and animal and human health. Mortality management methods include rendering, incineration, composting, burial, or hauling the carcass to a county landfill that is approved to accept horse carcasses. More information is available in the document Florida Animal Producer Guidance for Routine Disposal of Animal Carcasses, available at: http://ebookbrowse.com/producer-guidance-for-routine-carcass-disposal-rev-1-6-12-docx-d375519062.

We've touched on a number of important BMPs that small-scale horse owners can use to protect and improve water quality. Now, review the property sketch that you created earlier. Based on your sketch, decide if your management strategies prevent or possibly contribute to water quality degradation. Use the sketch as a planning tool for implementing BMPs on your horse farm.

APPENDIX 1: DEFINITIONS AND ACRONYMS

Animal Feeding Operation (AFO): An agricultural operation where animals are kept and raised in confined situations.

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

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

Best Management Practices (BMPs): Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.

Buffer: Zone of vegetation adjacent to a waterbody that helps to reduce runoff, stabilize soil, prevent erosion, and provide wildlife habitat.

Confined Animal Feeding Operation (CAFO): An animal feeding operation (AFO) that confines animals for more than 45 days during a growing season in an area that does not produce vegetation, and that meets certain thresholds for the number of animals.

Compost: Manure and other organic material that has decomposed into nutrient- and mineral-rich humus by the action of microorganisms.

Continuous Grazing: The grazing of a specific area by livestock throughout the year or for the part of the year when grazing is feasible.

Deferred Grazing: Saving a pasture for grazing during certain seasons or stages of forage growth, such as after seed production. This approach may be used on previously denuded pastures or pastures that require improvement.

Ecosystem: An environmental system containing a living biological community (plants, animals and microorganisms) and nonliving components (air, water, and soil). These interact through nutrient cycles and energy flows.

Estuary: Areas where fresh water meets and mixes with salty ocean waters. The term estuaries refers to protected, near-shore waters, such as bays and lagoons.

FDACS: Florida Department of Agriculture and Consumer Services

FDEP: Florida Department of Environmental Protection

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.

Ground Water: Water that occurs below the Earth's surface at depths where all the open spaces in the soil, sediment, or rock are completely filled with water. All ground water originates and is replenished (recharged) by precipitation.

Harrowing: Breaking up and smoothing out the soil surface using a special implement.

High-Intensity Area (HIA): An area of a horse farm that has been denuded of ground cover due to repeated use by livestock (e.g., sacrifice areas, arenas, round pens, hotwalkers, etc.). For the purposes of this manual, HIAs do not include watering troughs and supplemental feeding and mineral stations.

Impervious: Not allowing something to pass through; impenetrable.

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

Microorganism: A microscopic organism, especially bacteria, fungi, and some algae, that can only be seen with the aid of a microscope.

NOAA: National Oceanic and Atmospheric Administration

Nonpoint Source (NPS): Diffuse runoff without a single point of origin that flows over the surface of the ground by stormwater and is then introduced to surface or ground water. Nonpoint sources include atmospheric deposition and runoff or leaching from agricultural lands, urban areas, unvegetated lands, on-site sewage treatment and disposal systems, and construction sites.

OAWP: Office of Agricultural Water Policy (FDACS)

Overstocking: The practice of allowing too many horses in a pasture so it becomes overgrazed.

Pathogens: Disease-causing microorganisms such as bacteria and viruses.

Potable: Fresh water used for drinking.

Rain Garden: A landscaped area designed to capture and hold excess water for a short period, allowing it to soak into the soil.

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

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

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.

Spot Grazing: Grazing some pasture areas with young forage down to the bare ground.

Spring: A point where underground water emerges to the earth's surface (including the bottom of the ocean). Stocking Rate: The number of animals assigned to a grazing area on a seasonal basis.

Stormwater: Water from rainfall that runs off the land or an impervious surface and does not percolate into the ground. As it flows across streets, parking lots, and rooftops, the water accumulates nutrients, pesticides, bacteria, sediments, or other pollutants that can adversely affect water resources.

Surface Water: The state of Florida has established a rule that defines "surface waters" as follows: ". . . [T]hose waters of the State upon the surface of the earth to their landward extent, whether contained in bounds created naturally or artificially or diffused. Water from natural springs shall be classified as surface water when it exits from the spring onto the earth's surface." See https://www.flrules.org/gateway/chapter-home.asp?chapter=62-303.

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

Swale: A man-made, 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 is used to treat standing or flowing water.

Trap Crops: Specific crops that attract pests away from pastures and horses.

Turbidity: Substances in water that reduce visibility and cause cloudiness in the water.

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

Watercourse: Any natural or man-made (ditch or canal) water feature that flows continuously or intermittently.

Wellhead: The source of a water well or the structure built over the water well.

Wetlands: As defined in Subsection 373.019(25), Florida Statutes, wetlands are those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils.

APPENDIX 2: ADDITIONAL REFERENCES

Aerial photographs: http://earth.google.com/index.html

U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS) soil survey maps: http://websoilsurvey.nrcs.usda.gov/app/

U.S. Geological Survey (USGS) topographic maps: http://topomaps.usgs.gov

U.S. Fish and Wildlife Service National Wetlands Inventory data: http://www.fws.gov/wetlands/data/index.html

National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center historical rainfall records: http://www.ncdc.noaa.gov/oa/ncdc.html

On-Farm Composting Handbook ($25)
This 1992 handbook, developed by the Natural Resource, Agriculture, and Engineering Service, an outreach effort of several state universities, 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.
Available: http://palspublishing.cals.cornell.edu/nra_order.taf?_function=detail&pr_booknum=nraes-54.

Calculating Manure and Manure Application Rates
This guide, developed by Purdue University Cooperative Extension Service and published in 1993, contains comprehensive nutrient and mineralization/availability values for all types of manure. It also includes information on manure spreader calibration.
Available: http://www.ces.purdue.edu/extmedia/AY/AY-277.html.

Horse Keeping: A Guide to Land Management for Clean Water
This 2001 document, developed by the San Francisco Bay Resource Conservation and Development Council, describes methods to evaluate your property for sediment and nutrient impacts.
Available: http://books.google.com/books/about/Horse_Keeping.html?id=zei_GwAACAAJ.

Small Farm Environmental Issues
This website resource is a compendium of Extension Service articles geared to smaller horse farms. It includes articles on manure storage, barnyard and open lot management, and pasture management.
Available: http://www.extension.org/pages/Small_Farm_Environmental_Issues_Articles.

Florida Department of Agriculture and Consumer Services, Office of Agricultural Water Policy (FDACS-OAWP)
Best Management Practices – Rules, Manuals, and Other Documents.
This website provides links to the adopted BMP manuals and associated forms and rules, including Florida Equine Operations. Available: http://www.floridaagwaterpolicy.com/BestManagementPractices.html.

Water Quality/Quantity Best Management Practice for Florida Equine Operations
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Managing Pastures

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Forage Planting and Establishment Methods
(University of Florida–Institute of Food and Agricultural Sciences, Gainesville, FL, SS-AGR-161, revised April 2011).
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National Management Measures for the Control of Nonpoint Pollution from Agriculture (Chapter 4E, Grazing Management)
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Using Buffers and Filter Strips

Florida Stormwater, Erosion, and Sediment Control Inspector's Manual
(Florida Department of Environmental Protection, Tallahassee, FL, July 2008).
Available: http://www.dep.state.fl.us/water/nonpoint/erosion.htm. There is a line underneath the "J" in July above that I cannot get rid of no matter what I do—maybe David can figure this out?

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Managing Animal Mortality

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APPENDIX 3: PHOTO & ART CREDITS

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14	Sustainable Sanitation Alliance	http://creativecommons.org/licenses/by/2.0/deed.en	http://www.flickr.com/photos/22327656@N05/4770028684
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Back Cover	Amanda	http://creativecommons.org/licenses/by/2.0/deed.en	http://www.flickr.com/photos/spakattacks/1656339685/

APPENDIX 4: CONTACT INFORMTION

Florida State Agency Numbers

Florida Department of Environmental Protection

Nonpoint Source Management Section (Tallahassee)	(850) 245–7508
Hazardous Waste Management Section (Tallahassee)	(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 Beach)	(561) 681–6600
Southwest District Office (Tampa)	(813) 632–7600
South District Office (Ft. Myers)	(239) 344–5600

Florida Department of Agriculture and Consumer Services

Office of Agricultural Water Policy (OAWP) (Tallahassee)	(850) 617–1700
OAWP BMP Helpline (Tallahassee)	(850) 617–1727
Email address	AgBmpHelp@FreshFromFlorida.com

Water Management Districts

Northwest Florida (Tallahassee)	(850) 539–5999	
Suwannee River (Live Oak)	(386) 362–1001	(800) 226–1066
St. Johns River (Palatka)	(904) 329–4500	(800) 451–7106
Southwest Florida (Brooksville)	(352) 796–7211	(800) 423–1476
South Florida (West Palm)	(561) 686–8800	(800) 432–2045

University of Florida–Institute of Food and Agricultural Sciences Extension Service

Administration	(352) 392–1761
Website to obtain local contact information	http://solutionsforyourlife.ufl.edu/map/

SKETCH YOUR FARM

NOTES

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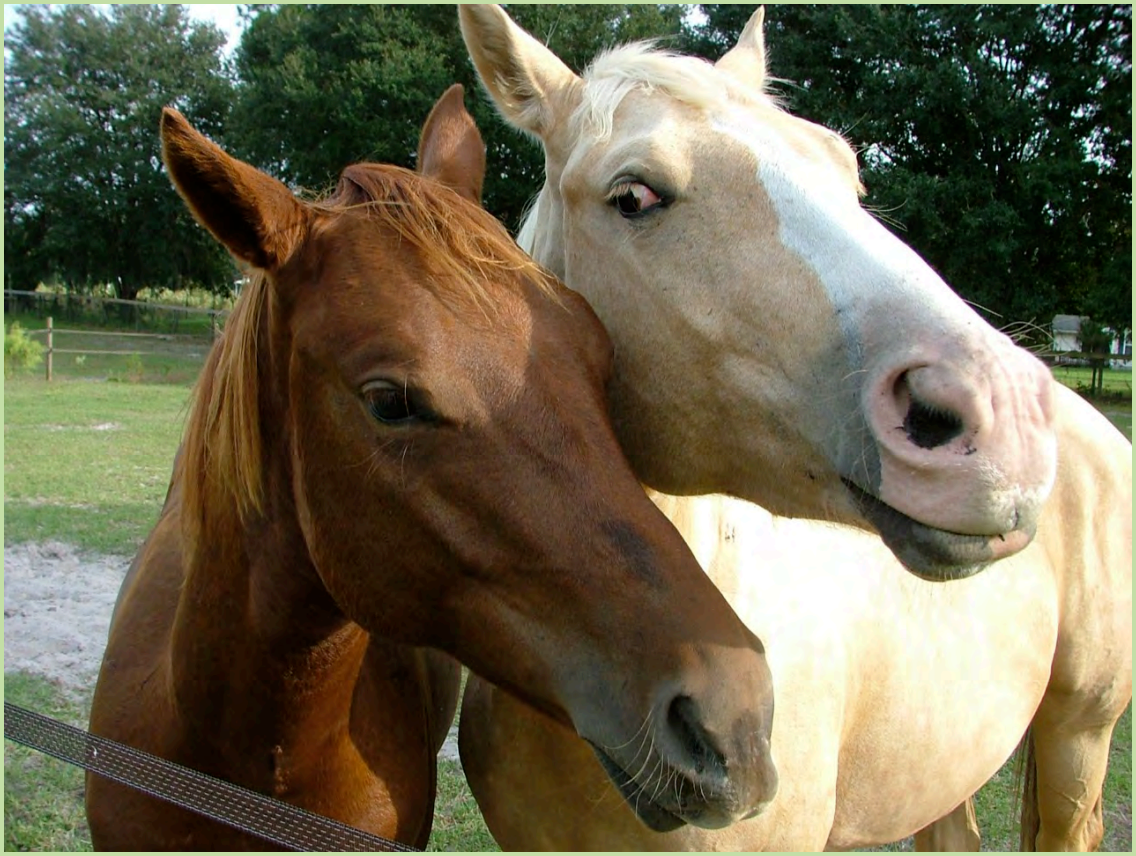

UF UNIVERSITY of FLORIDA

DEPARTMENT OF ENVIRONMENTAL PROTECTION
FLORIDA

Managing Manure and Mortality by Composting

Carissa Wickens, Ph.D.

Department of Animal Sciences

University of Florida

Implementation of sound manure management practices and methods of mortality disposal are important aspects of horse ownership and equine facility management. Composting provides equine owners and facilities with a financially and environmentally sound alternative to stockpiling manure and to common methods of mortality disposal (e.g. burial, rendering, incineration, use of a landfill).

Composting is a method of accelerating the decomposition of animal waste. Benefits of composting include the recycling of organic material and conservation of landfill space, decreased odor and parasites associated with manure piles, suppression of some soil-borne pathogens, and decreased mass and volume of the material being disposed of. When compost is completely processed it can be used as a soil amendment making it more attractive than raw horse manure to potential end users such as gardeners and nursery growers.

Composting of horse manure can be done using free standing piles or windrows, however, use of composting bins can provide better control of the process and will minimize runoff and leaching thus reducing the risk of water pollution. Selecting a suitable location and determining bin size are the first steps in designing a composting system. Information on how to determine the size and number of composting bins needed can be found at the links provided below.

Taking a more active role in managing the compost pile will produce a better quality compost in a shorter period of time, but horse owners and equine operations need to customize the composting system to fit their specific situation. Monitoring the pile and making adjustments can improve the process. Tips for trouble shooting during composting are also provided in the resources listed below. Finished compost will have an “earthy” or humus smell and will look like rich soil. Management of the compost pile consists of the following five components:

1. Amassing the pile – creating a minimum pile size of 1 cubic yard by adding bedding and manure from horse stalls, manure picked up from riding rings, corals, and trails being careful to avoid picking up too much dirt with the manure and making sure the pile is free from trash
2. Monitoring the temperature of the pile – maintaining a temperature of 130-150°F for at least 21 days and monitoring the pile every 2 to 3 days with a long-stemmed compost thermometer to ensure active composting is taking place
3. Turning and mixing the pile – this helps aerate the pile to deliver oxygen to the microorganisms involved in composting and accelerates the composting process
4. Adding water to the pile – the pile should be moist, but not too wet; squeezing a handful of compost should feel like holding a wrung out sponge
5. Amending the pile with nitrogen – bedding material contributes carbon, so the more bedding removed with the manure during stall cleaning, the more likely supplemental nitrogen will need to be added to maintain an active composting process

Mortality compost piles also require sources of carbon and nitrogen, moisture and oxygen. Woodchips provide a source of carbon and are an absorbent material. When used as a base, woodchips will soak up moisture from the mortality which helps prevent leaching of nutrients and other products into the environment and reduces odor emission from the pile. To build a compost pile for a large animal mortality, start by building a base of woodchips, or stall waste containing wood bedding, approximately 24 inches deep and approximately two feet wider on all sides than the mortality to be composted. Place the carcass in the center of the woodchips and cover with approximately 18 inches of stall waste. Top off the pile with another 18-24 inches of woodchips or stall waste. This will create a pile approximately 6-7 feet tall in the shape of a pyramid. This form will allow the pile to shed water and to maintain the appropriate moisture content. Turning a compost pile containing a large carcass can be an issue. The compost pile is usually left to process for at least 3-4 months before it is turned (static versus active composting). However, use of larger woodchips can increase porosity allowing air into the pile. When composting a carcass containing barbiturates (e.g. when a horse has been euthanized using pentobarbital), care must be taken to ensure pets and wildlife do not have access to the pile. Research on the use of composting to manage animal mortality is ongoing, but the publications and links listed below will be helpful to owners and equine operations looking for an alternative solution to animal mortality management.

References and Further Reading

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eXtension at http://www.extension.org/. Search for manure management, composting, livestock carcass disposal, and/or livestock mortality composting

Florida Department of Agriculture and Consumer Services (FDACS) BMP Rules, Manuals, and Other Documents. Available at http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy/Enroll-in-BMPs/BMP-Rules-Manuals-and-Other-Documents

Florida's Online Composting Center. Available at http://sarasota.ifas.ufl.edu/compost-info/

Managing Horse Manure by Composting. 2005 Florida Equine Institute Proceedings. Lori K. Warren, Ph.D., Department of Animal Sciences. Available at http://www.animal.ufl.edu/extension/equine/New/documents/2005EquineInstit/Composting.pdf

Managing Manure and Mortality by Composting

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Overview

- Discussing the why's and how's of composting horse manure
- Composting as a method of equine carcass disposal

How do you view manure?

- Waste?
- Nuisance?
- Nutrient source?
- Costly disposal issue?
- Source of disease?

Photo courtesy of FDACS Equine BMP Manual

Manure happens

- Feces, urine, bedding
- Source of nutrients
- Manure management requires responsible action
  - Storage
  - Disposition

Photo courtesy of thehorse.com

A mountain of manure

- A 1,000 pound horse:
  - Defecates from 4 to 13 times per day
  - Produces 50 lbs of manure per day
  - Produces 9.1 tons of manure per year containing 11 pounds of N, 2 pounds of P, and 8 pounds of K
  - 2.4 cubic feet per day (manure and bedding); 876 cubic feet per year (32 cubic yards)

Photo courtesy of myhorseuniversity.com

Composting manure: Why compost?

- Production of a more homogenous material
- Final product is dry making it easier to spread and manage
- May have marketability (soil amendment, growth media, mulch, slow-release fertilizer)

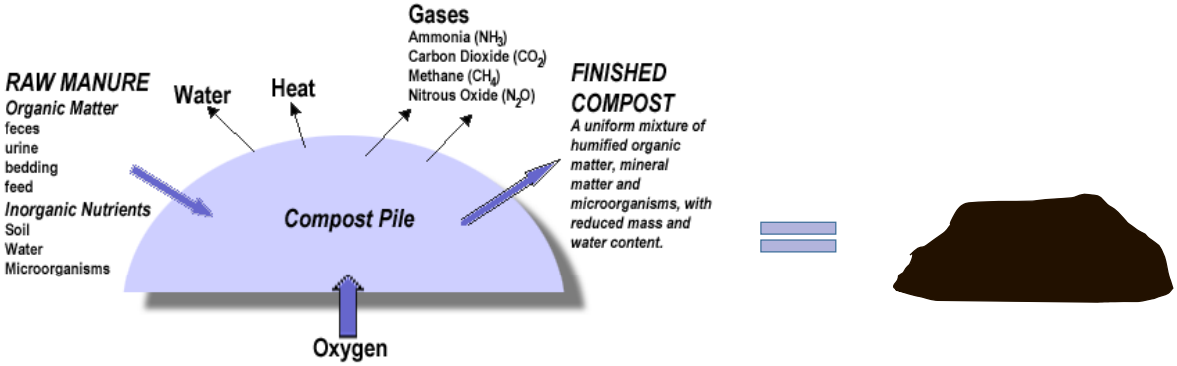
Photo courtesy of myhorseuniversity.com

Composting manure continued

- Well composted manure has an earthy smell, 25-50% volume reduction, and destruction of pathogens and weed seeds due to heat of composting

Photo courtesy of eXtension.org

Composting principles



Essentially the same process as natural decomposition except that it is enhanced and accelerated by mixing organic waste with other ingredients in a manner that optimizes microbial growth

Illustration courtesy of www.agriculture.gov.sk.ca

Building a composting system

- Location of pile
  - Fairly flat site, away from low lying areas
  - 300 feet away from springs or wells
  - 100 feet away from open bodies of water
  - Out of view and downwind from neighbors
- Managing the pile
  - Minimum pile size (1 cubic yard)
  - Temperature (130-150°F)
  - Turning (by hand or mechanically to aerate)
  - Adding water (moist but not too wet)
  - Amending with nitrogen (bedding primarily contributes carbon)

Photo courtesy of FDACS Equine BMP Manual

How to determine bin size

Example Calculation: 2-Bin System for a Small Operation	
Number of horses	2
Volume of manure and bedding generated each day	2 ft^3/horse X 2 horses = 4 ft^3
Total storage capacity (number of months)	4 months (120 days)
Amount of manure generated	4 ft^3/day X 120 days = 480 ft^3
Number of bins	2
Size of <u>each</u> bin	480 ft^3 / 2 bins = 240 ft^3 240 ft^3 = 8 ft X 8 ft X 4 ft

Warren, L. 2005 Florida Equine Institute Proceedings. Managing Horse Manure by Composting.

Trouble shooting

Symptom	Cause	Solution
Compost pile will not get hot	Pile may be too dry	Add water
	Pile may contain too much bedding (carbon)	Add fertilizer or manure to supply more nitrogen
	Pile may be too wet	Add more bulking materials; cover from rain
	Pile may be too small	Build a bigger pile
Compost has foul smell	Pile may be too wet	Add more bulking materials and turn pile
	Pile may need more air	Turn the pile more often
	Pile may contain a dead animal	Remove the carcass
Compost pile doesn't seem to be breaking down	Pile may be too dry	Add water
	Pile may be too small; not holding heat	Build a bigger pile
	Pile might not contain enough nitrogen	Add fertilizer or manure to supply more nitrogen

Warren, L. 2005 Florida Equine Institute Proceedings. Managing Horse Manure by Composting.

Large Animal Mortality Composting

The problem

- Disposal options for deceased/euthanized animals
- Burial
  - Zoning restrictions, groundwater contamination, odor
- Incineration
  - Air pollution, cost
- Rendering
  - Regulatory changes
- Landfill
  - Some won't accept, others limit numbers
- Composting

Composting

- Compost – decomposed organic matter
- When done properly
  - Effective, affordable, environmentally sound
  - End product use – land application
- The process
  - Aerobic bacteria and fungi
  - Requires carbon, oxygen, nitrogen, and water
  - Generates high heat (135-160°), kills many pathogens
  - Can pile up material and wait (static)
  - Shred material, add water, aerate/turn pile (active)
- Do you want to turn a pile with an animal in it?

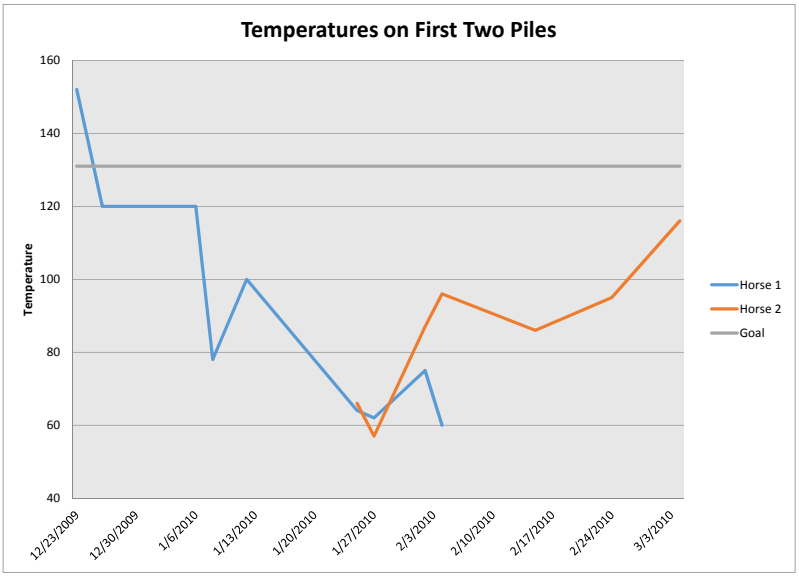
Research questions

- Will composting effectively dispose of mortality?
- How do you build a proper pile?
- Can we use static versus active composting?
- How will we know it's working?
- How long will it take?
- How will it look?

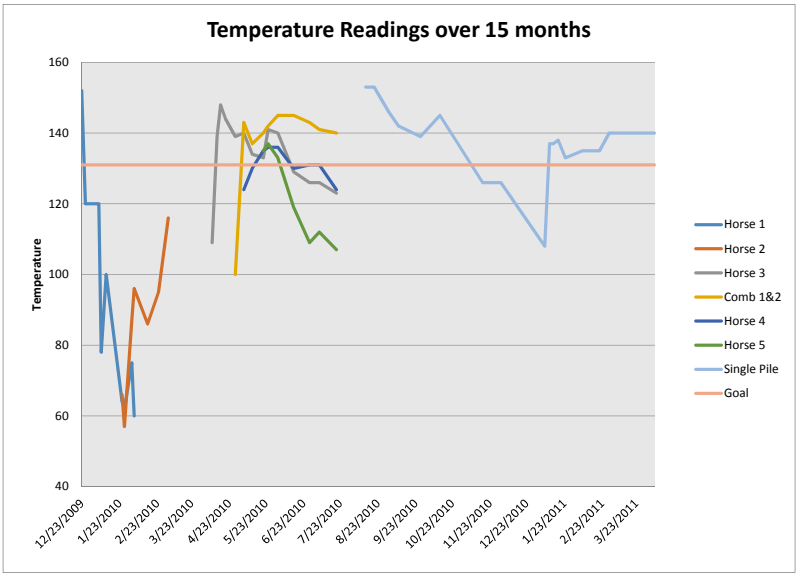
Pilot project (Virginia Tech)

- Horses euthanized for health reasons donated to the project
- Wood chips, stall waste, mortality
- Built 5 test piles
  - Dec, Jan, Apr, May (2)
- Collected temperatures, observational data
- Answering research questions

Data collection - temps



Data collection – temps



Answers

- Will composting effectively dispose of mortality?
  - Yes
- How long will it take?
  - 60 days – 90+% of soft tissue gone, some odor
  - 15 months – still bones
- How do you build a proper pile?
  - Size very important
- Can we use static versus active composting?
  - Yes

Barbiturates

- Potential contamination
  - Environment
  - Compost
- Cornell study
  - Euthanasia dose – 102.9 mg/kg given to horse
  - No leachate after 56d; 2.2 ppm last detectable
  - Liver, soil – undetectable by 83d
  - Compost – 181d, <6 ppm
- Impact
  - Dogs, sedative 30 mg/kg, lethal 85 mg/kg
  - At “worst” (12 ppm in compost), 20 kg dog needs to eat 50 kg compost to become sedated

Ivermectin

- Drugs and importance of
  - Microbial activity
  - Manure degradation
- Ivermectin and manure research
  - Dosed manufacturer's recommendation
  - Max concentration in manure at 2.5d
  - Concentrations detected
    - in manure can have impact on beetles
    - in compost appear to decrease quickly
- Concentrations in compost not likely to impact microbial activity nor beetle health

Bones

- Rib bones, flat bones
  - Showing signs of degradation
  - Many not easily identified
- Long bones, complex bones
  - Still solid
  - Easily identifiable
- Is this a problem?
  - Appearance
  - Spreading
  - Sifting

Current situation

- Composting mortality can be done
  - Build pile correctly
  - Little/no issue with odor
  - Little/no issue with scavengers
- Drug considerations
  - Barbiturates seem to be “safe”
  - No apparent or anticipated effect of ivermectin
- Final product use
  - No regulations, but…

Acknowledgements

Information and PowerPoint slides adapted from materials provided by Dr. Shea Porr, Murray State University and Jennifer Reynolds, University of Maryland Extension

References

- Florida Department of Agriculture and Consumer Services (FDACS) BMP Rules, Manuals, and Other Documents at http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy/Enroll-in-BMPs/BMP-Rules-Manuals-and-Other-Documents
- Florida's Online Composting Center at http://sarasota.ifas.ufl.edu/compost-info/
- Managing Horse Manure by Composting. 2005 Florida Equine Institute Proceedings. Lori K. Warren, Ph.D., Department of Animal Sciences. Available at: http://www.animal.ufl.edu/extension/equine/New/documents/2005EquineInstit/Composting.pdf
- eXtension at http://www.extension.org/
  - Search for manure management, composting, livestock carcass disposal, and/or livestock mortality composting

NOTES

Spring Ranchers Forum
Held at Yarborough Ranch
Central Florida Livestock Agents' Group
March 20, 2014

Individual Topic Evaluation:	**Useful**	**Somewhat Useful**	**Not Applicable**	**No Answer**
Small Ruminant Hoof Trimming / Dehorning (Live Animals) Jonal Bosques-Mendez, Sharon Fox-Gamble, Joseph Walter				
Selecting Bulls on the Hoof (Live Animals) Dr. Matt Hersom				
Selecting Bulls on Paper—EPDs Dr. Matt Hersom				
Equine Farm Manure Management & BMPs Jamie Cohen				
Basin Management Action Plans—Water Pollution—How it Affects You Jody Lee				
Equine Manure Disposal & Mortality Composting Dr. Carissa Wickens				
Was this the first time you attended an Extension Program?	☐ **Yes**		☐ **No**	

How many Spring Ranchers Forums have you attended? (circle one)	1 2 3 4 5 10 16	
Overall Program Evaluation. Answer below ONLY if you attended the Spring Ranchers Forum Last Year.	**YES**	**NO**
Did you share last year's information with anyone?	**YES**	**NO**
Did you improve your animal science skills because of last year's program?	**YES**	**NO**
Did you experience an improved economic return because of last year's program?	**YES**	**NO**
If yes, how much would you estimate is the value? (circle one)	$1,000 $5,000 $10,000 $25,000 or $_____ (fill in)	
Poisonous plant education save farm animals lives. Have you experienced saving an animal from toxic plants education received at Spring Ranchers Forum?	**YES**	**NO**
If yes, please estimate number of animals you have saved. (circle one)	1 5 10 25 50 100 or _____ (fill in)	

Which livestock do you raise?

How did you hear about this year's Spring Ranchers Forum?