



**Water Quality/Quantity
Best Management Practices
for
Florida
Poultry Operations**

June 2016 Edition

FDACS-P-02052



**Florida Department of Agriculture and Consumer Services
Adam H. Putnam, Commissioner**





FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES COMMISSIONER ADAM H. PUTNAM

COMMENTS BY COMMISSIONER ADAM H. PUTNAM

Dear Agricultural Producers:

This manual, *Water Quality/Quantity Best Management Practices for Florida Poultry Farms*, 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 practices in this manual address water quality and quantity impacts from poultry 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,

A handwritten signature in black ink, appearing to read "Adam H. Putnam".

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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TABLE OF CONTENTS

ACKNOWLEDGEMENTS	ii
ACRONYM LIST	iv
INTRODUCTION	1
POTENTIAL WATER QUALITY IMPACTS ASSOCIATED WITH POULTRY FARMS	5
KEYS TO POLLUTION PREVENTION	8
USER'S GUIDE TO BMP ENROLLMENT AND IMPLEMENTATION	9
BEST MANAGEMENT PRACTICES	11
1.0 Poultry Health and Nutrition	12
2.0 Pest Management and Pharmaceuticals	24
3.0 Mortality Management	29
4.0 Waste Management	33
5.0 Odor Prevention and Management	42
6.0 Stormwater and Erosion Control Measures	45
7.0 Water Resource Protection	48
8.0 Recycling and Chemical Waste Management	51
9.0 Poultry Closure	55
APPENDICES	57
Appendix 1: Glossary	58
Appendix 2: Incentive Programs for Qualifying Farms	60
Appendix 3: Soil and Tissue Testing	62
Appendix 4: Effectiveness and Maintenance of Vegetative Filter Strips	63
Appendix 5: Example Record Keeping Forms	65
Appendix 6: Contact Information	73
Appendix 7: Rule 5M-19, F.A.C.	74
Appendix 8: Notice of Intent to Implement Form and BMP Checklist	75

ACRONYM LIST

AFO – Animal Feeding Operation
ARS – Agricultural Research Service
ASABE – American Society of Agricultural and Biological Engineers
BMAP – Basin Management Action Plan
BMP – Best Management Practices
CAFO – Concentrated Animal Feeding Operation
C:N – Carbon to Nitrogen Ratio
CNMP – Comprehensive Nutrient Management Plan
CRF – Controlled Release Fertilizer
EPA – Environmental Protection Agency
ERP – Environmental Resource Permit
ET – Evapotranspiration
F.A.C. – Florida Administrative Code
F.S. – Florida Statutes
FAWN – Florida Automated Weather Network
FDACS – Florida Department of Agriculture and Consumer Services
FDEP – Florida Department of Environmental Protection
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Maps
FOTG – Field Office Technical Guide
GPM – Gallons per Minute


GPS – Global Positioning System
HDPE – High Density Polyethylene
HIA – High Intensity Area
IPM – Integrated Pest Management
K – Potassium
MPH – Miles per Hour
N – Nitrogen
NMP – Nutrient Management Plan
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
NRCS – Natural Resources Conservation Service
P – Phosphorus
RPM – Revolutions per Minute
SWCD – Soil and Water Conservation District
TKN – Total Kjeldahl Nitrogen
TMDL – Total Maximum Daily Load
TN – Total Nitrogen
TP – Total Phosphorus
UF/IFAS – University of Florida, Institute of Food and Agricultural Sciences
USDA – United States Department of Agriculture
USGS – United States Geological Survey
WMD – Water Management District
WSP – Waste Storage Pond

INTRODUCTION

Poultry Operations Intended to Use this Manual

In order to enroll in the Florida Department of Agriculture and Consumer Services (FDACS) **Best Management Practices** (BMPs) under this manual, farm operations must sell eggs from poultry or sell poultry. Producers that grow crops or raise livestock other than those covered by this manual should use the appropriate FDACS BMP manual. Poultry farms with a National Pollutant Discharge Elimination System (NPDES) or Florida Department of Environmental Protection (FDEP) Groundwater Discharge permit must follow their permit requirements, because FDACS BMPs do not replace these requirements. However, permitted poultry farms may want to use this manual for aspects of their operation that are not addressed by their permit.

Things to Keep in Mind as You Use this Manual

- Italicized words that appear in **bolded red** are defined in the glossary
- Specific record-keeping requirements are noted using a “pencil mark” icon: 
- You can access this manual electronically at: <http://www.freshfromflorida.com/Water/Best-Management-Practices-BMPs>

Overview of the Industry

The **poultry** industry is extremely diverse and covers many geographic regions of Florida. The industry’s total production is valued at \$466 million, with the majority of egg laying operations located primarily in central and south Florida, and broiler operations located exclusively in the North Florida area.

According to the USDA National Agricultural Statistics Service data from 2014, Florida produced over 2.4 million eggs and over 67 million broilers. Florida does not account for significant production of turkeys, ducks, or other poultry.

Poultry farms in Florida are generally divided into five types: broiler houses, belted layer houses, high rise layer houses, cage free layer houses, and flushed laying houses. Poultry comfort is of great concern in Florida due to the heat. Almost all houses have forced air circulation with associated cooling pads. These are usually operated by automatic or manual controls based on temperature.

Good poultry comfort generally results in products of greater value.

Broiler houses are stocked with young chicks and supplied with feed, water, and conditioned air when appropriate. They usually contain no cages, yet have beds made with wood chips or other carbon source(s) placed on the floor. The chickens are raised for about six to eight weeks until they reach a live weight of six pounds. At that point, all of the chickens are transported to a processing plant for slaughter and packaging. The top portion of the bedding which includes **manure** is referred to as “litter.” After each brood, the litter is scraped, stored, and then **land applied** at agronomic rates, either at the poultry farm or transported to nearby farms.

Caged layer operations usually consist of five to seven birds per cage that have waterers in each cage and are fed by an auger or chain feed system. Eggs are collected by a separate conveyor system. Chickens are placed into these houses when they are about 18 weeks old, at which time they begin laying eggs. The eggs are usually collected continuously throughout the day. Once chickens reach a specific age and egg laying declines, they are removed for slaughter or other uses. Manure from the cages drops down to the floor. In high rise houses, the manure accumulates below the cages for a period of time before it is cleaned out. Poultry manure is high in nutrients and is usually sold for fertilizer or land applied on crop land. In flush type barns, the floors are flushed with water to remove the manure on a daily basis. This is usually accomplished with recycled water from the **waste storage pond** (WSP). Wastewater from the WSP is generally sprayed onto crop land. Because of the high value of the dry manure, flushed systems are rarely used anymore.

Belted houses can be used for both laying operations and **pullet** houses. The birds are placed in cages, and each row of cages has a wide conveyor belt under it that collects manure and transports it to one end of the barn. A series of conveyors eventually transports the manure into a storage area or directly into a truck or trailer. In barns used for pullets, the chicks are brought into the barn at one day old and raised until about 18 weeks of age.

Some producers are experimenting with cage free laying houses. These houses may be similar to broiler houses, with nest boxes available for the egg laying and bedding on the floor. However,

most have slatted floors and the manure drops below the slats like a high rise house. Chickens go into the nest boxes to lay eggs, but some eggs are laid directly on the floor. All eggs are collected daily. Just like broiler houses, when the chickens reach a specific age they are removed, the house is cleaned, and the process repeats itself. Due to the dilution by mixed bedding, the litter has a lower fertilizer analysis than straight manure, so it is not worth as much when sold.

On laying operations, there is usually an egg washing process associated with processing and packaging the eggs. Wastewater from these operations is generally stored in a tank or **lined** waste storage pond and land applied.

Whole Farm Nutrient Balance

Poultry farms have two key attributes: nutrients and profitability. Ideally, nitrogen (N) and phosphorus (P), should be balanced. Doing so requires an accounting of all N and P nutrient sources entering the farm, then subtracting those leaving the farm to achieve as close to a zero sum as practical. The laws of thermodynamics notwithstanding, poultry farms must do their best given the constraints of practicality and on-farm economics. Even though a zero sum may be difficult to achieve, farmers should strive to achieve a reasonable nutrient balance.

Nutrient inputs include those from purchased feed, fertilizers, and animals; atmospheric deposition from both wet (rain) and dry (windborne dust) sources; N fixed from the atmosphere by legumes; and, nutrients in irrigation and drinking water for the animals. Managed outputs include animals, eggs, or crops sold or otherwise removed from the site, and manure or manure products transported off-site (e.g., fertilizer on another farm or composted product sold to the public). For P, the imbalance between inputs and managed outputs are the unmanaged outputs (soil storage, erosion, runoff, leaching, etc.) that over time will negatively impact a poultry operation as shown in **Figure 1**. Nitrogen is similar, except that volatilization and other atmospheric losses may be significant.

A farm which is close to whole farm nutrient balance and minimizes unmanaged outputs is almost impact-free from a water quality standpoint, and very likely profitable since maximum use is made of all purchased nutrients. Ultimately, an unrecoverable loss of nutrients through unmanaged outputs results in a loss of cash flow used to purchase those nutrients in the first place. **Figure 2** shows a farm with a 3.3:1 **phosphorus** ratio, which may be con-

sidered a hi-risk operation. Holding the ratio to less than 1.5:1 greatly lowers the environmental risk.

Best Management Practices

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

BMPs and Water Quality

Since the industrial permitting programs of the 1970s and 80s, more recent studies conducted by the United States Environmental Protection Agency (EPA) indicate that urban and agricultural nonpoint sources are now the nation's greatest contributors to water pollution. Much of the contribution is due to rainwater carrying pollutants into lakes, rivers, **wetlands**, estuaries, and ground water. It is good stewardship and makes good sense for growers to prevent or minimize these impacts by using BMPs. The Florida Legislature has established BMP implementation as the means for agricultural nonpoint sources to comply with state water quality standards. When you implement BMPs you are also affirming the legislature's support for this approach.

Total Maximum Daily Loads

Under the Federal Clean Water Act and Florida law (section 403.067, F.S.), the Florida Department of Environmental Protection (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 need to undertake to reduce point and nonpoint source pollutant loadings. In **watersheds** with adopted BMAPs, and in some other areas, agricultural producers either must implement FDACS-adopted BMPs or conduct water quality monitoring prescribed by FDEP or the water management district (WMD).

Florida already has adopted a significant number of TMDLs and BMAPs, and many more are pending. 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 and learn more about BMAP development, 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, both FDACS and FDEP staff work closely with the industry and the Extension Service to ensure a full understanding of the agronomic, environmental, financial and managerial issues to be addressed by the manual. During the drafting stage, on-farm field evaluations of the manual are conducted with agricultural stakeholders. The FDEP conducts a final review before rulemaking to determine whether the BMPs 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. Even if additional numeric nutrient criteria become part of state standards, producers who enroll in and implement the BMPs still have the presumption of compliance.
- Release from the provisions of Section 376.307(5), Florida Statutes (F.S.), (fines for damages) for pollutants addressed by the BMPs.
- Technical assistance with BMP implementation.
- Eligibility for cost-share funding 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 that producers implement.
- Producers who implement FDACS-adopted BMPs might qualify for exemptions from WMD 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.

State and Federal Regulations

If your farm/facility is considered to be a **Concentrated Animal Feeding Operation (CAFO)**, or an **Animal Feeding Operation (AFO)** you may be subject to federal and/or state permitting requirements. The threshold for this is when animals have been, are, or will be **confined** and fed or maintained for a total of 45 days or more in any 12-month period; and when crops, vegetation, forage growth, or post-harvest residues cannot be sustained in the normal growing season over any portion of the lot or facility due to animal activity. If so, federal National Pollutant Discharge Elimination System regulations pursuant to 40 CFR, Part 122, and/or state regulations pursuant to Rule Chapter 62-670, F.A.C., may apply. However, if you have a facility that has no discharge and no **land application** you should not need a permit, regardless of animal numbers. An example of this is a farm that keeps all manure under a roof, has no water leaks, and moves all dead animals, any egg wash water,

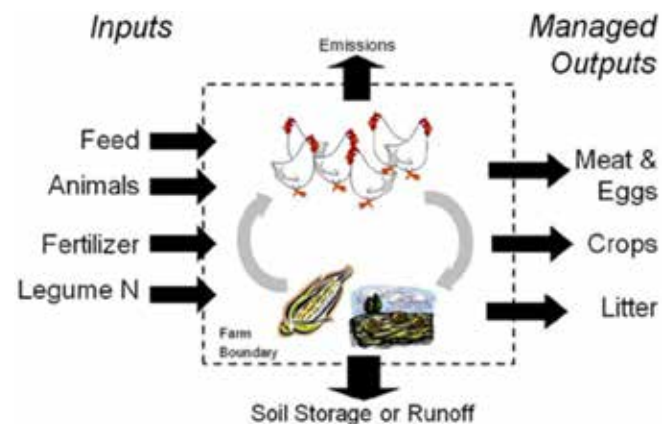


Figure 1

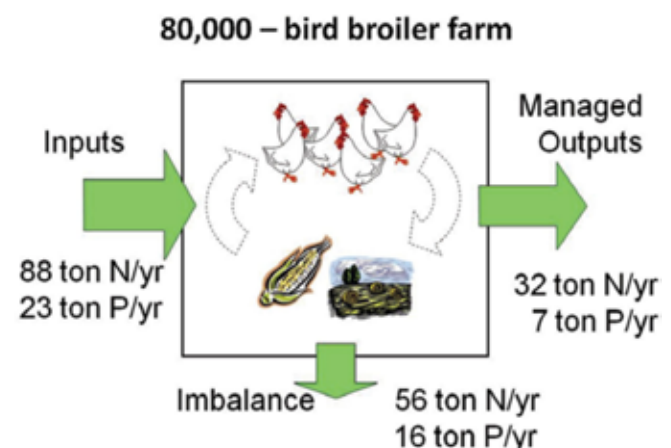


Figure 2

and manure off site. See <http://www.dep.state.fl.us/water/wastewater/iw/afo.htm> or call the FDEP Industrial Wastewater Program at (850) 245-8589 if you need help determining whether your facility requires a permit.

The EPA has delegated the authority to FDEP to issue all applicable permits that might be required. Poultry farms with less than 55,000 turkeys, and farms that use a liquid manure system but have less than 30,000 laying hens or broilers, or 5,000 ducks in confinement (annual average basis) do not need an **NPDES permit**, unless the poultry farm has a direct discharge of **process wastewater** to a surface water of the state. Poultry farms that do not use a liquid manure system and have more than 125,000 broilers, 82,000 laying hens, or 30,000 ducks in confinement are defined as large CAFOs, but do not require an NPDES permit unless they have a direct discharge of process wastewater to a surface water of the state.

Examples of a direct discharge are wastewater from a WSP, or runoff from piled manure that flows into a wetland or ditch that exits the property. If farmers have multiple animal species, they should check with FDEP on permit requirements.

State ERP Exemptions

Some agricultural activities, especially those that alter on-site hydrology, may require an Environmental Resource Permit (ERP). Check with your WMD or FDACS 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. If there is a documented dispute between a landowner and the WMD as to whether the exemption applies, either can request FDACS to make a binding determination.
- Under subsection 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 WMD that the proposed activity qualifies for the exemption.

- Under subsection 373.406(13), F.S., upland, unconnected farm ponds up to 15 acres in size may be exempt as long as the average depth is less than 15 feet and they are located at least 50 feet from wetlands.

Under this guidance, if the amount of impervious surface is less than five percent of the total contiguous land area owned where the poultry operation is being built or added, and the following criteria are met, no permit shall be required for the construction of poultry houses or associated impervious areas.

- The impervious area must be at least 200 feet from the property boundary (excluding roads).
- Drainage from the impervious surface must be directed away from any neighboring property.

If the amount of impervious area is between five and ten percent of the total land area, and the above criteria are met, and runoff is directed to either a natural basin or a constructed pond, then no permit is required.

As noted previously, agricultural producers within a watershed with an adopted BMAP must either implement BMPs or conduct water-quality monitoring. An exemption from ERP does not affect this requirement.

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, F.S. 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 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 WMD. Not all activities conducted on a farm are addressed by adopted BMPs, and some other exceptions apply, so it is important to research this beforehand.

POTENTIAL WATER QUALITY IMPACTS ASSOCIATED WITH POULTRY FARMS

Poultry farms produce significant amounts of nitrogen (N) and phosphorus (P) via animal manure, which is an organic fertilizer product that can reduce a farmer's dependence on commercial fertilizer. Some of these manure products may be used on the farmer's own fields, but in Florida most poultry manure is hauled off site and used on other farms.

Nutrients and Salts

Excess N and P are the most common causes of water quality impairments in Florida. These nutrients can enter surface waters through stormwater or irrigation runoff, or leach through soils into ground water.

The form of N most abundant in natural surface waters is soluble organic nitrogen. In aerobic well-drained soils, nitrogen is usually transformed by bacteria to nitrate (NO_3^-) which is a plant-available form. Due to its high mobility, NO_3^- can also leach from soil into ground water. Nitrogen and P are key elements necessary for the growth of plants and animals.

Phosphorus is more effectively retained in the soil than N.

However, excessive P in soil may saturate the adsorption capacity of the soil, thereby increasing the chance of it moving into groundwater or surface waters. This is important because some Florida sands have very low adsorption capacity. Phosphorus attached to particulate matter usually enters waterbodies via erosion and sediment transport.

Calcium and sodium salts are typically added to poultry feeds. Excess salts can pass through the animals and end up in the manure. Laying hen manure can raise soil pH due to the calcium supplements in their diet, so this should be monitored closely on lands receiving repeated applications of poultry manure.

The Nitrogen Cycle

The N cycle, like other cycles, has no clear beginning or end, as shown in **Figure 3**. In theory, the cycle begins with N in soil organic matter, where it can be decomposed and converted into inorganic forms by soil microorganisms

(bacteria and fungi) in a process called mineralization. These specialized bacteria and fungi, also called decomposers, are generally found in the uppermost soil layers.

In the presence of oxygen, certain bacteria convert ammonium (NH_4^+) into NO_3^- through a process known as nitrification. If NO_3^- is not taken up by plant roots, it is very mobile and can be transported below the root zone and leached; **denitrified** in **anaerobic** soils into nitrogen (N_2) or nitrous oxide (N_2O) gas; or may be volatilized into ammonia gas. In sandy soils, the bottom of the root zone is typically 12 inches for shallow-rooted crops and 3 feet for the deepest-rooted crops (the actual rooting depth may be limited by the presence of compaction layers, acidic layers, or a **spodic horizon**). Because the water-holding capacity of most sandy soils is typically 10%, the top 12 inches of soil can only hold about 1 inch of water. If more water is added, water will readily move downward.

Once below the root zone where there is little to no organic matter, NO_3^- can readily move and become a pollutant. It not only affects surface waters such as springs, lakes, rivers and streams, but can also cause human health concerns in potable or drinking water wells. **Karst** geology is commonly found throughout Florida, where a sand layer of variable thickness covers a limestone base, as depicted in **Figure 4**. Through repeated wet/dry cycles,

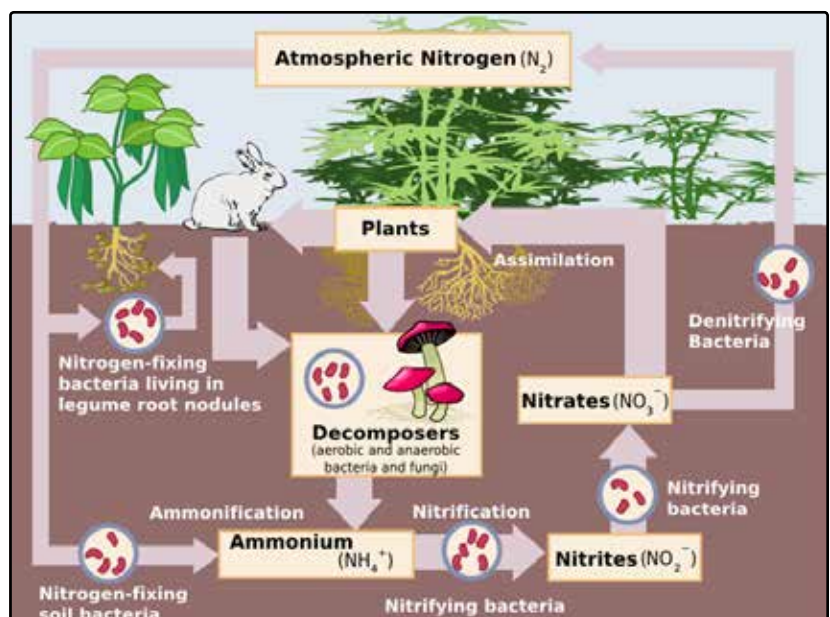


Figure 3

limestone can slowly dissolve to create **sinkholes** and other fissures, where pollutants can enter ground water, and later re-emerge through springs vents that flow to spring-fed rivers.

Nitrogen gas from the atmosphere can be converted and “fixed” in soil by specialized microorganisms, through a process called nitrogen fixation, which makes N available to crops. This occurs in legume plants that have nitrogen-fixing bacteria living within their root nodules. The main legume crops that are grown commercially in Florida are peanuts, snap beans, soybeans, southern peas, and perennial peanut forages. The environmental benefit of growing legumes is a reduction in commercial N fertilizer inputs to make a crop.

The last phase of the N cycle is the return of organic matter to the soil. Soil organic matter may originate from crop residue, incorporation of cover crops, and/or the addition of organic amendments such as compost, manure, or **biosolids**. In Florida, soil organic matter content is often very low in sandy or mineral soils, and is quickly decomposed and mineralized.

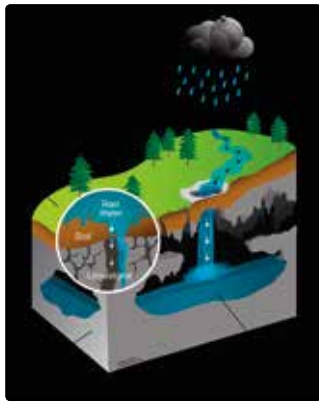


Figure 4

The Phosphorus Cycle

The P cycle, as depicted in **Figure 5**, is much different than the N cycle. The three major forms of P in mineral soils are organic P associated with humus, insoluble P, and plant-available P in soil solution. The most biologically active form of P is the phosphate ion (PO_4^{-3}). P is present in plants, manures, soil organic matter, and in mineral deposits such as sand and rock. When plant residues and other organic materials biodegrade, phosphate is released and returned to the environment.

In soil, phosphate species exist as a soluble form in the soil solution, a labile (relatively soluble) form, or as an immobilized or insoluble form. The change (transformation state) between these three forms generally depends on microbiological reactions and soil pH. Unlike N which is highly mobile, P solubility is limited in most soils, and all of it may not be readily available for plant uptake depending on soil chemistry. Phosphorus adheres to mineral soil particles and clay components through a process known as **adsorption**. Further, P tends to build up near the soil surface, making it more available for transport via particulate matter in runoff. The exception to this is on coarse **uncoated sands**, predominant in areas of Central and South Florida, which have an extremely low ability to adsorb P because these sands have little aluminum and iron coatings.

Excess Algal Growth

Algae are microscopic food-chain plants that provide the nutrition necessary to support aquatic animal life. Certain types of algae also provide habitat for aquatic organisms. However, high levels of nutrients in surface waters result in abnormal plant growth, including algae. The presence of algal blooms, submersed aquatic vegetation, 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 lower the available dissolved oxygen, which can lead to fish kills and decreased recreational and economic value to the community.

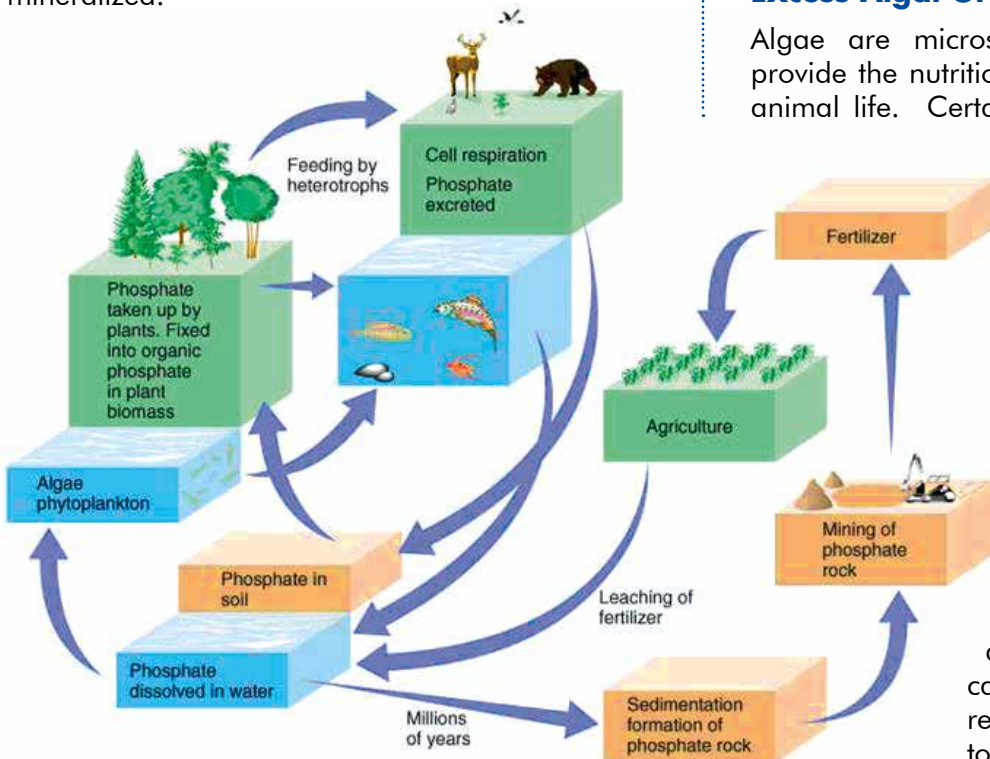


Figure 5

Blue-green algae (*Cyanobacteria*) can become so abundant that they can cause a scum layer to form on the surface, shading the sunlight-dependent life below and disturbing the food chain. Cyanobacteria can also produce toxins known to cause liver and nervous system effects in humans.

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 agricultural operations come from the erosion of unprotected (non-vegetated) soils. Slope can further exacerbate this issue. Soil erosion also increases the amount of P in surface waters.

Sediments can fill in water bodies, clog waterways, carry pollutants, 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. Additionally, sediments can clog gills and cause irritation to the mucous membranes covering the eyes and scales. As the sediments settle, fish eggs can be buried. Recreational use may also decline because of reduced fish populations, less visibility, and reduced desirability of associated swimming areas.

Sedimentation reduces the ability of ditches to move excess water away from crucial farm areas; putting livestock and other farm infrastructure at risk. As a result, more frequent ditch maintenance is usually necessary. Consequently, nutrients and other contaminants, such as pesticides, can attach to sediments and be transported to nearby waterbodies, impacting water quality.

Microorganisms

Undesirable microorganisms can include bacteria (coliforms), viruses, fungi, protozoa, and parasites. Fecal coliforms from wildlife, uncomposted manure, or improperly treated or applied biosolids can be particularly problematic and are another cause of water quality degradation. Fecal coliforms are

used as an indicator, and elevated levels indicate the potential for serious human health impacts. Animal waste is a potential source of approximately 150 disease-causing pathogens. The likelihood of contamination is increased if these materials are applied in excess of agronomic rates or under wet weather conditions. This can lead to serious food safety concerns and affect the marketability of perishable products. Moreover, the decomposition of fecal and other organic matter in water can lead to increased biological oxygen demand and lower dissolved oxygen levels.

Other Regional Considerations

In the South Florida flatwoods production region, many farms are on flat, sandy soils that have a spodic horizon, commonly referred to as hardpan. These soils typically are poorly drained and have high water tables during the summer months. Because of these characteristics, artificial drainage is often required to grow crops. Therefore, spreading of manure and/or wastewater should occur during dry months, unless drainage or well-drained soils exist.

In contrast, parts of the North Florida production region are on karst geology. This type of geology is very vulnerable to leaching of NO_3^- to ground water, and runoff into karst features and sinkholes that are links to the aquifer. Manure applications during or prior to excessive rainfall events often cause nutrients to leach below the active root zone area, increasing the risk of nitrate contamination of the aquifer and spring system. The nitrate standard in Florida for springs and springs runs is 0.35 mg/l. Where springs or other surface waters are influenced by the groundwater, this standard will likely affect agricultural operations within a springshed. From a practical standpoint, large sinkholes that appear in **land application areas** should have at least a 35 foot vegetative buffer maintained around them. If significant runoff can enter the sinkhole, a berm should be constructed to divert the water to a vegetated area. Nutrients from farm operations can also affect springs when they leach into groundwater even in the absence of sinkholes.

KEYS TO POLLUTION PREVENTION

It is agriculture's responsibility to protect water quality and water supply by implementing BMPs. Implementing BMPs helps demonstrate the industry's commitment to protecting water resources, and maintains support for this non-regulatory approach. Below are key guidelines.



Understand Water Quality Issues

Water quality includes chemical, biological, and physical characteristics. Elevated levels of phosphorus, nitrogen, sediment, bacteria, and organic material contribute to the degradation of water quality. The potential for discharges from agricultural operations to cause water quality problems varies, depending on soil type, slope, drainage features, nutrient management practices, and activities in or near wetlands, surface waters, or karst features. Farm management practices determine an operation's impact on water quality. For more information on surface water quality, go to the following link: <http://lakewatch.ifas.ufl.edu/LWcirc.html>. For information on ground water quality, go to: <http://edis.ifas.ufl.edu/fe601>



Manage Nutrients Properly

Managing nutrients carefully is critical to protecting water quality. Minimize the pollutants that leave your property by controlling the types of materials used on your operation. Nutrient-related pollutant discharges can come from excess use, inefficient placement, or poor application timing of commercial fertilizer, manure, wastewater and/or biosolids. Litter/manure is a valuable commodity so use it wisely. One advantage of manure is that it acts as a slow-release fertilizer; that is, not all the nutrients are released immediately. A successful approach called the 4R Nutrient Stewardship Program captures the key elements of effective nutrient management: using the right fertilizer; at the right time; at the right rate; with the right placement. More information about the 4Rs can be found at: www.nutrientstewardship.com.



Manage Irrigation and Drainage Carefully

Water is the carrier for nearly all pollutants. Irrigating in excess of the soil's water-holding capacity or excessive drainage will lead to increased runoff or leaching. Managing irrigation inputs and drainage to keep moisture and fertilizer material in the root zone will reduce nutrient-related impacts.



Minimize the Potential for Erosion Impacts

Land clearing, culvert installation, road construction, ditch and canal maintenance, livestock activity and cultivating short-term crops can expose soil and lead to erosion and increased pollutant loading. It is very important to take appropriate erosion control measures during these activities.



Minimize Impervious Areas

Impervious areas (poultry house roofs, shell roads, barn roofs, parking and staging areas, etc.) are inevitable, but they should be limited as much as possible. Impervious areas can increase and channelize runoff leading to greater erosion or flooding problems. It is wise to check with local authorities before creating any new impervious areas on your property.

USER'S GUIDE TO BMP ENROLLMENT AND IMPLEMENTATION

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

Notes:

- 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 to demonstrate compliance with water quality standards.
- Producers who submit a Notice of Intent (NOI) to implement the BMPs in this manual, implement and maintain the applicable BMPs, and achieve nutrient balance on the poultry operation covered under the NOI have a presumption of compliance with state water quality standards. However, poultry farms with a National Pollutant Discharge Elimination System (NPDES) or FDEP Groundwater Discharge permit are governed by their permit requirements.
- If you have a Natural Resources Conservation Service (NRCS) approved **comprehensive nutrient management plan** (CNMP) or FDEP approved **nutrient management plan** (NMP), and are implementing all listed practices, please note this on the NOI.

1. Request On-farm Technical Assistance.

FDACS field staff, NRCS, and contractors are available to assist you with evaluating what BMPs are applicable to your operation. For free assistance, call (850) 617-1727, email AgBm-pHelp@FreshFromFlorida.com, or contact a field person in your area (see **Appendix 6**)


2. Conduct an Inventory. The selection of BMPs begins with a basic inventory of the farm's natural features, structures, and other improvements. Sources include:

- ✓ Aerial photographs (<http://earth.google.com>, or other providers)
- ✓ 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/>)

3. Select the Applicable BMPs. Carefully read the manual and select all of the BMPs that are applicable to your operation and feasible for you to implement. Applicable Level 1 BMPs must be implemented. Level 2 BMPs only need to be implemented if certain criteria apply. Record the BMPs on the checklist in **Appendix 8: Notice of Intent to Implement and BMP Checklist** of this manual. The checklist includes a column for you to schedule BMP implementation if a practice is not already in place.

4. File a Notice of Intent (NOI) to Implement BMPs. Complete and submit to FDACS an NOI, contained in **Appendix 8: Notice of Intent to Implement and BMP Checklist** of this manual, along with the BMP checklist and, if applicable, a copy of your CNMP or FDEP approved NMP. Once received by FDACS, the NOI 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.

5. Implement the BMPs. Implement all applicable Level I BMPs as soon as practicable, but no later than 18 months after submittal of the NOI. Level II BMPs may take longer than 18 months, depending upon the availability of state or federal cost-share.

6. Keep records on BMP Implementation. FDACS rule requires record keeping to document BMP implementation. Fertilizer, manure solids, wastewater applications and rainfall amounts are types of record keeping. Record-keeping requirements are identified by a  in the manual. 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 5**. 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 inspection, and falsification of records is a first-degree misdemeanor under Florida statutes. Confidential records should be labeled in accordance with Chapters 812 and 815, F.S., or Section 403.067, F.S.

BMP Implementation Plan

It is advisable to consolidate your inventory and all your BMP decision-making, including the BMP Checklist, into a simple implementation plan, which will 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, FDACS and USDA-NRCS staff, or others.

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 cyclical basis by BMP program,

FDACS mails surveys to enrollees, which contain questions about BMP-related activities. The surveys are anonymous in terms of a producer’s identity. Also, FDACS staff visit enrolled operations, at a mutually agreed upon time, 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 vital to the continuing success of agricultural BMP programs in Florida.



BEST MANAGEMENT PRACTICES



1.0 POULTRY HEALTH AND NUTRITION

Poultry Health and Nutrition is maintaining a clean, disease-free production environment with biosecurity measures in place. It also involves a good working knowledge of the science of feeding in order to avoid imbalanced rations, poor performance, and associated disease issues.

Management of bird nutrition is not only necessary to maximize productivity and profitability of a poultry operation, but also has a large impact on the environmental footprint. Excess nutrients are excreted in the manure and must be disposed of properly. If not, the N will raise the ammonia level in the house, which may result in bird health problems. It may also result in negative impacts to water resources. In addition to nutritional needs, proper bird health requires adequate supplies of clean water. Water supply BMPs are included later in this chapter along with BMPs for bird health and biosecurity. In-house manure and litter management, and ventilation BMPs are also covered because bird health and productivity are dependent upon proper levels of moisture, pH, and ammonia, which are directly affected by these factors.

Feed and Nutrition

Proper nutrition for the flock is critically important and a top priority. Over the long-term, managing nutrient balance across the entire operation is the most important element to minimize adverse effects on Florida's waters. If the farm's nutrient balance accounting indicates that a significant long-term risk may be present, the producer should carefully review all BMPs. Nutrient sources, managed outputs, and potential unmanaged outputs should be re-evaluated in order to uncover opportunities to improve the nutrient balance. This should encourage you to implement additional practices to reduce unnecessary inputs, environmental losses, or missed opportunities for managed outputs.

Probably the most important non-dietary factor influencing feed conversion is the ambient temperature of the poultry house. Birds are warm-blooded and maintain a relatively constant body temperature regardless of the environmental temperature. They perform best when there is minimal variation in house temperature over a 24-hour period. Maintaining an optimum temperature allows the birds to produce eggs or experience growth from

the calories in feed, rather than regulating body temperature.

All poultry farms import a variety of nutrients in the form of commercial feed, animals, and/or fertilizer. Poultry feed is usually the largest input. Poultry farms also export considerable nutrients in the form of eggs, animals, manure, and other animal products leaving the farm. Many poultry farms export the majority of their manure, which then becomes a managed output. Remember, feed management is the main variable that governs the environmental footprint.

Most poultry farms have a certified nutritionist, or a very knowledgeable operator, who designs feed mixtures to meet the bird's nutrient requirements at different stages of life (also known as phase feeding). Many farms are supplied feed through a company or co-op that they are under contract with. This feed is always blended by a knowledgeable nutritionist or operator working on behalf of the farm. Feed must be adjusted to supply just the right amounts of the 38 dietary nutrients birds need based on egg production and/or body growth, but without harmful imbalances or excessive waste. **Table 1** lists a few of the major nutrients required for layers and broilers.

Total metabolizable energy (TME) is an energy measure of feed. Birds may vary feed intake with temperature, stress, physical activity, etc. Amino acids, vitamins, and minerals are independent of these factors, and tables for these are based on a neutral temperature and a specific energy content. Their concentrations must be varied for higher or lower energy feed sources because poultry will reduce or increase their intake based on feed energy level. In addition, feed conversion efficiency may also be affected by pelletizing, or conversely, by finely grinding the feed.

For layers, most white Leghorn chickens are self-regulating and may have free access to food (known as ad lib feeding). Brown egg layers and broilers usually require feed restriction to avoid obesity. When feed restriction is used, the feed levels of amino acids, vitamins, and minerals must be increased proportionately to prevent nutritional deficiencies. Using many different feed ingredients, nutritionists try to match amino acids to the bird's requirements for synthesis and maintenance of lean tissue protein. To review, N is supplied via protein content. For broiler operations, feed content and amount is dependent upon the size of the bird. Protein content generally ranges from 23 percent for younger birds to 18 percent for older broilers. It is a good idea to sample commercial feed and have it tested by an independent laboratory to assure that the labeling and/or guaranteed analysis is correct.

Twelve of the required amino acids are considered essential in the diet because the birds cannot synthesize these from nutrients, or can only do so at an insufficient rate for their metabolic needs. Two additional amino acids may be synthesized if sufficient amounts of certain other amino acids are adequate. The diet must supply sufficient amounts of N to permit synthesis of the non-essential amino acids; however, essential amino acids are often added to the diet in purified form to minimize the total protein level and the overall cost of the diet. This also has the advantage of minimizing the amount of N in excretion. For every 1 percent of reduction in crude protein, ammonia emissions may be reduced by 8 to 10 percent. Feeding zeolite, urease inhibitors, and organic acids can further reduce ammonia emissions. Moreover, organic acids have been shown to reduce the level of *Campylobacter* and *Salmonella* in poultry diets.

Table 1. Selected Nutrient Requirements for Poultry

Nutrient (percent or unit/kg of diet; 90% dry matter)	Layer 80*	Layer 100*	Layer 120*	Broiler 0-3 wk	Broiler 3-6 wk	Broiler 6-8 wk
Protein %	18.80	15.00	12.50	23.00	20.00	18.00
Calcium %	4.06	3.25	2.71	1.00	0.90	0.80
Non-phytate phosphorus %	0.31	0.25	0.21	0.45	0.35	0.30
Potassium %	0.19	0.15	0.13	0.30	0.30	0.30
Copper mg/kg	—	—	—	8.00	8.00	8.00
Zinc mg/kg	44.00	35.00	29.00	40.00	40.00	40.00

*Daily grams of intake per hen. Adapted from tables 2-3 – 2-6 – 3-1 – and 5-1 in Nutrient Requirements of Poultry, 9th revised edition, 1994, National Research Council, National Academy of Sciences.

Several vitamins are also required in the diet, or as purified supplements. Because some vitamins are easily degraded, generous margins of safety must be used, especially if diets are pelleted, extruded, or stored for long periods.

It is critical that only available P and not total P be considered in the diet. Over 80 percent of the P in cereal grains and oilseed meals can occur as phytate (a cyclic organic acid containing 6 phosphate groups). Phosphorus in this form is not well utilized by poultry since they do not produce phytase, the needed enzyme for digestion of phytate.

Traditionally, supplemental inorganic P has been added to the diet to meet the bird's growth requirements. However, an alternative is to add phytase to the feed, which allows the birds to digest the phytate which makes the P available. This will greatly reduce the amount of supplemental P needed in the feed, and likewise reduce the amount of P in excretion. Corn, for instance, may have only 20 percent of its P content available unless phytase is added. With phytase, up to 90 percent may be available. Several manufacturers are now successfully pelletizing feed with heat-resistant phytase enzymes included, and have overcome earlier heat-related limitations associated with this process. More recently, some producers have practiced "super dosing" of phytase, in which the goal is to destroy all of the phytate. Although more expensive, some have found productivity increases to offset the increased cost of feed.

Alternatively, bone meal and meat have available P of about 65 percent. New strains of corn and other crops have recently been developed that have very low levels of phytate, and use of these varieties as feedstocks can lower excreted P in manure by up to 40 percent. In any case, the reduction of P in excreted manure is only realized when the traditional supplemental P is reduced accordingly.

Modern poultry producers have another advantage as it relates to feed and nutrition. Good genetics in birds may reduce the number of birds required for the same amount of egg production and decrease the age required to reach market weight. New, rapid-growing genetic lines have been shown to

Table 2. Potential for Feed Management to Impact the Nutrient Content of Poultry Manure

Strategy	Nitrogen % reduction	Phosphorus % reduction
Formulate diet closer to requirement	10–15	10–15
Reduced protein/Amino acid supplementation	10–25	n/a
Use of highly digestible feeds	5	5
Phytase/low phosphorus diet	n/a	20–30
Selected enzymes	5	5
Growth promotants	5	5
Phase feeding (age related)	5–10	5–10
Split-sex feeding	5–8	n/a

Adapted from the Federation of Animal Science Societies publication, Dietary Adjustments to Minimize Nutrient Excretion from Livestock and Poultry, January 2001.

have up to 69 percent reduced P excretion and up to 55 percent reduced N excretion as compared to older, slower-growing genetic lines. **Table 2** lists some expected reductions from the practices mentioned above.

Good feed storage facilities and conditions are equally important. To ensure properly stored grain in bins, high-moisture grains need to be dried to at least 14 percent moisture for long-term storage, with no more than 16 percent moisture for winter storage. Grain temperatures should not exceed 180° F or there will be some browning, evidence of decreased lysine availability. Therefore, an adequate fan system for cooling may be needed. Vitamin stability varies greatly among vitamins, depending on conditions they are exposed to and storage time. Store vitamin premixes in a cool, dark, dry place.

1.1 Feed Ration BMPs Level I

- ✓ **1.** Maintain house temperature to minimize the energy needs of the bird.
- ✓ **2.** Adjust feed ingredients and amounts for each group based on the phase of growth or egg production.
- ✓ **3.** Minimize waste by adjusting feeders based on the bird's average age and height.
- ✓ **4.** Feed the minimum amount of protein/amino acids and available phosphorus required to maintain healthy bird production.
- ✓ **5.** Limit high phytate feed ingredients as much as possible, unless the phytase enzyme is incorporated in the feed material. Consider super-dosing if it is cost effective.

- ✓ 6. Store feed so it has no contact with rainwater, and do not exceed recommended temperature and moisture levels. Use antioxidants to preserve fats and oils and use stable forms of vitamins.
- ✓ 7. Clean up feed spills immediately and re-use or land-apply, compost, or place in an appropriate container.

References

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3. Feed Management, Code 592, USDA-NRCS-FOTG Section IV. www.nrcs.usda.gov/technical/efotg
4. Nutrient Requirements of Poultry. Ninth Revised Edition. 1994. National Academies Press. <http://www.nap.edu/catalog/2114/nutrient-requirements-of-poultry-ninth-revised-edition-1994>
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http://www.merckvetmanual.com/mvm/poultry/nutrition_and_management_poultry/nutritional_requirements_of_poultry.html

Water Requirements and Sources

Poultry, like humans, need a reliable source of fresh water in order to survive. Water helps soften food and carries it through their body, aids in digestion and absorption, and cools the body as it evaporates through the bird's lungs and air sacs. Water also helps remove waste, lubricate joints, is a major component of blood, and is necessary for many chemical reactions that form meat and eggs.

Chickens will consume almost twice as much water than feed on a weight basis. Water consumption varies with egg production, body weight, stage of growth, temperature, and ventilation. On average, layer hens will consume an average of 55 gallons per day per 1,000 birds in cool weather, and 105 gallons per day per 1,000 birds when it is hot. Mature broilers consume about 66 and 130 gallons per day per 1,000 birds when it is cool and hot, respectively.

Nearly all commercial houses use enclosed waterers which are more sanitary. A nipple type of waterer is shown in **Figure 6**. However,



Figure 6

Table 3. Drinking Water Guidelines for Poultry

Constituent	Average Level	Maximum Level	Remarks
Total bacteria	0/ml	100/ml	None is desirable
Coliform bacteria	0/ml	50/ml	None is desirable
Nitrate	---	25-45 mg/l	Levels from 3 to 20 mg/l affect performance
Nitrite	---	4 mg/l	
pH	6.8 to 7.5	> 7.5	Levels below 6.3 may affect performance
Total hardness	60 to 180	---	---
Calcium	60 mg/l	---	---
Chloride	14 mg/l	250 mg/l	---
Copper	0.002 mg/l	0.6 mg/l	Odor and taste issues
Iron	0.2 mg/l	0.3 mg/l	Odor and taste issues
Lead	---	0.2 mg/l	Higher levels are toxic
Magnesium	14 mg/l	125 mg/l	Higher levels result in a laxative effect
Sodium	32 mg/l	---	Greater than 50 mg/l may affect performance
Sulfate	125 mg/l	250 mg/l	Higher levels result in a laxative effect
Zinc	---	1.50 mg/l	Higher levels are toxic

Adapted from T.A. Carter and R.E. Sneed, Drinking water guidelines for poultry. *Poultry Science and Technology Guide No. 42*, North Carolina State University

their height is critical and must be adjusted often if birds are growing. Adequate flow to waterers should be checked frequently.

Water is also used for cooling pads, so farmers should make sure that their water supply or well has enough capacity to provide for drinking and cooling purposes. Typical 500-ft broiler houses usually require about 2 gpm for drinking and 8 gpm for cooling.

Water quality can have a direct or indirect effect on flock performance. Guidelines for this are provided in **Table 3**. Poor water quality can retard growth, curtail egg production, or produce lower quality eggs. High concentrations of sulfates can combine with magnesium or sodium salts and cause a laxative effect resulting in wet litter. Feed conversion, for example, has been positively correlated to the presence of sulfate and copper concentrates in the water. Bird survival (livability) has been associated with potassium, chloride, and calcium. Body weight is positively influenced by hardness and dissolved oxygen, and negatively influenced by total bacteria and a pH of less than 6.0.

Groundwater is the principal source of all water for Florida poultry farms. Although groundwater quality in the Floridan aquifer, which supplies most of Florida, is usually very good, farms should test their water at the start of operation and every few years thereafter.

Chlorination and filtration are the two most used water treatment options to eliminate bacterial contaminants. Sometimes just treating the well and lines with chlorine can solve the problem, but other times a chlorine injector that continuously injects small amounts of chlorine into the water system is required. Bell drinkers used in breeding houses must be chlorinated more often than nipple waterers. Excess iron is prevalent in parts of Florida. Bacteria that feed on the iron form a reddish brown slime that can clog filters, drinkers, and fogger nozzles. The chlorination technique mentioned above also works for these bacteria.

Other water treatment options are available if needed, but are often complex and expensive. Therefore, if cleaner water cannot be located, a professional should be consulted to help determine the best treatment options. Water softeners should be avoided because they usually replace calcium and magnesium ions with sodium ions which poultry is sensitive to.

For facilities that contain egg washing machines, water quality is also important for this area. FDA

and other governmental agencies are responsible for assuring a clean egg supply, and may have water quality regulations that exceed this manual. The farmer is responsible for following all applicable government regulations.

1.2 Water Requirement BMPs

Level I

- ✓ **1.** Check frequently to ensure that adequate water flow occurs during peak demand.
- ✓ **2.** Check water lines daily and adjust the height of the enclosed waterers as needed.
- ✓ **3.** Test water quality every time a new well is drilled, or every few years to protect bird health. Use **Table 3** for guidance.
- ✓ **4.** Maintain water treatment systems in good working order and, if used, change filters regularly. If chlorinating, maintain a free chlorine residual between 2 and 5 ppm at the most distant waterer.
- ✓ **5.** Do not chlorinate market age birds that are under heat stress. Discontinue chlorination 72-hours before introducing vaccines into the water.
- ✓ **6.** Flush water lines every time a new flock is placed in a barn, or more often for layer operations.

References

1. Poultry Drinking Water Primer. University of Georgia Extension. <http://extension.uga.edu/publications/detail.cfm?number=B1301>
2. Poultry Production Manual – Chapter 12, University of Kentucky. http://www2.ca.uky.edu/poultryprofitability/production_manual.html

Biosecurity and Bird Health

Producers are the first line of defense in our food security system. Thus, they need to operate profitably, because biosecurity and bird health go hand-in-hand. Biosecurity refers to procedures used to prevent the introduction and spread of disease-causing organisms in poultry flocks. The USDA's recommended minimum BMPs for biosecurity on commercial premises are the 12 items shown in the text box on the following page.

The benefits of biosecurity include:

- Preventing diseases
- Reducing risk
- Limiting the spread of disease

Biosecurity Principles

1. Biosecurity responsibility

Each production site or production system should have one designated person responsible for developing and maintaining the biosecurity program. This person could be called a Biosecurity Coordinator or some other appropriate title. The Biosecurity Coordinator should be knowledgeable in the principles of biosecurity, or should consult with a veterinarian experienced in poultry production medicine for assistance in the development of an effective program that, at a minimum, addresses the principles described below. The program should be reviewed internally at least annually and revised if needed. Production management (company, contract, and/or independent supplier) should be responsible for the implementation and execution of site-specific biosecurity protocols.

2. Training

The Biosecurity Coordinator works with production management (company, contract growers, and /or independent supplier) to develop biosecurity training materials that cover biosecurity principles described here, and site-specific biosecurity protocols. Production management (company, contract growers, and/or independent supplier) is responsible for training and documentation of site-specific training for all production personnel and suppliers that enter live production facilities, and/or perimeter buffer areas. Training is to be done at hire and at least once per calendar year.

3. Line of Separation (LOS)

For enclosed poultry an essential component for improved biosecurity is to implement a line of separation for each building. The walls of the poultry house normally form the line of separation and should separate poultry from potential disease sources. A plan must address how this line will be defined and defended for each poultry house or set of connected houses. For non-enclosed poultry operations, the LOS is recommended but not required. Further, in an emergency disease State, it is recommended to enclose all poultry and enforce a LOS.

4. Perimeter Buffer Area (PBA)

Biosecurity plans should incorporate the perimeter buffer area concept, which is aimed at reducing load in the outside environment. The perimeter buffer area entrance should be clearly indicated, located and marked with signage so that personnel do not leave the buffer area in the course of their daily tasks. Visitor's access should be controlled at all times.

5. Personnel

At a minimum, personnel should change into designated premises clothes and footwear prior to crossing into PBA. Personnel should not come into contact with other poultry or poultry premises unless having followed company established protocols.

6. Wild Birds, Rodents and Insects

Poultry operations should have control measures to protect poultry from wild birds, their feces and their feathers. Rodent and insect control programs should be in place.

7. Equipment and Vehicles

Equipment should be effectively sanitized between uses. Sharing of equipment should be minimized. If equipment must be shared a plan for cleaning, disinfecting, and inspecting equipment between farms needs to be in place as well as a plan of how equipment and vehicles will enter the PBA/LOS.

8. Dead Bird Disposal

Dead birds should be disposed of in a manner that does not attract wild birds, rodents and other animals and avoids the potential for uncontrolled cross-contamination from other facilities or premises.

9. Manure and Litter Management

Manure and spent litter should be removed and disposed of in a manner to prevent exposure of susceptible poultry (either on or off the farm of origin) to disease agents.

10. Replacement Poultry

Replacement poultry should come from health monitored facilities and should be transported in vehicles cleaned, disinfected and inspected appropriately.

11. Water Supplies

Drinking water and water for evaporative cooling should come from sources that have been treated to eliminate any potential contamination with disease agents. If such water comes from a surface water source, experts in water treatment should be consulted on how to continuously treat the water to eliminate disease agents. If surfaces have been cleaned or flushed with surface water, subsequent disinfection should be employed to prevent disease transmission.

12. Feed and Replacement Litter

Feed, feed ingredients and litter should be stored and maintained in a manner that limits exposure to and contamination by wild waterfowl or other birds, insects, and/or rodents.



Figure 7

- Promoting overall health of the flock
- Reduced mortality
- Increased profitability

Developing and practicing daily biosecurity procedures as BMPs on poultry farms will reduce the possibility of introducing infectious diseases. With the current tendency in many parts of the world to limit the use of antibiotic growth promoters and therapeutic antibiotics, more effort should be directed to preventive disease strategies rather than the indiscriminate use of pharmacologic agents.

Contract producers should check with poultry company personnel to be sure their actions are consistent and compatible with company policies. In developing a biosecurity plan, consider the five W's:

- Who is on your farm?
- What is brought on to your farm?
- When are they there?
- Where have they been?
- Why are they there?

The six main sources of disease are humans, contaminated equipment, newly introduced birds, pests, stress, and air. If the sources of disease are identified and managed, the number of outbreaks will be greatly reduced. These should be managed at all times, and not just investigated when a catastrophic disease outbreak occurs. The following are recommended guidelines to include in a disease prevention program for a poultry farm:

Communication is the most important key to biosecurity. Management should work with the FDACS State Veterinarian and Division of Food Safety staff to stay informed of disease outbreaks in your region and learn the best ways to combat them. Ensure



Figure 8

that all personnel are aware of the appropriate biosecurity procedures. Biosecurity is the responsibility of everyone involved in the industry.

Keep visitors to a minimum. Farm-workers, inspectors or other regulatory personnel that travel to more than one farm should shower and change clothes before entering houses. It is a good idea to furnish visitors with disposable coveralls. Also, be sure every visitor's footwear is properly sanitized, which can be done by soaking them in a chlorine water solution. **Figure 7** depicts this.

Be sure that equipment is properly sanitized. This includes equipment that is shared between farms and equipment that is used on or near a flock that may be diseased.

Vehicles should be parked away from houses, if possible. Tires and wheel wells should be sprayed with disinfectant, and vehicles should be washed frequently, as shown in **Figure 8**.

Keep a log of all people, equipment, and vehicles entering the farm and the location of any previous poultry exposure. This will help pinpoint the movement of disease spread during an outbreak.

Practice "all in, all out" introduction and removal with flocks, when possible.

Clean and sanitize areas thoroughly between flocks, which will decrease the occurrence of chronic or re-occurring disease outbreaks. There should be a minimum down time of two weeks when rotating flocks.

Be especially cautious with susceptible hosts. These can be young birds with an immature immune system, or an older bird with an unprotected immune system.

Table 4. Common Disinfectants

Chlorine	water sanitizing, processing plants, boot washing, egg sanitizing
Iodine	water sanitizing
Quaternary ammonium	incubators, hatcheries, wash houses, feed bins, egg dipping, waterers, feed pans
Phenol	floors, walls, soil, litter, tables, foot baths
Cresols	floors, walls, soil, litter

Since insects and rodents can spread disease, there should be measures in place to control them. Make sure rodents and wild birds cannot enter houses. When cleaning houses and replacing the litter, an insecticide that is approved for poultry use can be applied. Vector control is addressed in the next BMP chapter.

Recording mortalities at least once a day will enhance records and enable a more immediate response to a triggering event. Even better is to record mortalities by category. Categories will break down the types of mortality and provide clues as to the underlying cause of the problem.

Cleaning and disinfection is a critical component to biosecurity. Any organic material left inside or outside the house can be a reservoir of infection for your next flock. This includes dust, down, dander, feathers, eggs, manure particles, feed, dead birds, etc. Cleaning is 90 percent of the process, and involves the actual removal of the material from the surface. Disinfection is only 10 percent of the process and sterilizes the clean surface. Common types of poultry disinfectants and their uses are shown in **Table 4**.

The general health of a flock influences feed conversion efficiency and product marketability. Obviously, sick broilers and layers will not perform well and will result in lower production output. Providing adequate water, food, vitamins, ventilation, dry litter, monitoring the temperature of the houses, protecting the animals from adverse weather conditions and predators, and ensuring adequate space are critical to good health by reducing stress on the flock. Proper vaccinations will minimize the chances of preventable disease if exposure occurs.

The development of an infectious disease depends on three variables: resistance capabilities, virulence of the disease-causing organism, and the dosage of the pathogen to which the birds are exposed. Producers should watch closely for early signs of disease and treat all affected birds promptly. Use vaccines and medications carefully since reactions caused by improper administration can adversely affect weight gain and feed conversion. The main reason for carcass condemnation is Septicemia,

also known as toxemia. Broilers that have no chance of making it to market should be eliminated as early in the grow-out as possible.

Numerous diseases cause poultry to excrete wet droppings. Control of coccidiosis through vaccination or the use of an anticoccidial supplement in the feed is important because if not controlled, coccidial infection may lead to necrotic enteritis, resulting in wet litter.

The effects of wet litter are discussed in the next section.

There are a number of respiratory and non-respiratory diseases that affect poultry – both bacterial and viral in origin. Due to the modern system of management with high bird densities, these diseases are

able to spread rapidly. For more information about these diseases, go to: <https://edis.ifas.ufl.edu/ps044>. Under FDACS Rule Chapter 5C-20, F.A.C., dangerous poultry diseases such as those listed in **Table 5** must be reported to the State Veterinarian immediately.

Carcasses that are contaminated to the extent that valid inspection cannot be made are condemned. A feed withdrawal program plays an important role in reducing the level of contamination in broiler processing plants. Removal of feed and water from market-aged broilers before catch and live haul is a standard management practice that has been used by the poultry industry for many years. During this feed withdrawal time, broilers will evacuate their digestive tracts, and carcass contamination in the plant will be reduced.

Table 5. Dangerous Diseases

Avian Influenza
Chlamydiosis
Equine Encephalitis
Exotic Newcastle Disease
Infectious Bronchitis
Infectious Laryngotracheitis
Mycoplasmosis
Pullorum

1.3 Bird Biosecurity and Health BMPs Level I

- ✓ 1. Use the all-in-all-out method of management for flock health.

- ✓ 2. Use vaccines, as appropriate, that have been approved by the USDA-Animal and Plant Health Inspection Service to maintain flock health.
- ✓ 3. Limit visitors as much as possible, and provide disinfectant foot pans at the entrance of bird houses.
- ✓ 4. Eliminate sick birds as early as possible. Remove all culls promptly.
- ✓ 5. For layers, use only well developed, well fleshed pullets, and use artificial lights to stimulate production.
- ✓ 6. Become familiar with the diagnostic poultry laboratories and the important poultry diseases, especially the dangerous, reportable ones under Chapter 5C-20, F.A.C.
- ✓ 7. Monitor and promptly treat watery droppings to avoid creating wet litter.

References

1. Biosecurity: Protecting Animal Agriculture Poultry Production. Chapter 13. Clemson Poultry Production Manual.
2. Poultry Production Manual – Chapter 4, University of Kentucky. http://www2.ca.uky.edu/poultryprofitability/production_manual.html
3. Biosecurity for the Poultry Industry. UF-IFAS Publication No. VM176. <http://edis.ifas.ufl.edu/vm138>
4. Feed Passage in Broilers: A Complex Problem. UF-IFAS Publication No. VM123. <https://edis.ifas.ufl.edu/vm090>
5. The Merck Veterinary Manual. <http://www.merckvetmanual.com/mvm/poultry.html>

In-House Manure and Litter Management

Caged layer operations usually consist of five to seven birds per cage with waterers in or above each cage. They are fed by an auger or chain-feed system. Conveyor belt manure systems under the cages are designed to transport wastes as they are deposited inside the layer facility. Waste remains on the belt, which carries the manure to the end where it is collected by a series of conveyors that transport the manure into a storage area or directly into a truck or trailer. This manure is high in nutrients and usually sold for fertilizer or land applied on crops. Some caged systems do not have belts and the manure drops directly to the floor.

Litter is defined as the combination of bedding material, excreta, feathers, wasted feed, and wasted

water. Litter is used primarily in broiler houses and some cage-free layer houses. Maintaining good litter quality is important to achieve optimum bird performance. Diarrhea caused by infection or poor nutrition, moldy feed, poor climate control or equipment failure, or improperly adjusted waterers are common causes of wet litter. Wet litter will increase the incidence of breast blisters, skin burns, scabs, bruising, condemnations and downgrades. Wet litter also promotes the growth of pathogens, and is the primary cause of ammonia emissions in houses. Dry poultry litter should remain under roof until it is time for cleanout.

As discussed earlier, birds are very sensitive to ammonia as it can cause blindness, decreased growth rate, reduced feed conversion rate, and condemnations. Effects of ammonia volatilization become significant at levels above 25 parts per million. The best ways to reduce in-house ammonia levels are by good housekeeping, proper ventilation, keeping the litter pH below 7.0 and its moisture content below 30 percent, and through the use of chemical additives such as aluminum sulfate (alum), sodium bisulfite (PLT), or other proprietary materials. These materials convert the ammonia to ammonium sulfate which is a fertilizer. To measure ammonia, sample the air in the house at “bird level” which is roughly one foot above the ground in broiler houses. A Draeger tube (**Figure 9**) is a common instrument to use, but relative humidity can be used as an indirect measure of ammonia, since levels above 70 percent can create an ammonia problem.



Figure 9

To keep litter dry, circulation fans can be used to move warm air from the ceiling and down to the floor. When air inlets are used, proper static pressure and air velocity should be maintained to promote a good mixing of air and to keep cold air from going to the floor. In addition, heating and ventilating a house will remove moisture, since warm air holds more moisture. It takes about 12,000 cubic feet of air to remove a gallon of water. Remember to also check the height and pressure of the waterers, since this can add additional water to the litter. Nipples should be checked for wear at least every few years. Reductions of cake volume of 50 to 90 percent have been reported following replacement of worn nipples.

Maintaining uniform bird density throughout the house is essential. Performance, carcass quality, and litter quality are negatively affected when birds are under stress associated with high density in a portion of the house.

The importance of adequate layout time in reducing disease cannot be over emphasized. In-house pasteurization/composting litter between flocks is a good in-house management procedure to reduce pathogens, to extend the life of the litter, and to extend the time required before complete replacement of the litter. Through in-house pasteurization, bird performance is improved, and the chance of spreading disease is decreased. The litter should remain in the windrows (**Figure 10**) for 7 to 10 days before being redistributed over the floor of the houses.

1.4 Manure and Litter Management BMPs Level I

- ✓ 1. Monitor ammonia levels in the house. Do not rely on sense of smell alone.
- ✓ 2. Check waterer nipples for wear annually, and replace them as needed. Doing so will reduce the amount of wet litter.
- ✓ 3. Maintain a uniform flock density throughout the house. Use migration fences as needed to help with this.

For broilers, do the additional BMPs below: ↗

- ✓ 4. Maintain the in-house litter moisture level between 20 and 30 percent.
- ✓ 5. Maintain the pH of the litter below 7.0 and consider using alum, PLT, or other chemical additives to reduce ammonia volatilization.
- ✓ 6. Maintain a minimum litter depth of 4-inches and remove the cake between flocks.
- ✓ 7. Ensure adequate layout time and, if feasible, practice in-house pasteurization/composting between flocks.

Table 6. Common Gasses of Concern

Gas	Symbol	Lethal	Desirable
Carbon Dioxide	CO ₂	>30%	<1%
Methane	CH ₄	>5%	<1%
Ammonia	NO ₃	>500 ppm	<25 ppm
Hydrogen Sulfide	H ₂ S	>500 ppm	<40 ppm
Oxygen	O ₂	<6%	>16%

Adapted from Vest and Tyson, 1991 UGA Ext. Bul. 893



Figure 10

References

1. Poultry Production Manual – Chapter 14, University of Kentucky. http://www2.ca.uky.edu/poultryprofitability/production_manual.html
2. Causes and Prevention of Wet Litter in Broiler Houses. UF-IFAS Publication No. VM99. <http://edis.ifas.ufl.edu/vm020>
3. Litter Treatments for Poultry. Alabama Cooperative Extension Publication No. ANR-1199. <http://www.aces.edu/pubs/docs/A/ANR-1199/index2.tmpl>
4. The Merck Veterinary Manual. <http://www.merckvetmanual.com/mvm/poultry.html>

Ventilation

Ventilation supplies fresh air that is essential to sustain life, and reduces the extremes of temperature, humidity and air contamination to tolerable limits for confined birds. Birds produce about 5 BTUs per pound. Therefore, ventilation must be used to remove excess heat and moisture from the house. When heated, air expands in volume and will hold more moisture. The moisture holding capacity of air doubles each time the air temperature is raised by 20°F.

Relative humidity is a measure of how saturated the air is with water vapor. When the relative humidity is 100 percent, the air is fully saturated. If relative humidity is too low, the litter will become excessively dry and the amount of dust in the air will increase. This may adversely affect the bird's respiratory system. Relative humidity of 30 to 75 percent has little effect on birds if the air temperature is within their thermal comfort zone.

If air is not replaced in an enclosed poultry house, the concentration of carbon dioxide, ammonia and other potentially harmful gases may increase to unacceptable levels. **Table 6** lists these and other



Figure 11



Figure 12



Figure 13

gases along with their desired and critical levels. Simply put, a ventilation system exchanges the air in the building, bringing in oxygen while carrying out harmful gases. The ventilation system can also dilute airborne disease organisms and help keep them at a tolerable level to maintain bird health.

Adult birds have a ± 15 to 20°F range of comfort (thermoneutral range) within which they will not be

uncomfortable. However, this can be misleading as there is only a 2 to 3°F "sweet spot", which varies with age, where the efficiency of feed conversion for growth or egg production is maximized. Maintaining air temperature within these narrow temperature ranges is best accomplished with modern electronic controls. A minimum of three thermometers should be used at bird level along the entire length of the house; and one should be placed near the ceiling to observe stratification, so that stir fans can be activated when appropriate.

While minimum air flow rates are generally calculated for moisture removal, other factors are equally important. Up to nine times the minimum ventilation rate may be needed for removal of ammonia generated in older litter. In hot climates, high velocities may be needed to cool the chickens using the wind chill effect. It is important that air temperatures at the bird level are measured accurately and fans are controlled based on the needs of the birds throughout the day. Evaporative coolers, such as those shown in **Figure 11**, may be needed to cool the house in hot climates, and these are best controlled automatically. Stir fans (**Figure 12**) can be used to circulate hot air near the ceiling to provide a more even house temperature and to dry the litter. They can reduce energy costs by 10 to 20 percent.

Insulation can significantly affect the level of supplemental heat and ventilation requirements. It reduces heat losses or gains through the walls and roof, controls condensation, and reduces the supplemental heat requirements. In Florida, insulation under the roof is used to prevent radiation of the sun's heat onto the birds below. The effectiveness of insulation is measured by its R-value. The higher the R-value, the more effectively the insulation reduces heat transfer. The optimum amount of insulation for poultry housing depends on its cost in relation to fuel cost and local climatic conditions. Because of these factors, optimum insulation levels vary for every situation. It is important to protect the insulation from rodents.

Minimizing air leaks in poultry houses will reduce the load on fans. For controlled ventilation systems, houses with air leaks use more power, have poorer temperature control, and have higher heating and cooling costs. Heated air can leak out in winter, while warm air drawn in during the summer increases the load on the cooling system. This is why tight sealing of sidewall curtains, filling of cracks around doors and shutters (**Figure 13**), and maintaining uniform ceiling insulation will reduce air leaks.

Effectively managing environmental conditions reduces the cost of production. Ventilation is the most important tool in managing the in-house environment for best bird performance. Improved ventilation systems have allowed for high-density populations of poultry in confinement, thus reducing the building cost per unit housed.

The scientific principles related to ventilation can be complex. Nonetheless, producers should familiarize themselves with this information so that they can have a good working knowledge. This will not only save the operation money in the long-run, but will also help maintain maximum bird production levels. For an excellent primer on this topic, read chapters 7 through 10 in the University of Kentucky Poultry Production Manual at: http://www2.ca.uky.edu/poultryprofitability/production_manual.html.

1.5 Ventilation System BMPs

Level I

- ✓ 1. Use automatic control systems to improve efficiency by continuously monitoring and adjusting for parameters such as light, temperature, humidity and static pressure.
- ✓ 2. Use energy efficient exhaust fans and regularly maintain belts to ensure optimum efficiency.
- ✓ 3. Keep fan shutters clean. Dirty shutters can reduce the air-moving capacity of a fan by up to 30 percent with a similar increase in electricity usage.
- ✓ 4. Ensure that fan shutters close tightly when not in use. Fans that are not being used should be sealed to prevent infiltration by using plastic or a manually-closed panel.

- ✓ 5. Minimize air leaks in houses by tight sealing of sidewall curtains, filling large cracks and spaces around doors, and maintaining uniform insulation.
- ✓ 6. Maintain a minimum amount of house ventilation to prevent wet, caked litter and/or ammonia problems. Have a reliable way to monitor ammonia levels and keep them below 25 ppm.
- ✓ 7. Use an alarm system and a backup generator to maintain ventilation in the event of power failure.
- ✓ 8. For broilers, mount thermometers high and low (at bird level) in the house to see how much air/temperature stratification occurs. Strategically incorporate stir and/or paddle fans, as needed, to move hot air down to reduce stratification and to dry litter.

References

1. Poultry Production Manual – Chapters 7, 8, 9 and 10, University of Kentucky. http://www2.ca.uky.edu/poultryprofitability/production_manual.html
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3. Environmental Guidelines for the Australian Egg Industry. AECL Publication No. 08/01. <https://www.aecl.org/assets/Uploads/Resources/Environmental-Guidelines-for-the-Australian-Egg-Industry.pdf>
4. Farmstead Energy Improvements, Code 374, USDA-NRCS-FOTG Section IV. www.nrcs.usda.gov/technical/efotg



2.0 PEST MANAGEMENT AND PHARMACEUTICALS

Pest management involves the monitoring of pest and environmental conditions with the judicious use of cultural, biological, physical, chemical controls, and pharmaceuticals to manage pest problems and diseases.

Integrated Pest Management (IPM) combines proper plant selection (if growing crops), 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 and keep vegetation away from the edge of houses), 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.

Common pests around poultry houses are flies, darkling beetles (also known as lesser mealworm), mice, rats, and squirrels. Additional pests may be present in adjacent crop fields and the birds themselves can have lice, mites, fleas, and ticks.

Rodent, Beetle, and Fly Control

Rodents

Rodent control is probably the single most important on-farm action to address losses and associated food safety issues. Rodents are destructive pests and cause damage to the house structure by their burrowing nature and gnawing habits. They have a direct economic impact on the operation by eating eggs and chicks. Rodents also eat poultry feed and can contaminate (via urine, feces and hair) even more feed than they eat. With a modest estimate of their daily feed consumption at 10 percent of their body weight, rodents such as rats consume about 20 pounds per year.

Rodents also serve as vectors and hosts for a large number of infectious organisms of concern to poultry producers. This is evidenced by the fact that rodents can transmit about 35 different diseases affecting both man and poultry.

The first step to control rodents is to conduct a visual inspection of the premises. The purpose of this is to determine whether a current or potential rodent infestation exists at a specific location. The inspection will also reveal their infestation routes. Rodent sightings, droppings, tracks, burrows, pathways, fresh gnawing marks, and dead rodents offer proof of their presence. The first line of attack is to prevent their entry into the poultry house or feed storage area. The inspection should focus on drainage, pipes, holes, and overhanging tree branches.

The standard inspection procedure is to:

- Observe and note for garbage areas, drainage problems, openings at the base of the walls, and burrows around the premises.
- Observe any note for overhanging tree branches, electrical and telephone wires, and water or drainage pipes penetrating the poultry house.
- Observe and note for fecal pellets near walls or corners, rat or mouse holes, paw markings, rat smears on beams, wiring, etc. Look for entry points such as gaps between outside doors, windows and ventilation openings, and any openings. Based on the findings, a suitable action plan may be developed according to the severity of the problem.

Good sanitation and rodent proofing buildings as much as possible will help control rodent population, but rodent extermination may be required at times. Rodenticides in bait stations are the best way to kill rodents. Strategically place them at various



Figure 14

locations, protecting them from moisture, dust, and weather. Inspect and replace baits frequently as they become dirty or exhausted. In smaller settings, rodents can also be trapped (**Figure 14**) with snap, glue, or live traps. When setting traps, leave baited and unset initially and on occasion, so that the rodents will avoid trap shyness.

Darkling beetles

Darkling beetles (Lesser Mealworm, **Figure 15**) can have populations in the millions in poultry house litter and feed areas. They are about six millimeters long



Figure 15

and larvae hatch in four to seven days and become adults in 40 to 60 days. They can damage insulation and the structure of a poultry house. They are an avian disease vector and an intermediate host for poultry tapeworms and cecal worms. Chicks and chickens can eat the beetles at a rate of up to 400 a day. However, this inhibits feed efficiency and may cause other intestinal problems. Frequent cleanout of litter can help reduce populations, but beetles can then migrate from fields that receive litter. Several formulations of carbaryl are registered for use against the darkling beetle including wettable powders, dusts, sprayable liquids, and baits.

Flies

House fly eggs are laid in almost any type of warm, organic material. Poultry manure is an excellent breeding material for the eggs to be laid in and turn into maggots within about 24 hours. After emergence, the adult fly can live for up to 30 days. Moist litter is especially problematic, and caged layer operations are the most susceptible to this problem. Sanitation is extremely important

for fly control, but in caged high rise houses, breeding areas are always present. Mechanical control includes many types of fly traps including sticky tape, spot cards, and baited jugs. Predatory wasps have been used with good success on some operations. Residual sprays are the most effect and economically insecticide to use.

Other Insects

Lice become a problem when proper maintenance practices are not routinely followed. Both premise and bird treatments are necessary to control some mites. Insecticides are available to kill most lice, mites, fleas and ticks. Wetting agents may be necessary to break surface tension on the feathers when treating birds. Both indoor (bird) and outdoor treatments are often required for outbreaks.

Pesticides and IPM

Pesticide Selection and Use

The EPA and the FDACS regulate the use of pesticides in Florida. 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



Figure 16

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.

The USDA National Organic Program (NOP) is responsible for developing national standards for organically-produced agricultural products. The NOP recognizes the Organic Materials Review Institute (OMRI) <http://www.omri.org/> as a reviewer of material meeting NOP standards.

Certifying agents may consult with a reputable third party source (e.g., EPA, or the Organic Materials Review Institute (OMRI) that evaluates the product's compliance with the USDA organic regulations, and accept their determination. OMRI has a publicly available list of approved products available at <http://www.omri.org/omri-lists>.

Policy memo 11-4, Source: USDA NOP Website, <http://www.ams.usda.gov/about-ams/programs-offices/national-organic-program> 1/26/2016.

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. 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 Chapter 5E-9.024, F.A.C., or must hire someone appropriately certified. Applicators must read and follow all label directions and the directions on the Material Safety Data Sheets.

Chemical Storage and Spill Response

Most poultry farms with egg washing facilities have several chemicals used in the operation to clean the eggs and the egg room. They should be kept in a dedicated storage area, as depicted in **Figure 16**. Bulk chemicals greater than 50 gallons should be

stored under roof in rooms that do not have floor drains. Chemicals should never be disposed of in the wastewater system or in ditches or creeks. Return unused or outdated chemicals to the supplier or take them to the local landfill or other authorized collection center.

Pesticide spills should be cleaned up immediately following an incident. Barriers and absorbent materials generally are used to contain spills and should be stored onsite for quick access. 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 spills. 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 in accordance with the label or veterinary prescription. 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 the health of the environment, birds, and humans. Expired medications often can be returned to the supplier/manufacturer or some veterinary offices. Check with your local municipality or county to see if they will accept pharmaceuticals during household hazardous waste disposal events.

Proper disposal of spent needles, referred to as "sharps," is regulated by the 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 illustrated in **Figure 17**.

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.



Figure 17

Follow pharmaceutical label instructions for disposal of unused product. **Do not** pour unused product down a sink or drain. Instead, use 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.

2.1 Rodent, Beetle, and Fly Control BMPs Level I

- ✓ 1. Rodent proof all houses by sealing openings around water pipes, drain spouts, vents, etc. Ensure that openings and gaps are less than ¼ inch.
- ✓ 2. Keep areas around poultry houses mowed and clear of debris. If side curtains are dropped for the summer, raise and lower them once or twice a week to prevent rodents from nesting in the folds.
- ✓ 3. Maintain a year-round treatment program to control darkling beetles in litter. The best time for insecticide application is on the first day after removing a flock; followed by cleanout on the second day. Treat again, including the outside perimeter, just before introducing the new flock, and follow the pesticide label.
- ✓ 4. Monitor fly activity. Use mechanical controls such as fly traps, sticky tape, and investigate the use of feed-through larvicides or commercially available parasitic wasps.
- ✓ 5. Incorporate strict sanitation and maintenance protocols to eliminate cracks and crevices,

and maintain cleanliness to prevent tick outbreaks.

- ✓ 6. Ensure that all sprayers and other applicators are calibrated for the pesticide used.
- ✓ 7. In general, insecticides should be used as the last resort after practicing strict sanitation and cultural management methods. Ensure that all pesticide products used on or near birds are labelled for poultry use.

2.2 Pesticide and Pharmaceutical BMPs Level I

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.

- ✓ 1. Store pesticides in a roofed structure with a lockable door, at least 100 feet from wells, surface waters, and sinkholes.
- ✓ 2. If mixing pesticides in the field, conduct loading activities at random locations. Stay as far away from surface waters as possible.
- ✓ 3. Use a check valve or air gap separation to prevent backflow when filling a sprayer.
- ✓ 4. Clean up spills immediately. Barriers and absorbent materials should be used to contain spills.
- ✓ 5. Wash the outside of pesticide spray equipment at random spots away from surface waters or wells. The **rinstate** may be applied as a

pesticide or stored for use as make-up water for the next compatible application.

- ✓ 6. Dispose of spent needles and unused pharmaceutical products by using an approved biomedical container, or by following other guidance per the product's label.

References

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6. External Parasites of Poultry. University of Florida. <http://edis.ifas.ufl.edu/ig140>
7. Agrichemical Handling Facility, Code 309; Integrated Pest Management, Code 595, USDA-NRCS-FOTG Section IV. www.nrcs.usda.gov/technical/efotg



3.0 MORTALITY MANAGEMENT

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

Even with excellent management and health care, a certain portion of birds will die as they grow older. This is especially true in broiler or cage free layer houses, where bird on bird conflicts are more prevalent. Farms can expect about one-hundredth to one-tenth of one percent of birds will die per day. Although this may seem like a small number, for farms with a significant number of chickens, this can be a large number of dead birds to deal with on any given day. Each dead bird contains nutrients and bacteria.

Dead birds must be removed without delay. The carcasses should be stored in water tight, covered containers before being properly disposed. In summer, decomposition and odor will usually require the storage time to be less than three days, unless freezing or refrigeration is used. There are several methods of disposal including composting, burial, rendering, and limited options for incineration. Feeding raw birds to animals is not allowed. Ongoing burial of a significant quantity of birds is usually not permitted.

Composting

Composting is an extremely popular choice for carcass disposal for farms that are not able to send their mortality to a rendering facility. Composting

is a controlled, natural aerobic process in which heat, beneficial bacteria and fungi change organic wastes into a finished product. The product is fairly odorless, and biologically sound, but requires good management to produce. Compost has valuable nutrients with humus like qualities and is ideal for land application. Due to the high rainfall in Florida, carcass composting should occur under roof, therefore, initial costs for composting can be high. However, cost share and engineering support may be available from NRCS for building compost barns. Operational costs are low.

In order for the composting process to remain aerobic, the particle size of the carbon source must be large enough to allow adequate air flow but small enough to allow heat to build up. This is often accomplished by using layers of straw between carcasses encased in manure. If the litter removed from houses still has sufficient structure to allow air flow to occur, it can be used instead of the straw manure combination providing the carbon to nitrogen ratio is correct (between 20:1 and 35:1). A thermometer is an essential piece of equipment for a composting operation. A 36-inch stainless steel thermometer is recommended.

According to the Alabama Cooperative Extension Service, the mixture should be composed of 1 part poultry carcasses, 2 parts poultry litter, 0.1 part straw, sawdust or woodchips, and 0.25 part water, based on weight, not on volume. The average bulk density of litter is 30 pounds per cubic foot. Such a



Figure 18

mixture will have a C:N ratio of about 23:1 and a moisture content of about 55 percent. Acceptable C:N ratios are between 15:1 and 35:1.

Composting for small operations can occur inside the poultry house, but it is recommended that a separate composting barn (**Figure 18**) be constructed for larger operations. Small farms without a tractor and bucket or a front end loader may choose a single-stage composter, whereas larger farms with the equipment mentioned above should use a two-stage process. Make sure carcasses are kept at least six inches from the edge of the bin.

It is desirable to have extra bins that can be used to store litter, manure, and straw. These bins can also be used for composting, if needed. Ceiling height of the compost barn should accommodate any equipment anticipated, and concrete flooring should be used in the entire barn. The roof overhang should extend far enough to prevent blowing rain from reaching the compost, or side curtains should be installed. Fire protection is very important due to the temperatures and the threat of spontaneous combustion.

A minimum temperature of 131°F must be reached during the composting process (temperatures of 140°F to 160°F are ideal). If this temperature is not reached, the resulting compost must be re-composted by turning and adding moisture as needed. Moisture content should be checked during this process. Once the process is complete, the compost should be left in the bins or moved to another storage area for 30 days before being land applied. Similar to all land applied organic material, lab testing should be done before it is removed, and it should be spread at agronomic rates.

Recordkeeping is an important function of composting. Record the date, average weight and number of deaths, daily compost temperature,



Figure 19

climate condition, compost condition, date turned, and any inspections made to the facility. For more information about composting, go to: <http://www.aces.edu/pubs/docs/A/ANR-0558/ANR-0558.pdf>.

Incineration

Disposal by incineration can occur at a central disposal facility or on the farm. Few stationary incinerators accept poultry carcasses in Florida.

Portable air curtain incinerators (ACIs) may be used for the destruction of animal carcasses, provided FDACS has determined that this need constitutes an emergency requiring the use of open burning pursuant to Rule 62-256.700(6), F.A.C. An ACI consists of an air manifold, a blower, a diesel engine and a refractory-lined firebox. A wood fire is started in the firebox. The air manifold is located on one side and blows air across the top. The “air curtain” captures the smoke and recirculates it back into the fire for more complete combustion. Carcasses are loaded into the firebox by a bucket loader or other similar piece of equipment.

Portable ACIs used for this purpose are exempt from the requirement to obtain an air permit pursuant to Subsection 62-210.300(3)(a)26, F.A.C. However, such portable ACIs must comply with the conditions of the exemption, which includes applicable requirements for setbacks, authorized fuels, operation, visible emissions, etc. Operation of the ACI should be by trained professionals. This will ensure proper operation, good combustion practices, and compliance with applicable ACI requirements.

Farms may be able to contract with an operator to bring a portable cremation unit to their site, as depicted in **Figure 19**. Animal crematories are regulated for air quality and must be designed and operated in accordance with Section 62-296.401(6), F.A.C. Truck-mounted portable

cremation units can be transported to the site and set up quickly for carcass disposal.

Portable cremation units are normally batch-loaded units with capacities of up to 2 tons of carcasses per hour. These units typically consist of two chambers. Animal carcasses are fed into the primary chamber through a loading hatch. During cremation, exhaust gases from the primary chamber enter the secondary chamber to complete combustion. Diesel or natural gas is typically fired in the primary and secondary chambers to maintain the exhaust gas at 1600°F for at least one second. When properly designed and operated, there is little or no smoke present. Cremation units can be operated continuously around the clock. Such units require an air permit or other temporary authorization.

Unless otherwise approved by the Division of Waste Management, residual ash from combusting poultry carcasses is generally considered a solid waste and may be disposed of at a Class I landfill.

Portable units pose a biosecurity risk when traveling between farms. Therefore, it is recommended to locate portable units away from poultry houses and to sanitize storage containers, trucks and equipment before leaving a farm.

Rendering

For rendering, Florida has facilities capable of disposing of dead birds. Rendering is an environmentally friendly and fairly easy option if the producer can get the plant to pick up birds on a scheduled route. Transportation cost is highly dependent on total weights of carcasses and farm location. Large farms have more dead birds, but are more likely to be able to have a rendering plant pick up their carcasses. Many farms that choose this option install freezers (Figure 20) to hold birds for pickup. Depending on cause of death, rendering may be an option for catastrophic events.

The rendering pickup vehicle may pose a biosecurity risk as it travels between farms. Therefore, it is rec-



Figure 20

ommended that the pickup containers be cleaned regularly and pickup points be located away from poultry houses, unless the trucks are sanitized.

Burial

In order to protect groundwater quality and to assure that pathogens are not spread, animals must be buried with the carcass a minimum of two feet above the highest expected water table level (available in the soil survey for the county) and a minimum of 30-inches of cover surrounding all sides of the carcass. The burial site should be at least 500 feet from a **private drinking water well, public drinking water well**, or irrigation well, 100 feet from the property line, , and 200 feet from a stream, lake, pond, or wetland. In areas with high water tables, this requires a mound system to be constructed, with the carcass resting above the ground surface but still surrounded by the required amount of soil. This is why onsite burial is usually considered as a last option for many poultry producers.

Most Class I landfills will accept poultry carcasses for disposal. Dumpsters should be located away from buildings if practical to prevent disease spread and should be water tight and covered at all times. Pickup frequency should be such that odor and decomposition do not occur, or the carcasses should be frozen or otherwise preserved for pick up. Cost of this option can be fairly high depending on location.

3.1 General Mortality BMPs

Level I

- ✓ 1. Quickly remove dead animals from the live population.
- ✓ 2. Store carcasses in a watertight, covered container.
- ✓ 3. Promptly dispose of carcasses after death, or refrigerate or freeze.
- ✓ 4. For catastrophic mortalities associated with Avian Influenza, or other reportable diseases, contact the FDACS Division of Animal Industry State Veterinarian at (850) 410-0900. There are a number of specific state and federal requirements for addressing these types of disease outbreaks.

3.2 Composting BMPs

Level I

- ✓ 1. Use the proper ratios of all materials for composting.
- ✓ 2. Monitor temperature daily and add water or turn if necessary.

- ✓ 3. The composting structure or area should be at least 100 feet from adjacent property and at least 200 feet from watercourses (ditches), streams, wetlands, wells, or sinkholes. Existing structures that are unable to meet these setbacks can use other water quality treatment measures, but must list them in the BMP Checklist.
- ✓ 4. Ensure that all compost reaches a minimum temperature of 131°F throughout the pile for at least three days.

3.3 Incineration BMPs Level I

- ✓ 1. For air curtain incinerators and portable cremation units, ensure that the unit is exempt from permitting, has a valid FDEP air permit, or is otherwise temporarily authorized by an ongoing emergency order. The unit must be operated by qualified operators in compliance with the conditions of the permit, authorization or exemption.
- ✓ 2. Locate air curtain incinerators at least 300 feet away from any occupied building and at least 50 feet away from wildlands, brush, combustible structure, or paved public roadway. Portable cremation units should be located at least 100 feet away from any occupied building and at least 50 feet away from wildlands, brush, combustible structure, or paved public roadway.
- ✓ 3. Dispose of residual ash from combustion of poultry carcasses at a Class I landfill. Exceptions to this must be approved by the FDEP Division of Waste Management.
- ✓ 4. Locate portable units away from poultry houses and sanitize storage containers, trucks and equipment before leaving a farm. This will reduce the biosecurity risk.

3.4 Rendering BMPs Level I

- ✓ 1. Ensure cause of death does not compromise biosecurity.
- ✓ 2. Ensure that bird transport vehicles are sanitized between pickups at other poultry farms.

3.5 Onsite Burial BMPs Level I

- ✓ 1. For below-ground burial, move dead poultry to an upland area at least 100 feet from adjacent property; at least 200 feet from water-

courses, streams, wetlands, or sinkholes; and at least 500 feet from any wells. Locate burial sites at least 2 feet above the seasonal high ground water table and 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 poultry to an upland area at least 100 feet from adjacent property; at least 200 feet from watercourses, streams, wetlands, or sinkholes; and at least 500 feet from any wells. Cover with 6 inches of compacted soil and at least 2 feet of additional soil.

References

1. Poultry Water Quality Handbook <http://nepis.epa.gov/Exe/ZyNET.exe/9101WVW1.TXT?ZyActionD=ZyDocument&Client=EPA&Index=1991+Thru+1994&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C91thru94%5CTxt%5C00000031%5C9101WVW1.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=p%7Cf&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL>
2. Best Practices for Digestion http://ssl.tamu.edu/edss/handbook/05_DigEmerg.pdf
3. O&M plan for Poultry Carcass Composting Facility. NRCS. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_024449.pdf
4. Animal Mortality Facility, Code 316; Emergency Animal Mortality Management, Code 368; Composting Facility, Code 317. USDA-NRCS FOTG-Section IV. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026388.pdf
5. Florida Animal Producer Guidance for Routine Disposal of Animal Carcasses. FDACS. <http://www.flart.org/acmwg/>
6. USDA Mortality Composting Protocol for Avian Influenza Infected Flocks. https://www.aphis.usda.gov/animal_health/emergency_management/downloads/hpai/mortalitycompostingprotocol.pdf
7. Construction of a Dead Bird Poultry Composter. Alabama Cooperative Extension. Publication No. ANR-0604. <http://www.aces.edu/pubs/docs/A/ANR-0604/ANR-0604.pdf>



4.0 WASTE MANAGEMENT

Waste management involves the proper transport, storage, and disposal of litter, manure and wash water to avoid impacts to water quality and to human and livestock health.

Litter and Manure Storage, Use and Disposal

Proper handling and storage of poultry litter or manure is needed to preserve its nutrient value and prevent contamination of surface and groundwater. Litter or manure that is not properly stockpiled or stored results in losses of N to air and water. To prevent such losses, permanent storage facilities should have a roofed structure of sufficient capacity to hold the waste pending final disposition; a concrete floor; and, be sited in a location that prevents runoff to surface waters or percolation to groundwater. Limit composting litter or manure contact with wood or use concrete wall construction to prevent spontaneous combustion from occurring. Temporary stacks (**Figure 21**) on open concrete slabs should be covered with heavy (6 mil or greater) plastic tarps to protect them from rainfall when left unattended. The storage area should be protected from flooding or runoff.

There are several options to address wastes as useful by-products from a poultry operation. One method discussed earlier is to reuse the litter through in-house composting or pasteurization between flocks. This can extend the life of the litter and reduce the overall costs and the amount of litter to be handled. Another method is to compost the litter with the bird carcasses. The bottom line is that poultry litter is a valuable product that can be beneficially recycled. It is an excellent source of plant nutrients such as N, P, K, Ca, Mg, and S, per **Table 7** below. In addition, it is an excellent source of organic matter for the soil.



Figure 21

Table 7. Average Nutrient Composition of Poultry Litter in lbs/ton (as is basis)

	N	P ₂ O ₄	NH ₄ -N	K ₂ O	Ca	Mg	S	Na	Fe	Mn	B	Mo	Zn	Cu
Broilers	36	8	80	34	54	8	12	6.2	1.5	0.59	0.041	.00069	0.55	0.27
Layers: under cage	28	14	31	20	43	6.1	7.1	4.5	0.52	0.27	0.05	.00390	0.32	0.036
High- Rise Stored	38	18	56	30	86	6.8	8.8	5.0	1.8	0.52	0.046	.00038	0.37	0.043

Source: *Poultry Water Quality Handbook Second Edition, Chapter PWM/6, Table 1.*

Addressing the fate of litter or manure should begin about two weeks before the cleanout is to take place, and includes sampling to determine the nutrient content for use in calculating agronomic rates for application to cropland. Application to production cropland may be the most common use for litter, and is discussed fully later in this chapter. Litter and dry manure may also be composted and sold for horticultural use. Because the composted litter is almost odorless, it can also be used in potting mix for indoor plants.

Use of litter as a feed supplement for beef cattle is another valuable option, but producers are encouraged to contact FDACS Division of Animal Industry before doing so. The upper layers of the litter have the highest nutritional value and the least ash. The litter should be deep-stacked (composted) for at least three weeks to allow temperatures to rise high enough to kill pathogens. To allow for any drugs in the litter, other precautions include: to stop feeding cattle litter 15 days before slaughter, and to not feed litter to lactating dairy cows. Litter used for feed must not be composted with any dead bird carcasses, so this will require a second composting site or an alternative method of carcass disposal. Litter to be fed should have a crude protein level of at least 18% and an ash level below 28%. No more than 25% of the crude protein should be bound or insoluble. Because litter is deficient in vitamin A, always add vitamin A to rations containing litter.

Unless infected, litter is too valuable a product to be simply disposed. Brokerage programs are available to arrange for the sale and transport of poultry litter to willing customers. If the flock is infected and must be de-populated, litter should be disposed with the bird carcasses by incineration or in an approved Class I landfill in accordance with the biosecurity plan.

4.1 Litter and Manure Storage, Use and Disposal BMPs

Level I

- ✓ 1. Litter stored for three months or longer should be kept in a permanent storage facility built in accordance with USDA-NRCS guidelines.

- ✓ 2. If left unattended, manure stacked on temporary outdoor storage areas should be covered with heavy plastic to prevent runoff from becoming contaminated.
- ✓ 3. 🪵 Sample the manure/litter for nutrients at least once a year and provide results to end user if transported for use offsite.
- ✓ 4. Never stockpile litter or manure within 200 feet of a well, wetland, creek, pond, or other surface waters, or in a manner where contaminated runoff can percolate into the ground water.

References

1. Waste Storage Facility, Code 313; Composting Facility, Code 317; Short Term Storage of Animal Waste By Products, Code 318; Waste Treatment, Code 629; Waste Recycling, Code 633; Waste Transfer, Code 634. USDA-NRCS FOTG-Section IV. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026388.pdf
2. Storage of Broiler Litter. University of Florida Publication No. PS-15. <http://edis.ifas.ufl.edu/ps003>
3. Poultry Water Quality Handbook <http://infohouse.p2ric.org/ref/05/04702/p1.pdf>

Sampling and Recordkeeping

Ideally, sampling from layer houses should occur two weeks prior to cleanout, so whoever is land applying the manure can apply the product at the proper agronomic rate. Sampling from existing broiler houses should occur after the product has been composted. The product must be sampled at least once a year to characterize its nutrient content. Sampling at the beginning of the week may minimize having the sample sit in the postal system over the weekend.

Collecting a representative sample is very important. In high-rise houses with cages, the manure is usually fairly consistent across the floor with some differences based on depth, dryness due to fan locations, etc. Ten to twelve sub-samples should be collected from different parts of the house at different depths. If using a shovel instead of an auger,

it is important to take some samples from the top, middle, and bottom areas of the pile. If using a probe or pipe to sample, insert it all the way to the floor when collecting the sub sample.

In cage-free layer and broiler houses, the manure will be very inconsistent across the floor due to the birds spending more time around waterers, feeders, or cooler (or warmer) sections of the house. In cage-free layer houses with slatted floors, the accumulation will be at different areas, but the manure itself will be relatively consistent, so different depths will need to be sampled like a high-rise building. Similarly, ten to twelve sub-samples should be collected from different parts of the house at different depths. In bedded houses, it is important to take a sample that is as deep as the amount of litter that is planned to be removed. If all the litter is going to be removed, be careful so that you do not get any sand from below the litter layer. A shovel should be used to dig a small pit with one vertical wall, as depicted in **Figure 22**. Then scrape an even layer from that wall all the way down to collect a sub-sample. If the bedding material in the litter is fine enough, a sampling probe or pipe can be used. If water and feed system areas cover 20 percent of the floor, then 20 percent of the samples need to come from these areas. It is important to get representative samples in proportion to the area of the barn.



Any feathers collected should be picked out if possible. All sub-samples from a barn, cleanout collection, or pile should be combined in a clean plastic bucket and mixed well. A representative sample from the bucket should be taken to fill about $\frac{3}{4}$ of a freezer quart size zip-lock type bag. The owner's name, farm name, and barn name or number, as



Figure 22

well as the date should be recorded on the bag. Place this bag in a second bag before delivering or sending the sample to a lab for analysis for pH, TKN, ammonia, TP, TK, dry matter, plus any other tests the farmer desires. If the sample cannot be delivered promptly to a lab, either refrigerate or freeze it pending delivery.

4.2 Sampling and Recordkeeping BMPs Level I

- ✓ 1. Collect representative samples.
- ✓ 2. Use a lab to perform an analysis of the litter.
- ✓ 3.  Keep all records required under the individual section BMPs.
- ✓ 4.  If transporting manure or litter offsite, keep records of the amount and contact information of the farmer or hauler, and provide them with the lab analysis.

References

1. Collecting a Poultry Litter Sample for Analysis. UF-IFAS Publication No. SL282. <http://edis.ifas.ufl.edu/ss495>

Land Application and Crop Fertilization

Growing good crops is essential for feed production and nutrient uptake. Some poultry operations remove all of the waste from their site and sell it to neighbors or other producers, resulting in no onsite land application of waste. However, on many farms, litter or manure is applied onsite to crops.

If you have sufficient land available, application of 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. If using land application, be careful to prevent manure from entering streams, canals, or ditches 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.

The most critical factor in good crop nutrient uptake is plant nutrition. However, over-application of

manure can add excess nutrients to the soil. Extra potassium is rarely needed on a waste application field. The N:P ratio of poultry litter or manure is often 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, a poultry 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. In most cases, application rates of manure will be based on P, with additions of N from commercial fertilizers to make up the difference in crop requirements.

Warm-season perennial grasses comprise the majority of hay production in Florida. Bermudagrass, stargrass, and bahiagrass dominate, primarily because they grow for 6 to 12 months of the year, depending on the location. Cool-season grasses, which are generally grown in North and Central Florida, include small grains (rye, wheat, oats, and triticale) in addition to annual ryegrass. Legumes such as perennial peanut, vetch, clover, lupine, or alfalfa also may be used in hay production and can take up large amounts of applied nitrogen. They are considered luxury users of nitrogen, and will use N applied to the field before making their own N. Additionally, some producers plant summer annual crops such as corn, sorghum, and millet for silage to supplement animal feedstocks. Maturity stage at harvest is the most important factor determining quality, as forage quality usually declines with advancing maturity.

Soil and Tissue Testing and Interpretation

A scientifically reliable method to determine the amount of plant-available nutrients, other than N, to grow a crop is annual soil testing. Soil test results provide soil pH information (lime requirement), and the amounts of P, K, Ca, Mg, and micronutrients needed to meet a crop's nutritional requirement. Before land applying manure, obtain a sample of your soil and the manure product and have them analyzed.

Soil pH is the single most important chemical parameter of the soil. The availability of many nutrients decreases with low or high soil pH. For most crops, the target soil pH is between 6.0 and 6.5. Most poultry manure is between 6.5 and 8.0. Many nutrient-related disorders may be corrected simply by adjusting the pH. In North Florida's highly acid soils, poultry litter may reduce the acidity some, but the addition of lime may still be needed. Therefore,

producers should strongly consider a regular liming program to maintain optimum availability of these nutrients. Always apply lime according to soil test results/recommendations. Further south in the state, alkaline soils may require lowering the pH by the addition of powdered sulfur or other acidifying materials.

Because most fields receiving poultry waste are P-based and may not provide the optimal amount of N, leaf tissue analysis is an important tool. Tissue analysis, used in conjunction with soil analysis, is a powerful tool to diagnose the overall effectiveness of a fertilization program. Soil testing alone does not always indicate nutrient availability to plants because it is just a snapshot of what is present at the time of sampling and does not address the highly mobile N. The concentrations of various nutrients inside plant tissue are the best indicators of crop nutritional status. For more information on tissue testing and interpretation of results, see *Soil and Plant Tissue Testing* at: <http://edis.ifas.ufl.edu/ss625>

Calculate the manure application rate based on the crop nutrient requirement and test results. An application loss of 50 percent should be applied to the available nitrogen content reported from the lab, unless the laboratory states otherwise or the material is incorporated into the soil. 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 (**Figure 23**) to pasture or cropland. Injecting or incorporating litter or manure into the soil between



Figure 23

row crops as soon as possible after surface application will reduce nutrient losses. Material should be applied using a manure spreader that is properly calibrated.

Improperly calibrated spreading equipment may result in under- or over-fertilizing the target crop. Consequently, crop yields may be drastically reduced and/or fertilizer wasted and introduced into the environment. Both cost the poultry farmer money. Calibration methods vary based on the type of fertilizer or manure used and type of application equipment. Calibration should be done in accordance with the manufacturer's recommendations, and whenever wear or damage is suspected to have changed the delivery rate. A catch pan or a plastic sheet can be used to collect fertilizer or manure over a set distance in order to calibrate output rates. For granular materials, it may be necessary to recalibrate whenever using a new material that has different flow characteristics.

Manure can vary in nutrient and water content. It is important to take representative samples to determine the actual nutrient content. Manure should be mixed as much as possible before spreading to ensure uniform placement and distribution of nutrients. It is important to maintain the same speed and rpm to achieve even application throughout the field. For more information on calibration, see the *Equipment Calibration Information Sheet* at: <http://www.extension.iastate.edu/Publications/NMEP9.pdf>.

If you are applying wastewater, either from an anaerobic manure lagoon or egg wash water, you will need to determine the volume pumped. This is easy if the pump is equipped with a flow meter. If not, the gallons pumped can be calculated by multiplying the number of minutes the pump runs, by the pump's capacity (measured in gallons per minute or GPM). Record the time of application to each field. The wastewater volume should be multiplied by the laboratory nutrient analysis results to determine how much N and P were applied. Pivots, solid set sprinklers (including guns), and traveling guns should be configured and operated so that they spray evenly over the entire field.

Florida crop fertilization recommendations are available through the UF-IFAS Extension publication *Nutrient Management of Vegetable and Agronomic Row Crops Handbook (SP500)*. This document is on the internet at <http://edis.ifas.ufl.edu/SS639>, and provides up-to-date fertilizer recommendations. SP500 also includes guidance on when to conduct soil and/or tissue testing. If only agronomic crops

are grown, *Standardized Fertilization Recommendations for Agronomic Crops. UF-IFAS Publication SL-129*. <http://edis.ifas.ufl.edu/SS163>, which is included as a chapter in SP500, is available as a much smaller publication.

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. By matching the amount of N-P-K in commercial fertilizer with your soil analysis and the crop nutrient requirements you can apply the appropriate amount of nutrients. Remember to account for nutrients from any land-applied manure sources, and from those still remaining in the soil from the previous year.

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 are 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.

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 them 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 to minimize runoff and leaching.
- Consider using controlled-release fertilizers near environmentally sensitive areas. Avoid spreading fertilizers in or near ditches, canals, or karst features (sinkholes), and minimize application to filter strips and buffers, as this may result in the off-site loss of nutrients.

- Locate litter and fertilizer mixing/loading sites away from water bodies or karst features where spills can contaminate water resources.

4.3 Land Application BMPs

Level I

- ✓ 1. If the poultry farm has associated cropland, apply fertilizer materials at agronomic rates, adding all sources of nutrients together (manure, egg wash and commercial fertilizer).
- ✓ 2.  Base fertilization rates for P and micronutrients on soil test-based recommendations from a lab that uses a method accepted by the UF-IFAS Extension Soil Testing Laboratory. For bahiagrass, a tissue sample must be submitted along with the soil sample. See **Appendix 3** for more information on soil and tissue testing. Keep a copy of your soil and tissue test results.
- ✓ 3. Do not apply supplemental commercial P to waste application fields that are based on N. Where waste application is based on P, ensure that applications from all sources of P do not exceed crop uptake.
- ✓ 4. Follow split application recommendations for your particular crop fertilization program to maximize nutrient uptake and minimize leaching and runoff potential. As an alternative, use **enhanced-efficiency fertilizers** as practicable for your operation.
- ✓ 5.  Ensure that the spreader is calibrated and a uniform application is produced.
- ✓ 6.  Obtain the amount of daily rainfall from an onsite rainfall gauge or nearby weather station and record it for use in irrigation scheduling (if applicable).
- ✓ 7. Do not apply nutrients when the soil is saturated, and avoid applying them when heavy rain is forecast.
- ✓ 8.  If land applying manure or litter, or incorporating leguminous forage into the soil, use the record keeping worksheet in **Appendix 5** to account for these nutrient inputs, and adjust your fertilization program accordingly. Determine the amount each crop harvested during the year. Keep a copy of your worksheet(s) for each application made to a field to demonstrate that the farm is maintaining nutrient balance.

- ✓ 9. Do not apply fertilizer in or near ditches, canals, or karst features (sinkholes), and minimize application to filter strips and buffers, as this may result in the off-site loss of nutrients.

References

1. Certification Training for Operators of Animal Waste Management Systems, Chapter 3: Waste Management Plans; Chapter 6: Recordkeeping, North Carolina Cooperative Extension Service http://www.soil.ncsu.edu/certification/Manual/a/intro_a.htm
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5. Fertilizing and Liming Forage Crops. UF-IFAS Publication AG179. <http://edis.ifas.ufl.edu/AG179>
6. UF-IFAS, Forage Planting and Establishment Methods, SS-AGR-161. <http://edis.ifas.ufl.edu/AG107>
7. Florida Forage Handbook, UF-IFAS https://edis.ifas.ufl.edu/topic_book_florida_forage_handbook

Egg Facility Wash Water

Many egg laying operations produce egg wash water that must be properly handled. Others send the unwashed eggs to a central facility for washing and packaging. All eggs must be washed, before sale, as shown in **Figure 24**. A major egg production facility is defined as having more than 100,000 laying hens (30,000 if a liquid manure system), or processes at least the number of eggs produced by this number of hens. If the processing facility does not apply the egg wash water on site, it may be exempt from FDEP permitting. If a major egg production facility applies the egg wash water on site, an industrial wastewater permit from FDEP may be required. See Chapter 62-670, F.A.C. for more information.

All egg washing equipment must be operated as required by the FDACS Division of Food Safety. This requires certain levels of cleaners and sanitizers to be present in the wash water. Wash water is usually recycled for a certain number of eggs and then must be disposed of before a new batch is used. The average of wash water generated is usually less than two gallons per 1,000 birds. In addition to the wash water used for the eggs, a small amount of water is usually generated from washing the equipment and facility.

Land Application of Egg Wash Water

Land application of egg wash water is a permitted activity for a major egg production facility. Producers should follow all permit requirements. Producers handling eggs from less than 100,000 laying hens (30,000 if a liquid manure system) per day may want to obtain a permit determination letter from the local FDEP District Industrial Wastewater administrator to have a record of their exemption.

Egg wash water must go through a solids separator for grit removal before being pumped for land application. This is often a tank in the ground similar to a septic tank. Most farms hire a septic tank company to pump out the tanks once or twice a year. No person should ever enter a waste storage tank without proper confined space entry safety equipment and backup workers.

From the solids separation tank, wash water may be treated in several more tanks or pits before pumped to a land application area. It often has a high pH and biological oxygen demand, but if applied at less than an inch per week rarely causes any concern for groundwater. However, it may require treatment to avoid injury to crops, and should be sampled, and applied at agronomic rates.




Figure 24


Most poultry farms in Florida use solid set sprinklers. Use the largest sprinkler orifice possible to prevent clogging, and make sure that the pump tank is big enough to allow the irrigation system to run for at least ten minutes every time it is activated. Shorter runtimes result in uneven application across the field and premature pump wear.

4.4 Egg Wash Water BMPs

Level I

- ✓ 1. Limit the amount of wash water used to minimize wastewater production.
- ✓ 2. Ensure that all wash water flows to a lined storage tank or pit. Earthen pits are not acceptable unless approved by a licensed professional engineer.
- ✓ 3.  Keep records of the egg wash water lab analysis and the transfer of all loads removed from the site. If the water is pretreated and discharged to a municipal wastewater treatment system, keep all records required by the terms of your agreement with that system.

For land application of wash water:

- ✓ 4. Apply less than an inch of wash water per week. Irrigate often to keep storage times short and maximize storage capacity.
- ✓ 5. Apply wash water only when groundwater is more than 18 inches below land surface.
- ✓ 6. Sample wash water and apply at or below agronomic rates.
- ✓ 7.  Keep records of the lab analysis and of all applications.

Liquid Manure Treatment Systems

Waste storage ponds (WSP) hold liquid waste from a poultry barn or egg washing operation until it can be sprayed on crops or hauled off-site. Anaerobic lagoons usually require less surface area than WSPs, with depths ranging from 8 to 20 feet in order to provide biological treatment of wastes. Deeper lagoons offer several advantages, including less land area, more thorough mixing of lagoon contents by rising gas bubbles, efficient mechanical aeration, and minimum odor. Neither WSPs nor lagoons are designed for carcass disposal purposes. This section provides only a short overview of this topic. Seek professional assistance from a licensed engineer or FDEP if considering constructing new liquid waste storage or treatment ponds.

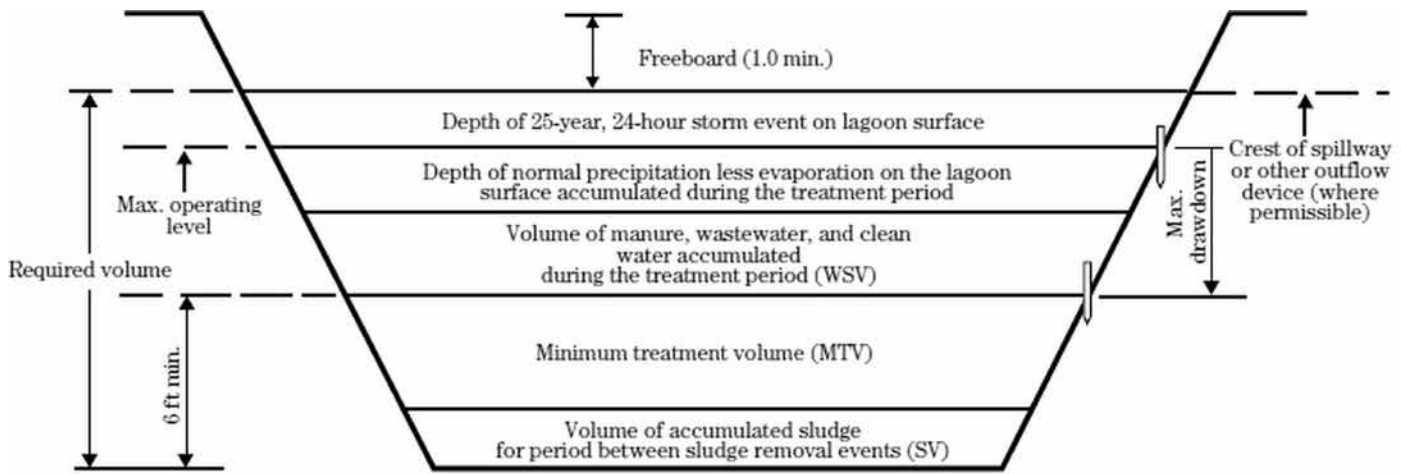


Figure 25

For lagoons, the minimum treatment volume (Figure 25) provides enough dilution volume for the breakdown of volatile solids by bacteria and should not be removed from the lagoon during normal pump-down operations. This volume is based on a daily loading rate of solids in pounds per day per thousand cubic feet. Research indicates that approximately 0.0295 cubic feet of poultry layer waste sludge accumulates per pound of total solids added to a lagoon.

Effluent levels in WSPs or lagoons should be kept as low as possible to allow for maximum storage in the event of heavy rain or equipment failure. It should never be higher than the standard operating level that allows for storage of a 25-year, 24-hour storm event. Irrigate on days that have low humidity and when winds are not blowing toward neighboring residences. Irrigating early in the morning should reduce offensive odors. Under normal conditions, wastewater should never be applied to a saturated field; however, under emergency conditions, wastewater can be applied to a field if the WSP or lagoon becomes full. It is more desirable to apply excess wastewater to a field than to let it discharge directly from the WSP or lagoon. Be sure to document this if it happens.

Most poultry houses generate “dry” manure and litter, as opposed to liquid wastes. The newer generation of houses will only increase this trend. If poultry operations use WSPs or lagoons to store and treat poultry wastes (not egg wash water), then operators should contact FDEP or a professional engineer to address design and potential permitting needs.

4.5 Liquid waste treatment BMPs Level I

- ✓ 1. Limit the amount of water used to minimize wastewater production.
- ✓ 2. Once a year, inspect and maintain the water systems, ditches or wastewater conveyance structures, associated berms, pipelines and irrigation systems.
- ✓ 3. Keep solids separators cleaned out to minimize sludge build-up in the waste storage pond or lagoon.
- ✓ 4. Keep the water level as low as practicable to leave room for an unexpected storm event. Avoid applying to saturated fields, when possible.
- ✓ 5. Inspect and maintain any pumping equipment.
- ✓ 6. Have a backup plan in case the pump fails. This should include a backup pump or hauler.
- ✓ 7. If the pond is not lined, line the existing pond or build a lined pond.
- ✓ 8. Collect WSP/lagoon samples quarterly (if applicable).
- ✓ 9. 🖋️ Keep records of the lab analysis and of all effluent applications.

Level II BMP

If your answer to the following question is “yes,” implement the Level II BMP below.

Question: Has wastewater ever overtopped your storage tank or lagoon at any time other than during a hurricane? Yes No

- ✓ 10. Have a professional engineer evaluate the system for proper sizing.

References

1. Certification Training for Operators of Animal Waste Management Systems, Chapter 3: Waste Management Plans; Chapter 6: Recordkeeping, North Carolina Cooperative Extension Service http://www.soil.ncsu.edu/certification/Manual/a/intro_a.htm
2. Nutrient Management, Code 590; Waste Treatment Lagoon, Code 359; Waste Storage Facility, Code 313; Pumping Plant, Code 533; Irrigation Pipeline, Code 430; Irrigation Sprinkler System, Code 442; Anaerobic Digester, Code 366; Sediment Basin, Code 350; Pond Sealing or Lining, Code 521. USDA-NRCS FOTG Section IV. <http://www.nrcs.usda.gov/technical/efotg/>



5.0 ODOR PREVENTION AND MANAGEMENT

Odor prevention and management involves addressing the factors most associated with chronic Poultry odor problems.

Odor associated with poultry farms generally comes from the birds themselves (alive and dead), and accumulated manure. Egg washing facilities will also generate some odor from the wastewater generated. Feed is generally very dry and stored in silos, and new bedding is clean, so they do not generate significant odors. However, feed that has spilled and becomes wet can cause significant odors, and the feeding system should be cleaned regularly to prevent old feed buildup. When building new facilities, locate barns and mortality management systems as central to the property as possible. Avoid orientating buildings so that fans blow towards neighbors or nearby roads. High rise buildings should be designed with fans in the lower level to aid in keeping the manure dry. Control vehicle speed to under 15 mph in unpaved areas around the facility to prevent generating excess dust and odors. Spreading manure or litter on land is the single biggest source of odor complaints.

Waste Storage Ponds or Tanks

Egg wash water contains FDA required cleaners and sanitizers as well as small amounts of manure and dust particles, and some egg material from any eggs that break during the cleaning process. It therefore has fairly low odor, and usually amounts to a small volume. However, if this water is left to sit in a non-treatment type storage for several days, more odor will form as compounds begin to break down. It is therefore desirable to land apply this material every day if possible or to store it in a system designed for treatment.

Mortality

Obviously dead birds can produce extremely bad odors, and must be dealt with as quickly as possible using one of the methods described in the Mortality section of this manual. Due to Florida's hot and humid climate, dead birds must be disposed of as quickly as possible to avoid any odors. Farmers should implement the necessary systems to minimize odors.

Building Storage and Cleanout

Manure and litter are stored under roof to keep the material as dry as possible and to prevent anaerobic decomposition of the manure. Any water added can result in significantly more odors being created. Water pipes, waterers, and evaporation pads should be checked daily to assure they are working properly and that no leaks are occurring. Rainwater should be prevented from entering the building either as wind-blown rain or as runoff from the ground. Any roof leaks should be fixed immediately. In broiler houses and cage free layer houses that use bedding, it is essential to provide adequate bedding for each new flock so that the bedding can help keep the manure dry. Try to keep dust levels to a minimum by cleaning the interior surfaces of the buildings on a regular basis.

Cleanout and hauling of manure should occur as expeditiously as possible. Any stockpiled manure or litter should be covered in the event of rain, but it can also be covered if it is generating significant odors. Cleanouts should not be scheduled on weekends or holidays if it can be prevented.

Land Application

Most odor complaints are a result of land-applying manure or litter. When the manure is applied to land, the exposed surface area is enlarged which allows a large odor plume to form. Clouds and high humidity tend to trap odor causing compounds and keep them low to the ground for longer periods of time.

Prior to waste application, consider odor level, proximity of neighbors, and weather forecasts. If multiple fields are available, apply waste to the field that has the fewest neighbors downwind. Try to avoid applying on weekends or holidays or during extremely windy days (greater than 10 mph). Maintaining vegetation around fields can help by trapping particulates out of the air which can also decrease the smell.

Good Neighbor Policy

Good neighbor and community relationships are critical for good business with minimal complaints. Make sure immediate neighbors have the phone number of someone associated with the farm who can assist them with a complaint. Ask neighbors to contact you if they have any major outdoor activities planned, so that you can work around those dates if possible. Consider giving small amounts of manure away for free to neighbors that are close if they want some for their gardens or small farms.

5.1 Odor Management BMPs

Level I

- ✓ 1. Reduce protein in feeds as much as possible to reduce pass through of nitrogen, which will reduce ammonia in the waste.
- ✓ 2. Maintain waterers in good condition to prevent leaks.
- ✓ 3. Prevent rainwater from entering buildings.
- ✓ 4. Provide adequate clean bedding in houses that use this material.
- ✓ 5. Clean feed systems regularly and make sure stored feed is kept dry.

Level II BMP

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

Question: Do you receive repeated, valid odor complaints from adjacent property owners?

Yes No

- ✓ 6. Establish a vegetative buffer or windbreak consisting of dense lower vegetation combined with higher vegetation. Cedar trees combined with pines work well.

5.2 Land Application Odor BMPs

Level I

- ✓ 1. Consider wind direction and neighbor locations before applying waste. Avoid applying wastewater if winds are more than 10 mph, when possible.
- ✓ 2. Try to spread manure in the late morning on clear, sunny days.
- ✓ 3. When practical, incorporate manure into the soil soon after spreading.
- ✓ 4. Calibrate your spreader and reduce the discharge spinner speed to minimize dust.

Level II BMP

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

Question: Is there significant odor or complaints from the land application of the egg wash water that occurs for more than ten days a year?

Yes No

- ✓ 5. Shorten storage time if possible to allow for a more frequent application or install an aeration system to allow wastewater to remain aerobic during the entire storage process. If

problems persist, contact a professional engineer for assistance.

References

1. Odor Control from Poultry Facilities. Clemson University. https://www.clemson.edu/extension/livestock/camm/camm_files/poultry/pch9_03.pdf
2. Poultry Environmental Best Management Practices. Louisiana State University. http://www.lsuagcenter.com/en/crops_livestock/livestock/poultry/Environmental+Concerns/Poultry+Production+Best+Management+Practices.htm
3. Herbaceous Wind Barrier, Code 603. USDA-NRCS FOTG Section IV. <http://www.nrcs.usda.gov/technical/efotg/>



6.0 STORMWATER AND EROSION CONTROL MEASURES

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.

Stormwater Management

Alteration of the land (e.g., construction of impervious surfaces such as roads, driveways, parking lots, and 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, erosion, and sedimentation in water bodies. Excessive sediments deposited on stream bottoms and suspended in the water column can affect fish spawning and impair fish food sources, reduce habitat complexity, potentially harm public water supply sources, and reduce water clarity. Reduction in water clarity can negatively affect submerged aquatic vegetation and recreation.

In some cases, there may be circumstances that require specific stormwater management practices. Some poultry operations already may have an ERP or other WMD surface water management permit

that requires on-site stormwater management features, such as on-site retention ponds. However, if stormwater problems exist, and they are not addressed by a WMD permit, it is important to develop and implement a stormwater management plan suited to the operation. The goal of the plan is to reduce stormwater runoff and off-site erosion and sediment transport.

Runoff containing sediments with nutrients and pesticides attached to particles 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 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, increased turbidity, and sedimentation in surface waters.

Minimizing downstream transport of sediments by roof runoff from houses, barns, and other impervious surfaces requires an integrated approach to manage erosion. Efforts should focus on stabilizing

the surrounding soils with vegetative buffers. The BMPs that follow help decrease runoff and reduce sediment losses around poultry house and land application areas.

Erosion Control

Soil is not a homogeneous substance but a mix of sand, silt, and clay. Sands have the largest particle diameter, and clays the smallest. The particles may be either highly consolidated, with very few pores, or loosely consolidated, with over 50 percent of the soil volume comprised of pore space. Soils with more solids than open space are more compacted, less porous. Lower soil porosity decreases infiltration and percolation, which may be detrimental to plant growth and may increase runoff.

An important element affecting sediment transport potential is the composition of soil particles. The sediment-delivery ratio for sandy soils normally is low, as sand particles rarely are transported very far from their point of origin. By contrast, clay soils usually have a high sediment-delivery ratio, since clays typically remain suspended in the water column for a longer period, regardless of flow velocity.

Sediment becomes “enriched” as it flows to a waterway, meaning that it contains a higher proportion of clays and other fine particles than does the soil from which it originates. The primary characteristics that determine how fast suspended solids (soil) settle are density, size and shape. Large particles settle faster than smaller ones of the same density, and spherical particles settle faster than flat ones.

Erosion control during construction is critical, since areas under construction will be especially prone to sediment loss. When constructing barns, roads, or other infrastructure, minimize the amount of land that is cleared of vegetation and the time it is left bare. Use silt fences when protection from sedimentation during sheetflow conditions is needed. Properly trench in, backfill, and compact silt fences in accordance with the Florida Stormwater, Erosion, and Sediment Control Inspector’s Manual referenced below. Whenever feasible, clearing vegetation to develop pasture areas should be conducted during the dry season, and re-vegetation with forage should occur as quickly as possible.

Examples of permanent erosion control BMPs are critical-area planting, prescribed grazing, and conservation buffers, as appropriate. Conservation buffers are permanently vegetated, non-cultivated areas that are positioned strategically upstream of discharge areas. They are used primarily to retain water and soil onsite to reduce pollutants in surface

water runoff. They include farm area borders, filter strips, grassed waterways, and **riparian** buffers, and are particularly effective in providing water quality treatment near sensitive discharge areas.


- **Borders** are strips of permanent vegetation, either natural or planted, at the edge or perimeter of farm areas. They function primarily to help reduce erosion from wind and water, protect soil and water quality, and provide wildlife habitat. Consider installing borders based on adjacent land uses and their environmental sensitivity.
- **Filter strips and grassed waterways** are areas of permanent vegetation between **production areas** that drain to natural waterbodies. Their main purpose is to infiltrate and decrease the velocity of runoff water and to remove sediment particles before they reach surface waters. Filter strips should have a minimum flow path of 30 feet. Entry to the flow path must be level to prevent development of concentrated flow paths. For more information on construction and maintenance of filter strips, see **Appendix 4**.
- **Riparian buffers** can be forested or herbaceous areas located adjacent to streams, which help trap sediment, organic material, nutrients, and pesticides in surface water sheetflow before they reach a waterbody, and stabilize the banks to prevent bank erosion and collapse. Riparian buffers may also eliminate the need for more expensive fencing options for animal exclusion by providing a barrier to animals entering the water body. Riparian buffers are most effective on highly sloped lands.

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

6.1 Stormwater BMPs

Level I

- ✓ **1.** Ensure that rain water from the roof of a building does not enter the building by sloping the grade away from the building, or by installing gutters and downspouts.
- ✓ **2.** If necessary to treat and infiltrate stormwater, use **level spreaders**, detention ponds, filter strips or grassed waterways.

- ✓ 3. Operate and maintain all stormwater management conveyances (swales, ditches, and canals) to ensure that they operate as designed.
- ✓ 4.  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. Evaluate the plan's effectiveness, and make adjustments as needed.

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 elevation of existing ditches, ponds, creeks, rivers, wetlands, and 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 <https://msc.fema.gov/portal>.

6.2 Erosion Control BMPs

Level I

- ✓ 1. Stabilize access roads 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, keep road width to a minimum, maintain hydrology, and locate the road(s) a minimum of 25 feet from regulated wetlands.
- ✓ 4. Use erosion and sedimentation BMPs during any onsite construction activities, following the appropriate guidance.
- ✓ 5. Maintain vegetation to minimize areas of erosion in construction areas, where feasible.

- ✓ 6. Seed and mulch denuded areas, as needed, to promote vegetative cover.

Level II BMP

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

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

- ✓ 7. Install a new culvert of the appropriate size, if the existing culvert is no longer functional. Contact USDA-NRCS or FDACS for technical assistance and/or structural design guidance.

References

1. Access Road, Code 560; Structure for Water Control, Code 587; Runoff Management, Code 570; Field Border, Code 386; Riparian Herbaceous Cover, Code 390; Riparian Forest Buffer, Code 391; Filter Strip, Code 393; Grassed Waterway, Code 412; Critical Area Planting, Code 342; Anionic Polyacrylamide Application, Code 450. USDA-NRCS FOTG-Section IV. <http://www.nrcs.usda.gov/technical/efotg>
2. The Florida Stormwater, Erosion, and Sediment Control Inspector's Manual. FDEP. <http://www.dep.state.fl.us/water/nonpoint/erosion.htm>
3. Water Management Districts, ERP Stormwater Quality Applicant's Handbook
4. National Management Measures for the Control of Nonpoint Pollution from Agriculture, EPA Document No. 841B03004, <http://www.epa.gov/nps/agmm/>
5. General Specifications for Establishing Riparian Forest Buffers, USDA-NRCS, Florida Technical Note Forestry FL-17, <http://www.nrcs.usda.gov/>
6. Riparian Buffers and Controlled Drainage to Reduce Agricultural Nonpoint Source Pollution, Technical Bulletin 318. <http://www.bae.ncsu.edu/extension/ext-publications/water/protecting/tb-318-riparian-buffers-evans.pdf>



7.0 WATER RESOURCE PROTECTION

Water resources are distinct hydrologic features, including wetlands, springs, Lakes, streams, and aquifers.

Wetlands, Springs, and Streams Protection

Under Florida Law, wetlands are areas 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.

Rule 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 uplands and wetlands and other surface

waters. The National Food Security Act manual is used by NRCS to determine wetland boundaries on agricultural lands. In most cases, both methodologies produce the same or nearly the same determinations.

The Florida Geological Survey defines a spring as a point where underground water emerges to the earth's surface. Springs 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 may be important archeological sites.

The area within ground water and surface water basins that contributes to the flow of the spring, as depicted in **Figure 26**,



Figure 26

is a spring's recharge basin, also called a "springshed." 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 million gallons per day (MGD) or more; and second magnitude springs discharge between 6.46 to 64.6 MGD. FDEP has initiated an effort to delineate the springsheds in the state, on a prioritized basis.

Wetlands and springs are important 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. 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. It is important to minimize pollutant discharges to rivers and streams.

Aquifer Protection

With the majority of Florida's water supply originating from underground sources (aquifers), it is extremely important for agricultural operations to protect wellheads from contamination. Successful wellhead protection includes complying with regulatory requirements and using common-sense measures with regard to 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. Sinkholes in agricultural areas can also introduce contaminants to the aquifer, and pollutants leaching into groundwater can contaminate springs and wells that are located miles from the pollution source.

7.1 Wetlands Protection

Level I

- ✓ 1. Do not dredge or fill in wetlands. Consult with the WMD and the NRCS prior to conducting activities in or near wetlands to ensure that you are complying with any permitting or NRCS program eligibility requirements.
- ✓ 2. Minimize adverse water quality impacts to receiving wetlands by applying measures progressively until the problem is addressed. Practices such as filter strips, conservation buffers, swales, or holding water on-site may preclude the need for more aggressive treatment measures.
- ✓ 3. Install and/or maintain a minimum 25-foot, non-fertilized **vegetated buffer** upland of the landward boundary of all wetlands and lakes, unless you have an existing WMD permit (e.g., ERP, or management and storage of surface waters permit) that specifies a different buffer. For any nutrient or fecal coliform impaired waters, expand the buffer to at least 50-feet.
- ✓ 4. For existing operations without an ERP that are unable to meet the vegetated buffers specified above, submit to FDACS a written description of the alternative measures you will take to protect the wetlands from water quality impacts (Use the comments section at the end of the BMP checklist in **Appendix 8**).

Note: Use an NRCS county soil survey map to help identify the location of wetlands, hydric soils, or frequently flooded areas. If you do not have an ERP (which provides a wetlands delineation), you may want to seek technical assistance from the FDACS, WMD or NRCS to determine the landward boundary of wetlands on your property.

References

1. Wetland Enhancement, Code 659; Nutrient Management, Code 590, USDA-NRCS FOTG-Section IV. www.nrcs.usda.gov/technical/efotg
2. National Management Measures for the Control of Nonpoint Pollution from Agriculture. EPA. http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm

7.2 Streams Protection

Level I

- ✓ 1. Install and/or maintain a riparian buffer along perennial streams on production areas that exceed 1-percent slope and discharge directly to streams. Contact FDACS, NRCS,

or an NRCS-approved Technical Service Provider for assistance in properly designing the riparian buffer.

- ✓ **2.** Locate and size any stream crossings to minimize impacts to riparian buffer vegetation and function and to maintain natural flows.

Note: Minimize any new significant fill areas placed within the established 100 year floodplain.

References

1. Field Border, Code 386; Riparian Herbaceous Cover, Code 390; Riparian Forest Buffer, Code 391; Filter Strip, Code 393; Grassed Waterway, Code 412; Streambank and Shoreline Protection, Code 580; Stream Habitat Improvement and Management, Code 395; Stream Crossing, Code 578. USDA-NRCS FOTG-Section IV. www.nrcs.usda.gov/technical/efotg

7.3 Protection for First and Second-Magnitude Spring Recharge Basins Level I

- ✓ **1.** Install and/or maintain a minimum 100-foot non-fertilized vegetated buffer upland of the landward boundary of springs and spring runs.
- ✓ **2.** Install and/or maintain a minimum 50-foot non-fertilized vegetated buffer around sinkholes.
- ✓ **3.** If you have a sinkhole on your property, never use it to dispose of used pesticide containers or other materials.

References

1. Protecting Florida's Springs, Land Use Planning Strategies and Best Management Practices, FDEP. www.dep.state.fl.us/springs/reports/files/springs-manual_2002.pdf.


2. Karst Sinkhole Treatments, Code 527. USDA-NRCS FOTG-Section IV. www.nrcs.usda.gov/technical/efotg

7.4 Well Operation and Protection

When installing a new well, contact your WMD to see whether the well requires a consumptive use/water use permit. Potable water wells as defined by Rule Chapter 62-521, F.A.C, must follow the requirements of that rule.

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 WMD well-construction permit requirements.

Level I

- ✓ **1.** Use backflow-prevention devices at the wellhead to prevent contamination of the water source, if injecting fertilizer or chemicals.
- ✓ **2.** Inspect wellheads and pads at least annually for leaks or cracks, and make any necessary repairs.
- ✓ **3.**  Maintain records of new well construction and modifications to existing wells.

References

1. Water Well, Code 642; Well Decommissioning, Code 351; Well Plugging, Code 755. USDA-NRCS FOTG-Section IV. www.nrcs.usda.gov/technical/efotg
2. Water Well Permitting and Construction Requirements Rule, Chapter 62-532, F.A.C. FDEP. <http://www.dep.state.fl.us/legal/Rules/rulelist.htm>
3. Florida Water Permits. <http://flwaterpermits.com/>

Note: See **Appendix 5: Example Record Keeping Forms** for list of record-keeping requirements and example record-keeping forms.



8.0 RECYCLING AND CHEMICAL WASTE MANAGEMENT

Waste Stream Management involves other environmental, health and safety issues that farms typically encounter.

Farm maintenance areas are sites where pesticides are mixed and loaded into application equipment; tractors and other pieces of farm equipment are serviced; or pesticides, fuel, fertilizer, and cleaning solvents are stored. These are areas of the farm where accidental pollution of soil, surface water, or ground water is most likely to occur. Contamination can occur when pesticides, lubricants, solvents, or other chemicals are spilled, rinse water from container or equipment cleaning is dumped on the ground or discharged into surface water, or improperly cleaned containers are stockpiled or buried. Proper management of farm maintenance areas is an important part of responsible chemical and pesticide use. Proper handling and disposal practices at these sites can help avoid serious environmental problems, protect the farm's water supply, reduce exposure of the owner to legal liability for contamination and cleanup (including fines), and foster a good public image for agriculture.

Use the guiding principles below in farm maintenance areas to help prevent contamination:

- **Isolate** all potential contaminants from soil and water.
- **Do not discharge** any waste material onto the ground or into surface waterbodies.
- **Conserve** resources to maximize efficient use of irrigation, fertilizers, and pesticides.

Try to eliminate the discharge of materials such as equipment wash water to ground or surface waters.

Surface water contamination can occur directly through spills or releases to a lake or canal, or indirectly through stormwater drains, field ditches, or swales. Discharge to ground water may occur by percolation through highly permeable soils from repeated activity at a single location, or by flow into sinkholes, improperly constructed wells or other direct conduits to ground water.

Fertilizers

If not handled properly, fertilizers can be a significant source of water pollution. The nutrients in fertilizers can lead to algal blooms and stimulate growth of noxious plants in lakes and streams.

Storage

Always store nitrogen based fertilizers separately from solvents, fuels, and pesticides since many fertilizers are oxidants and can accelerate a fire. Ideally, fertilizer should be protected from rainfall, and stored in a concrete building with a flame-resistant roof. Storage of dry bulk materials on a concrete or asphalt pad may be acceptable if the pad is adequately protected from rainfall and from water flowing across the pad. Secondary containment of stationary liquid fertilizer tanks containing greater than 80 percent nutrients or phosphoric acid is required per FDEP Chapter 62-762, F.A.C. Even where not required, the use of secondary containment is a sound practice.

Loading and Spill Containment

Load fertilizer into application equipment away from wells or surface waterbodies. A concrete

or asphalt pad with rainfall protection is ideal, as this permits easy recovery of spilled material. If this is not feasible, loading at random locations in the field can prevent a buildup of nutrients in one location. Do not load fertilizers on a dedicated pesticide chemical mixing center because of the potential for cross-contamination. Fertilizers contaminated with pesticides may cause crop damage or generate hazardous wastes. Clean up spilled material immediately. Collected material may be applied as fertilizer.

Solvents and Degreasers

The routine release of even small amounts of solvents can result in serious environmental and liability consequences due to the accumulation of contaminants in soil or ground water. As little as 25 gallons per month of used solvent disposal can qualify you as a “small quantity generator” of hazardous waste, thus triggering reporting requirements. Whenever practical, replace solvent baths with re-circulating water-based washing units (which resemble heavy duty dishwashers). Soap and water or other water-based cleaners often are as effective as solvent-based ones. Blowing off equipment with compressed air instead of washing with water often is easier on hydraulic seals and can lead to fewer oil leaks. Minimize the need for storage by carefully planning and ordering chemicals only as they are needed. Store solvents and degreasers in lockable metal cabinets in an area away from ignition sources (e.g. welding areas, grinders) and provide adequate ventilation. Many are toxic and highly flammable. Never store them with pesticides or fertilizers or in areas where smoking is allowed. Keep solvent containers covered to reduce volatile organic compound emissions and fire hazards. Keep an inventory of the solvents stored and the Safety Data Sheets and emergency response equipment on the premises near the storage area, but not inside the area itself, since it may not be available when needed most.

Use and Disposal

Always wear the appropriate personal protective equipment (PPE), especially eye protection, when working with solvents. Never allow solvents to drain onto pavement or soil, or discharge into waterbodies, wetlands, storm drains, sewers or septic systems, even in small amounts. Solvents and degreasers should be used over a collection basin or pad that can collect all used material. Most solvents can be filtered and reused many times. Store

the collected material in marked containers until it can be recycled or legally disposed.

Private firms provide solvent wash basins that drain into recovery drums and a pick-up service to recycle or properly dispose of the drum contents. Collect used solvents and degreasers, place them into containers marked with the contents and the date, and then have them picked up by a service that will properly recycle or dispose these materials. Never mix used oil or other liquid material with the used solvents. Use only licensed contractors when disposing of spent material offsite.

Paint

Paints, stains, or other finishing materials may be either oil-based or latex. The best method of disposal for empty latex paint cans is to allow the can to fully dry and then dispose of it as solid waste. Unused latex paints can be mixed together, re-tinted, and used. Charitable housing groups will often accept unused latex paint.

Oil and solvent based coatings which cannot be used should be disposed as hazardous waste, so check with your county for disposal options. However, most empty cans may be allowed to fully dry and then disposed of as solid waste.

Used Oil, Antifreeze, and Lead-Acid Batteries

Collect used oil, oil filters, and antifreeze in separate marked containers and recycle. In Florida, recycling is the only legal option for handling used oil. Oil filters should be drained into a container (puncturing and crushing helps speed drainage) and taken to the place that recycles your used oil. Many gas stations or auto lube shops will accept small amounts (including oil filters) from individuals. Do not mix used oil with used antifreeze or sludge from used solvents. Antifreeze must be recycled or disposed as a hazardous waste. Commercial services are available to collect this material.

Lead-acid storage batteries are classified as hazardous wastes unless they are recycled. All lead-acid battery retailers are required by law to accept returned batteries for recycling. Make sure all caps are in place to contain the acid. Store used batteries on an impervious surface and under cover.

Gasoline and Diesel Fuel

Design and manage fuel dispensing areas to prevent soil and water contamination. Place fuel pumps on concrete or asphalt surfaces. Fuel pumps with automatic shut off mechanisms reduce



Figure 27

the potential for overflow and spillage during fueling. Do not locate the pumps where a spill or leak would cause fuel to flow onto soil, or into a storm drain or surface waters.

Stationary fuel storage tanks should be in compliance with FDEP storage tank regulations (Rule Chapter 62-761, F.A.C. for underground tanks and Rule 62-762, F.A.C. for aboveground tanks) and EPA Oil Spill Prevention, Control, and Countermeasure rule at: www.epa.gov/osweroel/content/spcc/spcc_ag.htm. In general, underground tanks with volumes over 110 gallons and above-ground tanks with volumes over 550 gallons must be registered and located within secondary containment systems (**Figure 27**) unless of double-wall construction. While containment is not usually required for smaller tanks, it is still a good practice.

The water to be discharged from secondary containment must be checked for contamination. This can be done by looking for an oil sheen, observing any smell of fuel or oil, or through the use of commercially available test kits. Never discharge to the environment any water that is contaminated. If the water is not contaminated, it can be reused, or safely discharged.

General Equipment Cleaning

Clippings and dust removed from machinery should be handled separately from other waste materials and equipment wash water. Many manufacturers now recommend the use of compressed air to blow off equipment. This is less harmful to the equipment's hydraulic seals, eliminates wash water, and produces dry material that is easy to handle.

Wash equipment over a concrete or asphalt pad that allows water to be collected, or to run off onto grass or soil, but not into a surface waterbody or canal. After the residue dries on the pad, it can be collected and composted or spread in the field. To keep crop residue and other debris from becoming

contaminated with pesticide, do not conduct such operations on a pesticide mixing and loading pad.

Minimize the use of detergents. Try to use only biodegradable non-phosphate detergents. The amount of water used to clean equipment can be minimized by using spray nozzles that generate high pressure streams of water at low volumes.

Wash water generated from the general washing of equipment, other than pesticide application equipment, may not have to be collected. This wash water must not, however, be discharged to surface or ground water either directly or through ditches, storm drains or canals. For regular wash down of ordinary field equipment, allow the wash water to flow to a grassed retention area or swale. Do not allow any wash water to flow directly into surface waters or to a septic system.

Pesticide Application Equipment Washwater

Wash water from pesticide application equipment must be managed properly since it will contain pesticide residues. Wash the outside of the equipment at random spots in the field using water from a nurse tank. Clean the tires and particularly dirty areas of the equipment exterior prior to bringing it into the pad area. These practices prevent unwanted dirt from getting on the mix/load pad and sump or from being recycled into the sprayer. Avoid conducting washing in the vicinity of wells or surface waterbodies. For intensive centralized or urban operations, it may be necessary to discharge the wash water to a FDEP permitted treatment facility.

The inside of the pesticide application equipment should be washed on the mix/load pad. The rinsate may be applied as a pesticide (preferred) or stored for use as make-up water for the next compatible application. Otherwise it must be treated as a (potentially hazardous) waste. After washing the equipment and before an incompatible product is handled, the sump should be cleaned of any liquid and sediment.

8.1 Waste Reduction BMPs Level I

- ✓ 1. Store fertilizers in an enclosed, roofed structure with an impervious floor and lockable door, at least 100 feet from wetlands, waterbodies, or sinkholes.
- ✓ 2. Recycle used oil, solvent bath waste, and antifreeze using appropriate means.

- ✓ 3. Ensure that all regulated petroleum storage tanks are registered, and meet the requirements of FDEP rule for secondary containment.

References

1. USDA-NRCS Conservation Practice On-Farm Secondary Containment Facility, Code 319 FOTG-Section IV. http://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=stelprdb1263168&ext=pdf



9.0 POULTRY CLOSURE

Poultry Closure is the decommissioning of facilities in an environmentally safe manner.

When it becomes necessary to close a facility, certain actions must be taken. Producers may want to conduct pre-closure soil and water testing to establish baseline data as a means of due diligence.

All of the wastewater from the solids separators, WSPs, or tanks should be land applied at agronomic rates or removed by a licensed septic tank pumping company. The remaining solids from the WSP or tanks (if any), separators, barns, or any other places of significant accumulation should be removed and land applied at agronomic rates or hauled off-site. The solids should be removed to the maximum extent possible by agitation and pumping, dredging, or physical means (heavy equipment).

Existing waste transfer components and conveyances should be removed and replaced with compacted earth material, or decommissioned. All disturbed areas should be re-vegetated or treated using other erosion control measures.

Once a WSP or tank has been cleaned, it should be filled in or breached, unless the farmer wants to maintain it for alternative water use purposes.

9.1 Closure BMPs Level I

- ✓ 1. Clean all areas where concentrated manure has accumulated, including WSPs or egg wash water tanks.
- ✓ 2. Breach, fill, or use WSPs or tanks for an alternative purpose.
- ✓ 3. Contact the WMD about proper abandonment of onsite wells.
- ✓ 4. Identify and properly dispose of chemicals and other waste materials.

References

1. Waste Facility Closure, Code 360. USDA-NRCS FOTG-Section IV. <http://www.nrcs.usda.gov/technical/efotg>
2. Sample collection <http://edis.ifas.ufl.edu/ss495>

APPENDICES

APPENDIX 1: GLOSSARY

The definitions that follow apply to this BMP manual only and may not be consistent with definitions used in other material.

Adsorption – Adsorption is the adhesion of atoms, ions, or molecules from a gas, liquid, or dissolved solid to a surface.

Anaerobic – An environmental condition absent of free oxygen, or with greatly reduced concentrations of free oxygen.

Animal feeding operation – A facility (other than an aquatic animal production facility) where both of the following conditions exist:

- a. Animals have been, are being, or will be stabled, confined and fed, or maintained for a total of 45 days or more in any 12-month period.
- b. Crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season.

Best Management Practice – 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 – Solid, semisolid, or liquid residue generated during the treatment of domestic wastewater in a domestic wastewater treatment facility.

Comprehensive nutrient management plan – A plan developed by NRCS or a Technical Service Provider following NRCS criteria to manage the amount, source, placement, form and timing of the application of animal manure, fertilizer or other plant nutrients in order to minimize nutrient loss or runoff, protect water resources and maintain the productivity of crops.

Concentrated animal feeding operation – A large AFO as defined in subsection 40 CFR 122.23(b)4, and adopted per Chapter 62-620.100(3)(r-w), F.A.C.

Confined – Animals that stay or are brought into an area at least once a day.

Cyanobacteria – Also known as blue-green algae, these are bacteria that produce their energy

through photosynthesis. Certain cyanobacteria produce cyanotoxins that can be toxic to animals and humans.

Denitrified – Process where anaerobic bacteria converts nitrate to N₂ gas.

Discharge – The release of process wastewater to surface waters is a point source discharge. Agricultural runoff is not a point-source discharge. It is considered a nonpoint source and usually addressed through BMPs rather than permitting.

Enhanced-Efficiency Fertilizers – Products with characteristics that allow increased plant uptake and therefore reduce potential nutrient losses to the environment (e.g., gaseous losses, leaching, or runoff) when compared to an appropriate reference fertilizer that does not contain additives (AAPFCO 2012).

Evapotranspiration – The combined loss of water through evaporation and emission of water vapor (transpiration) through plant leaf openings (stomata).

Karst – A geologic formation generally consisting of well-drained sands over unprotected limestone.

Land application or land applied – The application of collected manure, litter, or process wastewater onto or incorporated into the soil.

Land application area – The land under the control of an AFO owner or operator, whether it is owned, rented, or leased, to which collected manure, litter or process wastewater from the production area is or will be applied.

Level spreader – A device used to disperse concentrated runoff uniformly over the ground surface as sheet flow.

Lined or liner – Concrete, plastic, clay, or other artificial coating that is used to prevent significant leakage into the surrounding soil. Liners must be structural secure, with a minimum of 4 inches of concrete used, a minimum of 40 mil HDPE or similar plastic, or two foot of clay.

Manure – Excreta of animals and excreta mixed with residual materials that have been used for bedding, sanitary, or feeding purposes for animals. Compost, as defined in 62-701.200(23), F.A.C., and other processed manure products that have been stabilized as defined in 62-701.200(24), F.A.C. are not considered manure.

NPDES Permit – A federal permit issued pursuant to 40 CFR Part 122.21(a).

Nutrient management plan – A plan developed for an AFO by a Professional Engineer experienced in this area, to manage the amount, source, placement, form, and timing of the application of animal manure, fertilizer, or other plant nutrients (N and P only) in order to minimize nutrient loss or runoff, protect water resources, and maintain the productivity of crops.

Phosphorus or P – Phosphorus measured in elemental form. To convert P to P_2O_5 multiply P by 02.29.

Poultry – are domesticated birds kept by humans for the eggs they produce, their meat, their feathers, or sometimes as pets. Commercial production is primarily chickens and turkeys.

Private drinking water well – A well that is a source of drinking water for human consumption for one or two residences or a for a commercial center that serves less than 25 people.

Process wastewater – Water generated in the Poultry production area (not in pastures) consisting of any of the following: spillage or overflow from animal watering systems; washing, cleaning, or flushing pens, barns or manure pits. Process wastewater also includes any water which comes into contact with any raw materials, products, or byproducts including manure, litter, feed, or bedding within the production area.

Production area – The part of an AFO that includes animal confinement areas (barns and lots), manure storage areas (WSP or solids storage areas), and non-clean raw material storage areas (grain and silage storage areas that are not covered).

Public drinking water well – A well that is a source of drinking water for human consumption that serves a public water system.

Public water system – means a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. (Rule 62-532.200, F.A.C.)

Pullet – A young hen; specifically: a hen of the domestic chicken less than a year old.

Rinsate – The solution remaining after rinsing something like a pesticide container.

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

Sinkhole – A naturally occurring geological feature that has an open connection to the groundwater. Areas that have topsoil and a root zone over the entire area or ponded areas that do not have an open connection to groundwater are not sinkholes in this manual.

Spodic horizon – A subsurface horizon in which amorphous materials consisting of organic matter, aluminum, and iron have accumulated.

Surface waters – Water upon the surface of the earth, whether contained in bounds created naturally or artificially or diffused. Water from natural springs is classified as surface water when it exits from the spring onto the earth's surface.

Uncoated sands – Sand particles that lack clay and organic matter coating, and have poor water and nutrient holding capacities.

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.

Waste storage pond – A man-made excavated impoundment constructed to hold manure, litter, and/or process wastewater. WSPs include waste lagoons designed for physical and/or biological treatment.

Watersheds – Drainage basin or region of land where water drains downhill into a specified body of water.

Wetlands – As defined in subsection 373.019(27), F.S., wetlands are those areas that are inundated or saturated by surface water or groundwater 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. 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.

APPENDIX 2: INCENTIVE PROGRAMS FOR QUALIFYING FARMS

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 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 cost-share programs have been established. These programs are designed to conserve soil and water resources and improve water quality in the receiving watercourse. The text below provides basic information regarding the primary federal, state, and regional cost-share programs. Sources of additional information have also been included, and producers 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 producers 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.

Emergency Conservation Program (ECP): The ECP provides financial assistance to producers and operators for the restoration of lands on which normal agricultural 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 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 poultry and livestock operations and farming operations that produce multiple commodities. Conservation Plans are developed in accordance with the NRCS FOTG. Assistance in developing a plan can be obtained through the local Soil and Water Conservation District (SWCD), the 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 in order to receive cost share under 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 wildlife habitat, nutrient and irrigation management, cross-fences, water control structures, brush management, prescribed burning, and 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 Easement (WRE): WRE under the Agricultural Conservation Easement Program 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.

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: 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 WMDs 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, your WMD, or FDACS. Information and links to other sites are also available on the Internet at the following web site: <http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy>.

APPENDIX 3: SOIL AND TISSUE TESTING

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. Samples collected from areas that differ from typical characteristics of the dairy pasture/fields should be submitted separately and should not be consolidated with the primary samples. Using a management zone (area that is managed similarly) as a guiding factor to collect and consolidate samples is strongly recommended to optimize resources. Consult the IFAS Soil Testing page at: http://edis.ifas.ufl.edu/topic_soil_testing for further information and to obtain the appropriate soil test sheet.

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 IFAS Extension Soils Testing Laboratory (ESTL) for different soils in Florida:

1. Mehlich-3 extraction – method used on all acid-mineral soils with a pH of ≤ 7.3 .
2. AB-DTPA extraction – method used on alkaline (calcareous) soils with a pH of 7.4 and above.
3. Water extraction – method used for extraction of P in all organic soils.
4. Acetic acid extraction – method used on all organic soils for extraction of K, Mg, Ca, Si, and Na.

It is extremely important that procedures used at private laboratories are well understood before submitting the samples, because BMPs are tied to the standardized procedures used by the ESTL. Similarly, it is also very important to note that the ESTL laboratory does not offer any test for N because 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 IFAS ESTL in Gainesville can be found in the extension publication, Circular 1248, at: <http://edis.ifas.ufl.edu/ss312>.

Interpretation of Test Results: The primary goal of laboratories that offer soil test services is to provide interpretation of the soil test results. These should be based on soil test-crop response trials and field calibration of the test results using optimum economic yields. 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.

Nutrient Recommendations: Nutrient recommendations based on soil test results are formulated based on the optimum economic crop response to an added nutrient to the soil. Recommendations can originate from crop nutrient requirement research, soil test results, and/or tissue test results as discussed below. Sometimes higher crop uptake values for waste disposal are used since they are based on the maximum crop uptake potential instead of economic responses.

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 leaves, with results compared to recommended nutrient ranges. Several types of hand-held field test equipment are also available. Growers are encouraged to contact their local extension agent before embarking on a tissue testing regimen.

References

1. Obreza, T.A. and K.T. Morgan. 2008. Nutrition of Florida Citrus, 2nd Edition. SL253. Soil and Water Science, Cooperative Extension Service. IFAS. <http://edis.ifas.ufl.edu/ss478>.
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. Rao Mylavarapu, Kelley Hines and Thomas Obreza. 2008/2011. Diagnostic Nutrient Testing for Commercial Citrus in Florida. <http://edis.ifas.ufl.edu/ss492>.

APPENDIX 4: EFFECTIVENESS AND MAINTENANCE OF VEGETATIVE FILTER STRIPS

A. Site Eligibility

1. Vegetative filter strips (VFS) are effective for water quality improvement only if the flow across the VFS is shallow and the VFS is not submerged. Vegetative filter strips should not be installed on fields with significant concentrated flow across the proposed VFS areas.
2. VFS should be located only within areas characterized by shallow sheet flow which are upslope of natural or man-made channels.
3. VFS should not be installed in areas higher than the fields they are intended to protect.
4. Large fields with significant natural drainageways or grassed waterways are acceptable for VFS only if they are installed on both sides of internal field drainageways. This will allow pollutants to be trapped before they can enter the drainageways.
5. VFS are inappropriate for fields in continuous forage or pasture because the field is already protected from excessive sediment and nutrient loss.

B. Vegetative Filter Strip Establishment

1. The type(s) of vegetation and seeding rates used in VFS should be appropriate for local soil and climatic conditions and approved for use in the designated area. Grasses and legumes or combinations thereof are the most effective for erosion control and water quality improvement because of their dense growth, resistance to overland flow and filtering ability. Shrub and wildlife strips should not be permitted because they are relatively ineffective for water quality improvement when compared to grass and legume VFS.
2. Trees, stumps, brush and similar materials should be removed from the proposed filter strip to avoid interference with proper VFS operation and maintenance.
3. The VFS area should be limed and fertilized according to soil test recommendations with subsequent incorporation into the top 3 to 6 inches of soil as part of seedbed preparation.
4. Vegetation should be planted during optimum seeding times on firm, moist seedbeds. If site

conditions are unfavorable at planting, mulch material should be applied immediately after seeding. Mulching is recommended to minimize rill development during VFS establishment.

5. Some sites may require limited grading to correct slope problems within the strip such as gullies or high areas within or immediately downslope of the filter. This is not economically feasible for sites with severe topographic limitations.
6. At sites where there may be significant flow along or parallel to the filter, shallow berms or terraces may need to be constructed perpendicular to the filter at 50-foot to 100-foot intervals to intercept runoff and force the flow through the VFS before it can concentrate further.
7. VFS should be a minimum of 20-feet in width at the time of establishment. In steeper areas with poorly drained soils, minimum VFS width should be determined with design equations or according to approved local specifications.

C. Maintenance Practices

1. VFS should be mowed and the residue harvested a minimum of 2 to 3 times per year to promote thick vegetation with optimum pollutant-removal capabilities.
2. VFS should be limed and fertilized annually along with the rest of the field according to soil test recommendations. Use controlled release products and take care to avoid deposition in water bodies when applying near the protected feature.
3. Caution should be used when applying herbicides to VFS or adjacent fields for weed control. If herbicides are applied to fields, sprayers should be turned off before crossing VFS or using them for turn rows.
4. VFS should not be used for roadways because roadways change flow patterns which can lead to concentrated flow problems. If a VFS must be used for a roadway then the VFS should be 8 to 10 feet wider than normal and the roadway should be located on the downslope side of the filter so that field runoff will be filtered before it can concentrate in the disturbed roadway area.

5. VFS should be inspected for stand establishment after planting and if stand is inadequate, the area should be re-fertilized and overseeded.
6. VFS should be inspected regularly for damage caused by tillage operations, misapplication of herbicides, gully erosion, sediment inundation, etc., and repaired as soon as possible.
7. VFS that have accumulated sufficient sediment so that they are higher than adjacent fields should be plowed out, disked and graded if necessary

before reseeding. This is necessary to reestablish flow conditions favorable for optimum VFS performance.

8. Care must be taken during all tillage operations to avoid tilling into VFS and reducing its effective width. If moldboard plowing is practiced, the last plow pass should turn soil towards the filter and the disturbed area next to the filter should be carefully disked to minimize gully formation and other flow problems.

Adapted from Bulletin 153, Long-Term Effectiveness and Maintenance of Vegetative Filter Strips, T.A. Dillaha. Virginia Polytechnic Institute.

APPENDIX 5: EXAMPLE RECORD KEEPING FORMS

General Records — Poultry Operations

Rev Date: 3/9/2016 NOI Filed (Date): _____

Farm Name					
Address	City	State, Zip	County	Latitude <small>(decimal)</small>	Longitude <small>(decimal)</small>

	Office Phone	Cell	Other	Email
Owner				
Manager				

	Flock Size (1000s)	
	Average	Peak
Broilers		
Layers		
Pullets		
Turkeys		
Other		
Total		

Field	Acres	Wastewater Applied Acres	Solids Applied Acres
1			
2			
3			
4			

Total Acres	
Cropland	
Waste Applied Acres	
# of Fields Where Waste is Applied	

Note: This record should be filled out once, unless significant changes are made.

Sampling and Analysis Record Sheets

Year _____

Manure / Litter Analysis *			Name of Laboratory:			
Date	Location sample taken	Broiler, Layer or Pullet	Total Phosphorus (mg/kg)	P (lbs/ton) as P ₂ O ₅	Plant Available Nitrogen (lbs/ton)	% Moisture content

* Annual sampling required. Multiply P by 2.27 to get P205.

(For Liquid Systems Only)

Waste Pond / Lagoon Analysis (Quarterly from pond or discharge)*			Name of Laboratory:					
Date	Location sample taken	Description of Sample	Total Phosphorus (mg/l)	P (lbs/1000 gal)* as P ₂ O ₅	TKN	Plant Available Nitrogen (lbs/1000 gal)	K as K ₂ O	% Solids

*At least 1 year of 5, may be reduced to annual if consistent.

Offsite Transfer of Wastes

Year _____

A copy of the latest nutrient analysis must be provided to the recipient. All lab results should be entered “as sampled”. Nitrogen and Phosphorus values may need to be converted to correspond to the units used for size of loads, and noted in their respective columns.

Date	Recipient's Name and Address	Solid or Liquid	Number of Loads	Average size of loads (lbs/gals)	Nitrogen	Phosphorus	Analysis Date

Onsite Land Application of Nutrients

Year _____

Annual Application Field Record

From Nutrient Management Plan or IFAS recommendations

Field ID _____ Crop _____ Recommended PAN uptake /Ac. * _____ (A)

Wetted Acres _____ Recommended Total P uptake /Ac. _____ (B)

1	2	3	4	5	6	7	8	9	10	11
Date	Nutrient Source*	Units	Amount per acre	Analysis or Fertilizer Grade	Plant Available N (PAN) Applied (lb/Ac.)	Remaining Nitrogen Balance**	Total P ₂ O ₅ applied (lb/Ac.)	Remaining Phosphorus Balance***	Potassium (K ₂ O) applied	Operator Initials

* Enter nutrient source (Litter, manure, commercial fertilizer, or lagoon)
 ** Enter the value received by subtracting column (6) from the last entry in (7). Repeat for each application.
 *** Subtract column (8) from the last entry in (9). Repeat for each application. If P is applied beyond the recommendation, consult a qualified professional.

Sampling and Analysis Record Sheets

(For Onsite Land Application Systems Only)

Crop Harvest Analysis*			Name of Laboratory:									
Date	Field ID	Crop	Plant Date	Harvest Date	Yield (lbs wet** weight)	Acres Harvested	% Moisture	% Protein	% N	% P ₂ O ₅	% K ₂ O	

* Plant tissue analysis required at each land application field harvest

** Use % moisture to convert wet weight to dry weight, or use as-sampled results. Wet x (100-%moisture) = dry

Soil Sample Analysis			Name of Laboratory:							
Sample Date	Field Location	# of Samples	P ₂ O ₅	K ₂ O	pH	Ca	Mg	Mn	Fe	Records Location

Waste Storage Pond / Lagoon Capacity and Manure / Stormwater Generation (if applicable)

Wastewater Production _____ Year _____

Date Measured or Calculated	Egg Wash Water/Hose Output (gallons/day)	Runoff entering pond (do not include surface of WSP)	Manure Production (gpd)	Misc (gpd)	Sum (gpd)

Contact your engineer or NRCS for guidance in calculating these values. Wastewater production is the average volume of wastewater entering the waste treatment system every day.

Waste Storage Pond Capacity			Design 25-yr, 24-hour storm			
Pond ID	Liner Type (none, clay, synthetic, concrete)	Level at Minimum Freeboard (feet)	Volume at Minimum Freeboard (cubic feet)	Total Impervious Surface Area Draining to the WSP (acres or square feet)	25-yr, 24-hr. Stormwater added to pond (cubic feet)	Pond storage capacity (days)
WSP 1						
WSP 2 / Lagoon						

Note: This record should be completed at the time the NOI is filed. Wastewater production continues to be recorded each quarter for 1 year of 5, unless significant changes occur that would require new calculations to be completed.

Daily/Weekly Waste Storage Pond Inspection Logsheet

Month/Year _____

Date	Final WSP/Lagoon level	Precipitation, inches	WSP/Lagoon Liner, bank/berm insp. (weekly)	Water line insp. (Min. weekly)	Irrigation equip. Insp. (weekly)	Inspector initials
Max.		<i>"Checkmark" means in good order; an "X" means maintenance or repair is needed.</i>				
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						

Emergency Release Log

Year _____

Date of Release	Source of Release	Solid or Liquid	Amount of Release	Cause of Release	Receiving Water Body	Damage Caused	Actions Taken

APPENDIX 6: CONTACT INFORMATION

Emergency Information

Emergency Reporting Numbers	24 hours	
State Warning Point <i>Division of Emergency Management – contact in case of oil or hazardous substance spill</i>	Toll-Free	1-800-320-0519
Emergency Information and Follow-Up Numbers	Monday - Friday	
State Warning Point Information Line	8:00 am - 5:00 pm	(850) 413-9900
DEP Emergency Response	8:00 am - 5:00 pm	(850) 245-2010
State Emergency Response Commission <i>For follow-up reporting only</i>	Toll-Free	1-800-635-7179

Non-Emergency Information

Florida State Agency Numbers	Toll Free	
Department of Agriculture and Consumer Services	www.freshfromflorida.com	
Office of Agricultural Water Policy	(850) 617-1727	
Division of Agricultural and Environmental Services.....	(850) 617-7900	
Bureau of Pesticides.....	(850) 617-7917	
Bureau of Compliance Monitoring.....	(850) 617-7850	
Department of Environmental Protection	www.dep.state.fl.us	
Non-point Source Management Section.....	(850) 245-2836	
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. Johns 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		
NRCS – Florida Office (Gainesville).....	(352) 338-9500	
UF/IFAS Extension Administration	(352) 392-1761	
Association of Florida Conservation Districts <i>Soil and Water Conservation Districts</i>	(407) 321-8212	

APPENDIX 7: RULE 5M-19, F.A.C.

5M-19.001 Approved Florida Poultry Best Management Practices.

The manual titled Water Quality/Quantity Best Management Practices for Florida Poultry Operations (June 2016 Edition), FDACS-P-02052, is hereby adopted and incorporated by reference. Copies of the manual may be obtained from the University of Florida county extension offices or from the Florida Department of Agriculture and Consumer Services (FDACS), Office of Agricultural Water Policy, Mayo Building, 407 South Calhoun Street, Tallahassee, Florida, 32399 or accessed online at <http://www.flrules.org/Gateway/reference>.

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-19.002 Presumption of Compliance.

Pursuant to Section 403.067(7)(c)3., F.S., implementation of Best Management Practices (BMPs), in accordance with this rule chapter, that have been verified by the Florida Department of Environmental Protection as effective in reducing pollutants addressed by the practices, provides a presumption of compliance with state water quality standards and release from the provisions of Section 376.307(5), F.S., for those pollutants. In order to qualify for a presumption of compliance and release from Section 376.307(5), F.S., the applicant must:

- (1) Submit a Notice of Intent (NOI) to Implement, as provided in Rule 5M-19.003, F.A.C., that identifies the applicable BMPs;
- (2) Implement all applicable BMPs in accordance with the requirements in Rule 5M-19.003, F.A.C.;
- (3) Implement all applicable Level I BMPs no later than 18 months after submittal of the NOI; and
- (4) Maintain documentation, in accordance with Rule 5M-19.004, F.A.C., to verify the implementation and maintenance of the identified BMPs.

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-19.003 Notice of Intent to Implement.

- (1) A Notice of Intent (NOI) to Implement Water Quality/Quantity Best Management Practices for Florida Poultry Operations (FDACS-04001, 02/16), hereby adopted and incorporated by reference, shall be submitted to the Florida Department of Agriculture and Consumer Services, Office of Agricultural Water Policy, Mayo Building, 407 South Calhoun Street, Tallahassee, Florida 32399. The NOI may be obtained from FDACS or accessed online at <http://www.flrules.org/Gateway/reference>.
- (2) A BMP checklist with a schedule for implementation, as contained in the manual incorporated in Rule 5M-19.001, F.A.C., must be submitted with the NOI. The applicant shall select the applicable BMPs by following the instructions in the manual with the assistance of FDACS field staff or agents.
- (3) Once the NOI is submitted, the applicant is eligible 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-19.004 Record Keeping.

BMP participants must keep records for a period of at least five years after they are generated to document implementation and maintenance of the practices identified in the manual incorporated by reference in Rule 5M-19.001, F.A.C., and in the Notice of Intent to Implement. All documentation is subject to inspection upon request.

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 8

Notice of Intent and BMP Checklist



ADAM H. PUTNAM
COMMISSIONER

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

FDACS-OAWP
Mayo Building
407 S. Calhoun St. MS-E1
Tallahassee, FL 32399

NOTICE OF INTENT TO IMPLEMENT WATER QUALITY / QUANTITY BMPs FOR FLORIDA POULTRY OPERATIONS

Rule 5M-19.003, F.A.C.

- Before beginning, check all boxes below that apply to your operation:
 - I have an existing National Pollutant Discharge Elimination Permit (NPDES).
If so, you have no further obligations under this manual. Permit No: _____
- In consultation with Florida Department of Agriculture and Consumer Services (FDACS) field staff or agents, complete the **Notice of Intent (NOI)**, and the **BMP Checklist** (all of these documents are in the manual), selecting the BMPs applicable to your property. The NOI may list multiple properties only if all the following apply: they are within the same county, they are owned or leased by the same person or entity, and the same BMPs identified on the checklist are applicable to them.
- Submit the **NOI** and the **BMP Checklist** to FDACS field staff or mail it to:

FDACS Office of Agricultural Water Policy
Mayo Building, 407 S. Calhoun Street, MS-E1
Tallahassee, Florida 32399
- **Keep a copy of the NOI** and the **BMP Checklist** in your files as part of your BMP record keeping.

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

You can visit <http://www.flrules.org/Gateway/reference> to obtain an electronic version of this NOI form.

Person To Contact and Name of Farm

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, are owned or leased by the same person or entity, and are applying the same BMPs on them.

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 FDACS 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. Notify FDACS if there is a full or partial change in ownership with regard to the parcel(s) enrolled under this NOI.
3. 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: <http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy>

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:** _____

Parcel No.: _____ **Parcel Owner:** _____


FLORIDA POULTRY OPERATIONS WATER QUALITY / QUANTITY BMP CHECKLIST

Checklist Instructions

Note: Before you fill out this checklist, refer to the **User’s Guide to BMP Enrollment and Implementation** section 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.

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.
3. For 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 Conservation Practice Code number associated with the practice (i.e. Code 590).
4. For BMPs you will not implement, check all of the following that apply under “Will Not Implement.”
 - NA = Not Applicable, if you do not have a resource concern that requires use of the BMP (i.e. do not have a liquid manure system),
 - TNF = Technically Not Feasible,
 - ENF = Economically Not Feasible, or
 - Other.

You must explain your reason for TNF, ENF, or Other 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.

BMP #	BMP Group <small>(See body of manual for full description of practices)</small>	In Use	Planned	Will not implement <i>(check reason below)</i>			
		Check/ or AMU	Month/ Year	NA	TNF	ENF	Other

1.0 Poultry Health and Nutrition

1.1. Level 1: Feed Ration BMPs

1. Maintain house temperature to minimize the energy needs of the bird.						
2. Adjust feed ingredients and amounts for each group based on the phase of growth or egg production.						
3. Minimize waste by adjusting feeders based on the bird’s average age and height.						
4. Feed the minimum amount of protein/amino acids and available phosphorus required to maintain healthy bird production.						
5. Limit high phytate feed ingredients as much as possible, unless the phytase enzyme is incorporated in the feed material. Consider super-dosing if it is cost effective.						

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.	Store feed so it has no contact with rainwater, and do not exceed recommended temperature and moisture levels. Use antioxidants to preserve fats and oils and use stable forms of vitamins.						
7.	Clean up feed spills immediately and re-use or land-apply, compost, or place in an appropriate container.						
1.2. Level 1: Water Requirements BMPs							
1.	Check frequently to ensure that adequate water flow occurs during peak demand.						
2.	Check water lines daily and adjust the height of the enclosed waterers as needed.						
3.	Test water quality every time a new well is drilled, or every few years to protect bird health. Use Table 3 for guidance.						
4.	Maintain water treatment systems in good working order and, if used, change filters regularly. If chlorinating, maintain a free chlorine residual between 2 and 5 ppm at the most distant waterer.						
5.	Do not chlorinate market age birds that are under heat stress. Discontinue chlorination 72-hours before introducing vaccines into the water.						
6.	Flush water lines every time a new flock is placed in a barn, or more often for layer operations.						
1.3. Level 1: Bird Biosecurity and Health BMPs							
1.	Use the all-in-all-out method of management for flock health.						
2.	Use vaccines, as appropriate, that have been approved by the USDA-Animal and Plant Health Inspection Service to maintain flock health.						
3.	Limit visitors as much as possible, and provide disinfectant foot pans at the entrance of bird houses.						
4.	Eliminate sick birds as early as possible. Remove all culls promptly.						
5.	For layers, use only well developed, well fleshed pullets, and use artificial lights to stimulate production.						
6.	Become familiar with the diagnostic poultry laboratories and the important poultry diseases, especially the dangerous, reportable ones under Chapter 5C-20, F.A.C.						
7.	Monitor and promptly treat watery droppings to avoid creating wet litter.						
1.4. Level 1: Manure and Litter Management BMPs							
1.	Monitor ammonia levels in the house. Do not rely on sense of smell alone.						
2.	Check waterer nipples for wear annually, and replace them as needed. Doing so will reduce the amount of wet litter.						
3.	Maintain a uniform flock density throughout the house. Use migration fences as needed to help with this.						

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

Level 1: Additional BMPs for Broilers

4. Maintain the in-house litter moisture level between 20 and 30 percent.						
5. Maintain the pH of the litter below 7.0 and consider using alum, PLT, or other chemical additives to reduce ammonia volatilization.						
6. Maintain a minimum litter depth of 4-inches and remove the cake between flocks.						
7. Ensure adequate layout time and, if feasible, practice in-house pasteurization/composting between flocks.						

1.5. Level 1: Ventilation System BMPs

1. Use automatic control systems to improve efficiency by continuously monitoring and adjusting for parameters such as light, temperature, humidity and static pressure.						
2. Use energy efficient exhaust fans and regularly maintain belts to ensure optimum efficiency.						
3. Keep fan shutters clean. Dirty shutters can reduce the air-moving capacity of a fan by up to 30 percent with a similar increase in electricity usage.						
4. Ensure that fan shutters close tightly when not in use. Fans that are not being used should be sealed to prevent infiltration by using plastic or a manually-closed panel.						
5. Minimize air leaks in houses by tight sealing of sidewall curtains, filling large cracks and spaces around doors, and maintaining uniform insulation.						
6. Maintain a minimum amount of house ventilation to prevent wet, caked litter and/or ammonia problems. Have a reliable way to monitor ammonia levels and keep them below 25 ppm.						
7. Use an alarm system and a backup generator to maintain ventilation in the event of power failure.						
8. For broilers, mount thermometers high and low (at bird level) in the house to see how much air/temperature stratification occurs. Strategically incorporate stir and/or paddle fans, as needed, to move hot air down to reduce stratification and to dry litter.						

2.0 Pest Management and Pharmaceuticals

2.1. Level 1: Rodent, Beetle, and Fly Control BMPs

1. Rodent proof all houses by sealing openings around water pipes, drain spouts, vents, etc. Ensure that openings and gaps are less than 1/4 inch.						
2. Keep areas around poultry houses mowed and clear of debris. If side curtains are dropped for the summer, raise and lower them once or twice a week to prevent rodents from nesting in the folds.						

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.	Maintain a year-round treatment program to control darkling beetles in litter. The best time for insecticide application is on the first day after removing a flock; followed by cleanout on the second day. Treat again, including the outside perimeter, just before introducing the new flock, and follow the pesticide label.						
4.	Monitor fly activity. Use mechanical controls such as fly traps, sticky tape, and investigate the use of feed-through larvicides or commercially available parasitic wasps.						
5.	Incorporate strict sanitation and maintenance protocols to eliminate cracks and crevices, and maintain cleanliness to prevent tick outbreaks.						
6.	Ensure that all sprayers and other applicators are calibrated for the pesticide used.						
7.	In general, insecticides should be used as the last resort after practicing strict sanitation and cultural management methods. Ensure that all pesticide products used on or near birds are labelled for poultry use.						

2.2. Level 1: Pesticide and Pharmaceutical BMPs

1.	Store pesticides in a roofed structure with a lockable door, at least 100 feet from wells, surface waters, and sinkholes.						
2.	If mixing pesticides in the field, conduct loading activities at random locations. Stay as far away from surface waters as possible.						
3.	Use a check valve or air gap separation to prevent backflow when filling a sprayer.						
4.	Clean up spills immediately. Barriers and absorbent materials should be used to contain spills.						
5.	Wash the outside of pesticide spray equipment at random spots away from surface waters or wells. The rinsate may be applied as a pesticide or stored for use as make-up water for the next compatible application.						
6.	Dispose of spent needles and unused pharmaceutical products by using an approved biomedical container, or by following other guidance per the product's label.						

3.0 Mortality Management

3.1. Level 1: General Mortality BMPs

1.	Quickly remove dead animals from the live population.						
2.	Store carcasses in a watertight, covered container.						
3.	Promptly dispose of carcasses after death, or refrigerate or freeze.						

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. For catastrophic mortalities associated with Avian Influenza, contact the FDACS Division of Animal Industry State Veterinarian at (850) 410-0900. There are a number of specific state and federal requirements for addressing these types of disease outbreaks.						
3.2. Level 1: Composting BMPs							
	1. Use the proper ratios of all materials for composting.						
	2. Monitor temperature daily and add water or turn if necessary.						
	3. The composting structure or area should be at least 100 feet from ditches and adjacent property and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes. Existing structures that are unable to meet these setbacks can use other water quality treatment measures, but must list them in the BMP Checklist.						
	4. Ensure that all compost reaches a minimum temperature of 131°F throughout the pile for at least three days.						
3.3. Level 1: Incineration BMPs							
	1. For air curtain incinerators and portable cremation units, ensure that the unit is exempt from permitting, has a valid FDEP air permit, or is otherwise temporarily authorized by an ongoing emergency order. The unit must be operated by qualified operators in compliance with the conditions of the permit, authorization or exemption.						
	2. Locate air curtain incinerators at least 300 feet away from any occupied building and at least 50 feet away from wildlands, brush, combustible structure, or paved public roadway. Portable cremation units should be located at least 100 feet away from any occupied building and at least 50 feet away from wildlands, brush, combustible structure, or paved public roadway.						
	3. Dispose of residual ash from combustion of poultry carcasses at a Class I landfill. Exceptions to this must be approved by the FDEP Division of Waste Management.						
	4. Locate portable units away from poultry houses and sanitize storage containers, trucks and equipment before leaving a farm. This will reduce the biosecurity risk.						
3.4. Level 1: Rendering BMPs							
	1. Ensure cause of death does not compromise biosecurity.						
	2. Ensure that bird transport vehicles are sanitized between pickups at other poultry farms.						


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

3.5. Level 1: Onsite Burial BMPs



1. For below-ground burial, move dead poultry to an upland area at least 100 feet from adjacent property; and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes; and at least 500 feet from any wells. Locate burial sites at least 2 feet above the seasonal high ground water table and 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 poultry to an upland area at least 100 feet from adjacent property; and at least 200 feet from watercourses, streams, wetlands, wells, or sinkholes; and at least 500 feet from any wells. Cover with 6 inches of compacted soil and at least 2 feet of additional soil.						

4.0 Waste Management

4.1. Level 1: Litter and Manure Storage, Use and Disposal BMPs






1. Litter stored for three months or longer should be kept in a permanent storage facility built in accordance with USDA-NRCS guidelines.						
2. If left unattended, manure stacked on temporary outdoor storage areas should be covered with heavy plastic to prevent runoff from becoming contaminated.						
 3. Sample for nutrients prior to cleanout and provide results to end user if transported for use offsite.						
4. Never stockpile litter or manure within 200 feet of a well, wetland, creek, pond, or other surface waters, or in a manner where contaminated runoff can percolate into the ground water.						

4.2. Level 1: Sampling and Recordkeeping BMPs

1. Collect representative samples.						
2. Use a lab to perform an analysis of the litter.						
 3. Keep all records required under the individual section BMPs.						
 4. If transporting manure or litter offsite, keep records of the amount and contact information of the farmer or hauler, and provide them with the lab analysis.						


4.3. Level 1: Land Application BMPs

1. If the poultry farm has associated cropland, apply fertilizer materials at agronomic rates, adding all sources of nutrients together (manure, egg wash and commercial fertilizer).						
---	--	--	--	--	--	--


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
	2. Base fertilization rates for P and micronutrients on soil test-based recommendations from a lab that uses a method accepted by the UF-IFAS Extension Soil Testing Laboratory. For bahiagrass, a tissue sample must be submitted along with the soil sample. See Appendix 3 for more information on soil and tissue testing. Keep a copy of your soil and tissue test results.						
	3. Do not apply supplemental commercial P to waste application fields that are based on N. Where waste application is based on P, ensure that applications from all sources of P do not exceed crop uptake.						
	4. Follow split application recommendations for your particular crop fertilization program to maximize nutrient uptake and minimize leaching and runoff potential. As an alternative, use enhanced-efficiency fertilizers as practicable for your operation.						
	5. Ensure that the spreader is calibrated and a uniform application is produced.						
	6. Obtain the amount of daily rainfall from an onsite rainfall gauge or nearby weather station and record it for use in irrigation scheduling (if applicable).						
	7. Do not apply nutrients when the soil is saturated and avoid applying them when heavy rain is forecast.						
	8. If land applying manure or litter, or incorporating leguminous forage into the soil, use the record keeping worksheet in Appendix 5 to account for these nutrient inputs, and adjust your fertilization program accordingly. Determine the amount each crop harvested during the year. Keep a copy of your worksheet(s) for each application made to a field to demonstrate that the farm is maintaining nutrient balance.						
	9. Do not apply fertilizer in or near ditches, canals, or karst features (sinkholes), and minimize application to filter strips and buffers, as this may result in the off-site loss of nutrients.						
4.4. Level 1: Egg Wash Water BMPs							
	1. Limit the amount of wash water used to minimize wastewater production.						
	2. Ensure that all wash water flows to a lined storage tank or pit. Earthen pits are not acceptable unless approved by a licensed professional engineer.						
	3. Keep records of the egg wash water lab analysis and the transfer of all loads removed from the site. If the water is pretreated and discharged to a municipal wastewater treatment system, keep all records required by the terms of your agreement with that system.						

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

For Land Application of Wash Water:

4. Apply less than an inch of wash water per week. Irrigate often to keep storage times short and maximize storage capacity.						
5. Apply wash water only when groundwater is more than 18 inches below land surface.						
6. Sample wash water and apply at or below agronomic rates.						
 7. Keep records of the lab analysis and of all applications.						

4.5. Level 1: Liquid Waste Treatment BMPs

1. Limit the amount of water used to minimize wastewater production.						
2. Once a year, inspect and maintain the water systems, ditches or wastewater conveyance structures, associated berms, pipelines and irrigation systems.						
3. Keep solids separators cleaned out to minimize sludge build-up in the waste storage pond or lagoon.						
4. Keep the water level as low as practicable to leave room for an unexpected storm event. Avoid applying to saturated fields, when possible.						
5. Inspect and maintain any pumping equipment.						
6. Have a backup plan in case the pump fails. This should include a backup pump or hauler.						
7. If the pond is not lined, line the existing pond or build a lined pond.						
8. Collect WSP/lagoon samples quarterly (if applicable).						
 9. Keep records of the lab analysis and of all effluent applications.						

Level 2: Additional Liquid Waste Treatment BMPs

10. Have a Professional Engineer evaluate the system for proper sizing.						
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5.0 Odor Prevention and Management

5.1. Level 1: Odor Management BMPs

1. Reduce protein in feeds as much as possible to reduce pass through of nitrogen, which will reduce ammonia in the waste.						
2. Maintain waterers in good condition to prevent leaks.						
3. Prevent rainwater from entering buildings.						
4. Provide adequate clean bedding in houses that use this material.						
5. Clean feed systems regularly and make sure stored feed is kept dry.						

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

Level 2: Additional Odor Management BMPs

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|--|--|--|--|--|--|--|
| 6. Establish a vegetative buffer or windbreak consisting of dense lower vegetation combined with higher vegetation. Cedar trees combined with pines work well. | | | | | | |
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5.2. Level 1: Land Application Odor BMPs


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| 1. Consider wind direction and neighbor locations before applying waste. Avoid applying wastewater if winds are more than 10 mph, when possible. | | | | | | |
| 2. Try to spread manure in the late morning on clear, sunny days. | | | | | | |
| 3. When practical, incorporate manure into the soil soon after spreading. | | | | | | |
| 4. Calibrate your spreader and reduce the discharge spinner speed to minimize dust. | | | | | | |

Level 2: Additional Land Application BMPs

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| 5. Shorten storage time if possible to allow for a more frequent application or install an aeration system to allow wastewater to remain aerobic during the entire storage process. If problems persist, contact a professional engineer for assistance. | | | | | | |
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6.0 Stormwater and Erosion Control Measures


6.1. Level 1: Stormwater BMPs

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| 1. Ensure that rain water from the roof of a building does not enter the building by sloping the grade away from the building, or by installing gutters and downspouts. | | | | | | |
| 2. If necessary to treat and infiltrate stormwater, use level spreaders, detention ponds, filter strips or grassed waterways. | | | | | | |
| 3. Operate and maintain all stormwater management conveyances (swales, ditches, and canals) to ensure that they operate as designed. | | | | | | |
|  4. 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. Evaluate the plan's effectiveness, and make adjustments as needed. | | | | | | |

6.2. Level 1: Erosion Control BMPs

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| 1. Stabilize access roads that cross streams and creeks using rock crossings, culverts, or bridges. | | | | | | |
| 2. Maintain vegetative cover on road banks. | | | | | | |

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.	When constructing above-grade access roads, keep road width to a minimum, maintain hydrology, and locate the road(s) a minimum of 25 feet from regulated wetlands.						
4.	Use erosion and sedimentation BMPs during any onsite construction activities, following the appropriate guidance.						
5.	Maintain vegetation to minimize areas of erosion in construction areas, where feasible.						
6.	Seed and mulch denuded areas, as needed, to promote vegetative cover.						
Level 2: Additional Erosion Control BMPs							
7.	Install a new culvert of the appropriate size, if the existing culvert is no longer functional. Contact USDA-NRCS or FDACS for technical assistance and/or structural design guidance.						
7.0 Water Resource Protection							
7.1. Level 1: Wetlands Protection BMPs							
1.	Do not dredge or fill in wetlands. Consult with the WMD and the NRCS prior to conducting activities in or near wetlands to ensure that you are complying with any permitting or NRCS program eligibility requirements.						
2.	Minimize adverse water quality impacts to receiving wetlands by applying measures progressively until the problem is addressed. Practices such as filter strips, conservation buffers, swales, or holding water on-site may preclude the need for more aggressive treatment measures.						
3.	Install and/or maintain a minimum 25-foot, non-fertilized vegetated buffer upland of the landward boundary of all wetlands and lakes, unless you have an existing WMD permit (e.g., ERP, or management and storage of surface waters permit) that specifies a different buffer. For any nutrient or fecal coliform impaired waters, expand the buffer to at least 50-feet.						
4.	For existing operations without an ERP that are unable to meet the vegetated buffers specified above, submit to FDACS a written description of the alternative measures you will take to protect the wetlands from water quality impacts (Use the comments section at the end of the BMP checklist in Appendix 7).						
7.2. Level 1: Stream Protection BMPs							
1.	Install and/or maintain a riparian buffer along perennial streams on production areas that exceed 1-percent slope and discharge directly to streams. Contact FDACS, NRCS, or an NRCS-approved Technical Service Provider for assistance in properly designing the riparian buffer.						

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
	2. Locate and size any stream crossings to minimize impacts to riparian buffer vegetation and function and to maintain natural flows.						
7.3. Level 1: Protection for First- and Second-Magnitude Spring Recharge Basins							
	1. Install and/or maintain a minimum 100-foot non-fertilized vegetated buffer upland of the landward boundary of springs and spring runs.						
	2. Install and/or maintain a minimum 50-foot non-fertilized vegetated buffer around sinkholes.						
	3. If you have a sinkhole on your property, never use it to dispose of used pesticide containers or other materials.						
7.4. Level 1: Well Operation and Protection BMPs							
	1. Use backflow-prevention devices at the wellhead to prevent contamination of the water source, if injecting fertilizer or chemicals.						
	2. Inspect wellheads and pads at least annually for leaks or cracks, and make any necessary repairs.						
	 3. Maintain records of new well construction and modifications to existing wells.						

8.0 Recycling and Industrial Materials Management

8.1. Level 1: Waste Reduction BMPs

	1. Store fertilizers in an enclosed, roofed structure with an impervious floor and lockable door, at least 100 feet from wetlands, waterbodies, or sinkholes.						
	2. Recycle used oil, solvent bath waste, and antifreeze using appropriate means.						
	3. Ensure that all regulated petroleum storage tanks are registered, and meet the requirements of FDEP rule for secondary containment.						

9.0 Closure

9.1. Level 1: Closure BMPs

	1. Clean all areas where concentrated manure has accumulated, including WSPs or egg wash water tanks.						
	2. Breach, fill, or use WSP or tanks for an alternative purpose.						
	3. Contact the WMD about proper abandonment of onsite wells.						
	4. Identify and properly dispose of chemicals and other waste materials.						

Florida Poultry Operations BMP Checklist Comments Section

BMP # Describe Alternative Measures Used	
BMP #	
BMP #	
BMP #	
BMP #	
BMP #	
BMP #	
BMP #	
BMP # Enter "Other" reasons for not implementing BMPs	
Field Notes:	
ERP #	



