2012 ANNUAL REPORT

*To Governor Jack A. Markell and the 147th Delaware General Assembly*

# Delaware Nutrient Management Commission

**April 1, 2013**

This report is to be included as an **advertisement** in The Delmarva Farmer.

Delaware Department of Agriculture

Serving Agriculture and Protecting Consumers

## Introduction

2012 was an important year for nutrient management.

During 2012 the Nutrient Management Program in cooperation with Department of Natural Resources and Environmental Control (DNREC) continued to implement new Concentrated Animal Feeding Operation (CAFO) Regulations. Nutrient Management Program staff drafted the first CAFO Permit under the 2011 CAFO regulations. Staff also worked on site visits, education and outreach with the agricultural community regarding these regulations.

As in previous years, farmers and other nutrient handlers are required to develop and implement Phosphorus-limited nutrient management plans, maintain nutrient handling records, maintain nutrient certification and submit an annual report.

The implementation progress illustrated in this annual report demonstrates that nutrient handlers are making significant improvements in reducing nutrient runoff. Animal feeding operations, row crop farmers, horse operations, golf courses and lawn care companies are implementing nutrient management practices and demonstrating accountability.

The ongoing challenge will be to continue implementation and evaluate true water quality improvements resulting from the 1999 Nutrient Management Law (3 Del. C. §2200 et. al.).

The following sections fulfill the reporting requirement to the Governor and the General Assembly as stated in the Nutrient Management Law. Additional information is included to represent measurable results and accountability for nutrient handlers, poultry companies, agricultural agencies and the Nutrient Management Commission (Commission).

## In Memoriam:

### *George Anthony 'Tony' Keen 1943-2012*

2012 saw the passing of Nutrient Management Commissioner Tony Keen. Tony was an important member of the advisory panel that drafted Delaware's Landmark 1999 Nutrient Management Law. In that role he was able to lend the panel his considerable technical expertise and experience as a certified agronomist. He was a member of the Commission from its inception in 2000 until his death, serving in a critical role as the Chairman of the Technology Subcommittee. In that role he was a vigorous champion for Delaware farmers.

Tony was born in New Jersey but raised in Sussex County, DE. He was a graduate of Georgetown High School and Delaware Valley College in Doylestown, PA. In 1980 he founded Keen Consulting. In that capacity he provided cutting edge agronomic services to many farming, golf and turf operations throughout Delmarva.

Tony's knowledge of agriculture, particularly Delaware agriculture, was both extensive and detailed. His contributions to the Commission were a key factor in reaching decisions that were both fair to the farming community and effective in protecting the state's waters. He will be missed.

**This Delaware farm exhibits excellent production area house keeping.**

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# History

The Nutrient Management Law was passed in 1999 and mandates that all farmers, golf courses and other nutrient handlers develop and implement phosphorus-limited nutrient management plans, maintain nutrient handling records, maintain nutrient certification and submit an annual report. In the past several years, the U.S. Environmental Protection Agency (EPA) has become much more interested in agriculture's influence on water quality and how Delaware officials, such as the Commission, were regulating nutrient runoff. EPA recognizes the success of the Nutrient Management Law but is very focused on two elements of the Clean Water Act called CAFO permits and Total Maximum Daily Load (TMDL) limits. Both elements consist of EPA regulations that the States must address.

The Commission is working jointly with the Delaware Department of Agriculture (DDA) and the DNREC to implement these federal requirements. The University of Delaware and the Natural Resources Conservation Service (NRCS) are valuable resources for understanding and addressing these requirements.

# Organizational Purpose and Strategic Goals

The mission of the Commission is "To manage those activities involving the generation and application of nutrients in order to help improve and protect the quality of Delaware's ground and surface waters, sustain and promote a profitable agricultural community, and to help meet or exceed federally mandated water quality standards, in the interest of the overall public welfare." In order to accomplish this mission, the following strategic goals are in place:

Strategic Goals:

1. Promote alternative use practices for excess nutrients generated in Delaware by developing and implementing incentive and market-based programs.
2. Maintain a program to assist in developing and funding nutrient management plans according to law and program standards.
3. Maintain nutrient management certification requirements by providing nutrient handlers with initial and continuing educational opportunities.
4. Maintain the State's National Pollutant Discharge Elimination System (NPDES) Permitting program for CAFOs in cooperation with the DNREC and according to the Clean Water Act and federal regulations.
5. Promote demonstration projects within the agricultural community for best management practices.
6. Audit nutrient management activities to instill legal compliance.
7. Respond to informal and formal complaints against nutrient management handlers and generators.
8. Recognize environmental stewards within the agricultural community with the cooperation and financial support of the agribusinesses and poultry companies operating within the state.
9. Facilitate and actively fund research projects according to priorities that will better balance science-based policy development with modern and responsible nutrient management practices.

## *Performance Measure Goals*

| Actual | FY2010 Actual | FY2011 Actual | 2011Actual |
|---|---|---|---|
| Tons of poultry manure relocated within Delaware for land application | 28,791 | 19,549 | 16,964 |
| Tons of poultry manure exported from Delaware for land application | 20,684 | 20,107 | 20,706 |
| Tons of poultry manure relocated to an alternative use project | 33,836 | 19,182 | 14,048 |
| % of cropland and nutrient-applied land managed under a current plan developed by a certified consultant | 100 | 100 | 100 |
| Acres managed under an updated nutrient management plan | 129.235 | 91,922 | 61,481 |
| # of nutrient consultants | 109 | 113 | 113 |
| # of commercial handlers | 74 | 75 | 74 |
| # of private applicators | 1,130 | 1,164 | 1,150 |
| # of nutrient generators | 470 | 494 | 495 |
| # of nutrient management farm audits | 6 | 20 | 116 |
| # of constituent complaints: | | | |
| received | 21 | 24 | 29 |
| resolved | 20 | 21 | 29 |
| # of CAFO permits | 372 | 370 | 382 |

# Nutrient Management Training, Education and Certification

The Commission continues to view education as a priority for many nutrient management topics and depends on the University of Delaware and agribusinesses to educate nutrient handlers. Currently, 1,839 different nutrient management certifications are maintained by the program and can be individually viewed on the Program's website (http://dda.delaware.gov/nutrients/forms/2009/020409_Certified%20Users.pdf):

The University of Delaware Cooperative Extension continues to offer Nutrient Management Certification classes throughout the year for both initial and continuing certification. These programs educate Delaware's diverse agricultural and horticultural producers on the importance of the relationship between nutrients and water quality. In 2012, 13 different classes were offered for initial certification along with six different testing opportunities. These sessions resulted in 83 new certifications of individuals who handle and apply nutrients in Delaware. The Nutrient Management Program works with 2,411 individuals who are currently certified through the Program. These individuals are required to attend continuing education programs to maintain their certifications. Public and private organizations conducted 130 continuing education programs, offering a total of 319.25 continuing education credits and these programs were attended by 2,968 individuals. Continuing education opportunities can be integrated with any meeting or gathering of nutrient handlers. One continuing education credit is equvilant to approximately 50 minutes and is measured in ¼ hour credit increments.

The Nutrient Management Program is now offering online continuing education opportunities. Publications highlighting the latest nutrient management information are provided for anyone seeking continuing education credits with a brief exam following the publication to test the knowledge gained. The program hopes to to increase the number of online continuing education opportunities in the future to help program participants comply with the law and provide flexibility in their busy schedules.

In order to become certified as a consultant or a commercial nutrient handler, one must pass an examination. Three examination sessions for nutrient consultants and three examinations for commercial nutrient handlers were offered in 2012, resulting in 14 (47%) passing scores and 16 (53%) failing scores. Nutrient consultant test questions are pulled from a databank of questions shared by Delaware, Maryland, Virginia

**There are many opportunities to obtain nutrient management continuing education credits.**

and Pennsylvania for reciprocal purposes. The test sessions are also coordinated with the national Certified Crop Advisor (CCA) program to expand the opportunities for crop consultants. University and Program Staff generated the exam for commercial nutrient handlers.

| Certification Session | # of Sessions | Total Attendance |
|---|---|---|
| Session I: General | 3 | 94 |
| Session II: Nutrient Generator | 3 | 89 |
| Session III: Private Nutrient Handler | 3 | 62 |
| Session IV: Commercial Nutrient Handler | 2 | 17 |
| Session V: Nutrient Consultant | 2 | 17 |
| Commercial Nutrient Handler Exam | 3 | 14 |
| Nutrient Consultant Exam | 3 | 17 |

All certifications, except Nutrient Consultants, are valid for a three-year period. Nearly one third of all certifications will expire on May 1, 2013.

## *Summary*
## *Delaware Nutrient Management Program*
## *Approved Continuing Education Programs*

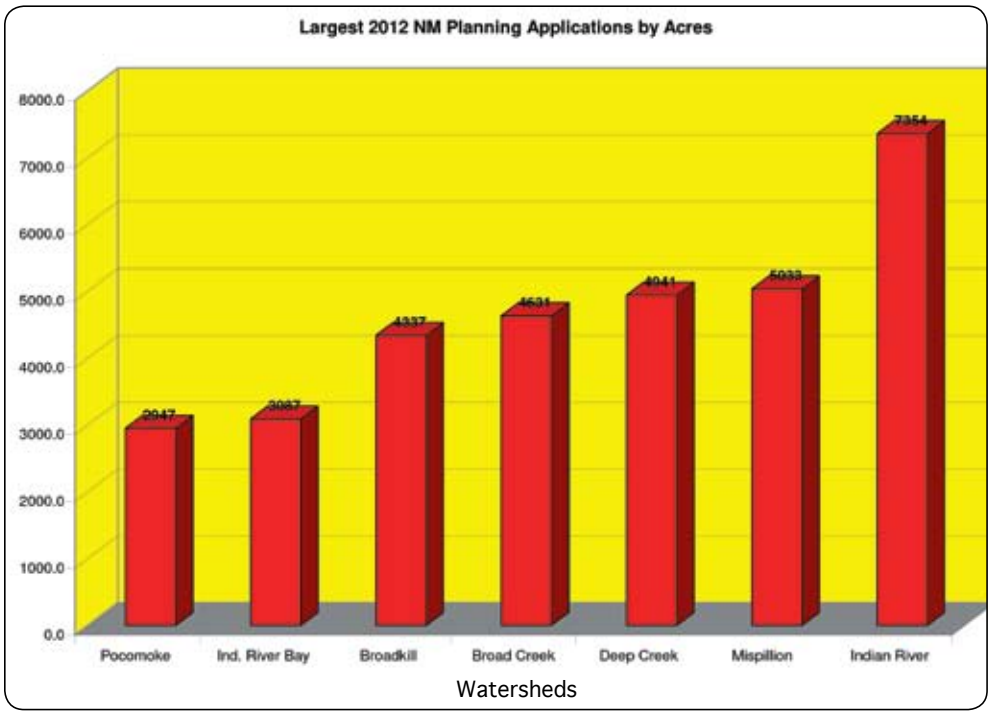
| Year | Number of Programs | Number of Continuing Education Credits Available | Attendance |
|---|---|---|---|
| 2007 | 94 | 197.50 | 3,027 |
| 2008 | 98 | 244.25 | 2,036 |
| 2009 | 130 | 280.50 | 3,270 |
| 2010 | 139 | 339.25 | 3,036 |
| 2011 | 136 | 357.25 | 2,651 |
| 2012 | 130 | 319.75 | 2,968 |

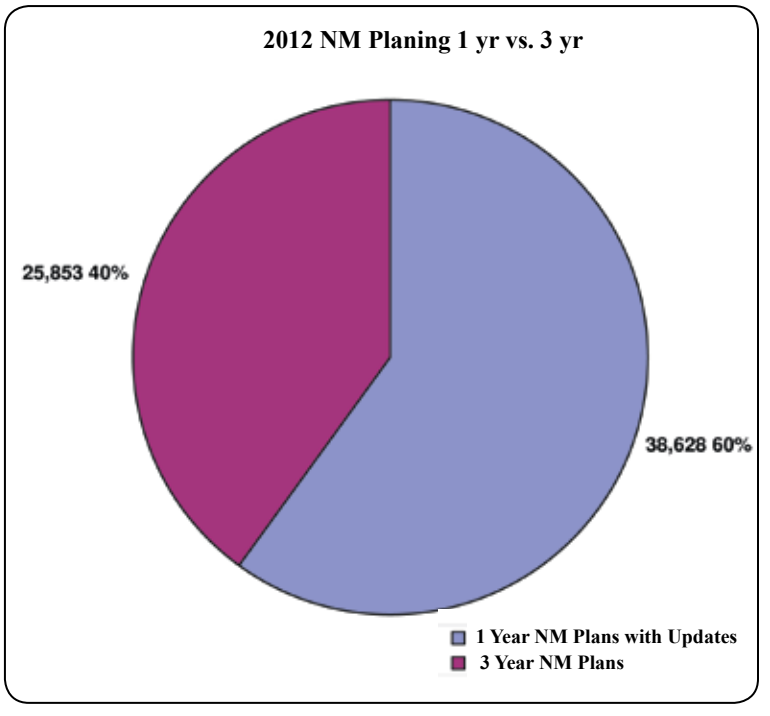
# Nutrient Management Planning

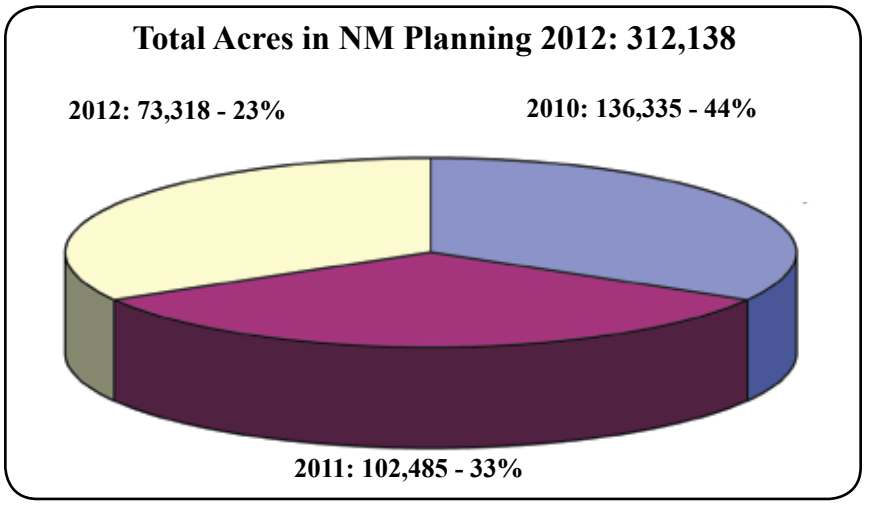
A nutrient management plan is a farmer's "business plan" for nutrients. The more efficiently fertilizers are used on the farm, the less nutrients escape to waterways. A plan is developed by a certified nutrient consultant and includes contents such as maps, soil analysis, manure analysis, crop yield goals and a budget for nutrients.

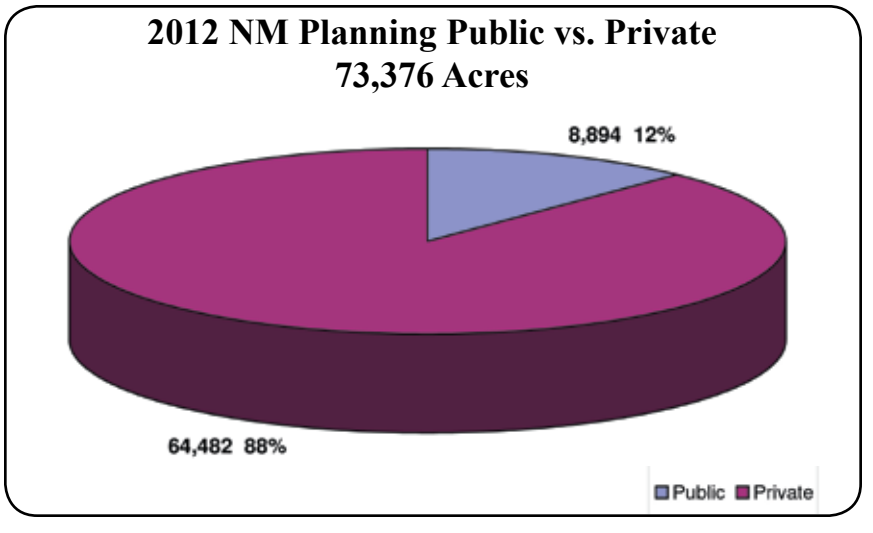
The Commission depends on private and public nutrient consultants to develop nutrient management plans. In 2012, 116 farms representing 64,482 acres were reimbursed at a capped rate for a plan developed by a private consultant. The Kent and Sussex Conservation Districts assisted Delaware farmers by writing nutrient management plans totaling 8,894 acres. These acres represent an obligation for at least three years of nutrient management planning. Also, 115 farms were assisted with an animal waste management plan or comprehensive nutrient management plan.

During 2012, Delaware farmers applied and were approved for a total of 73,376 acres of nutrient management planning. The total acreage covered by nutrient management planning reimbursement during 2012, including those farms approved during 2010 and 2011, was 296,778 acres.



# Nutrient Management Reports Due March 1

The Nutrient Management Law requires anyone operating under a nutrient management plan or animal waste management plan to submit an annual report for each calendar year detailing all the organic and inorganic nutrient handling activities that occurred January 1st through December 31st. There have been modifications made to the 2012 annual report to collect more detailed information of agricultural, golf course and lawn care operations.

Approximately 1,850 annual reports were mailed to agricultural, golf course and lawn care operations throughout Delaware. The Nutrient Management Program is very appreciative of the annual report response and is encouraging all operations to complete the form in its entirety to ensure an accurate representation of nutrient handling activities within Delaware.
The accuracy of the information provided on these annual reports is vital to ensure all nutrient generators and handlers are following the recommendations outlined in their Nutrient Management Plans to sustain agronomic productivity and environmental responsibility. The data from the annual report is very important because it will help the Nutrient Management program advocate Delaware farming operations as leaders in achieving better water quality while maintaining a high yield production environment.

**A Nutrient Management Plan is the farmer's guide to the application of nutrients.**

# Nutrient Management Plan Audits

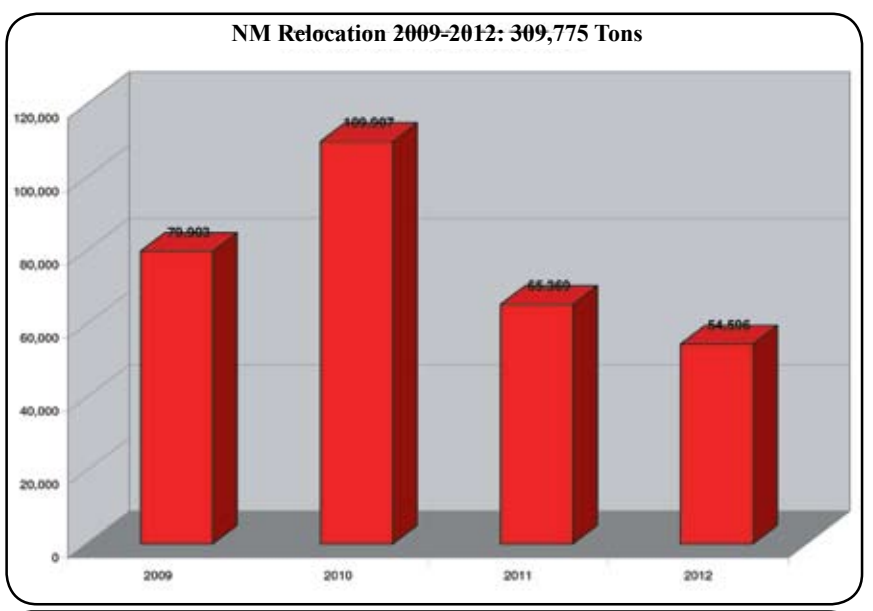
Each year Program Staff performs audits on a number of facilities required to operate with a nutrient management plan, records and certification. This process helps to ensure that plans meet the intent of the nutrient management laws and regulations. During 2012, program staff audited the nutrient management plans for four agricultural operations, two golf courses and 110 CAFOs.

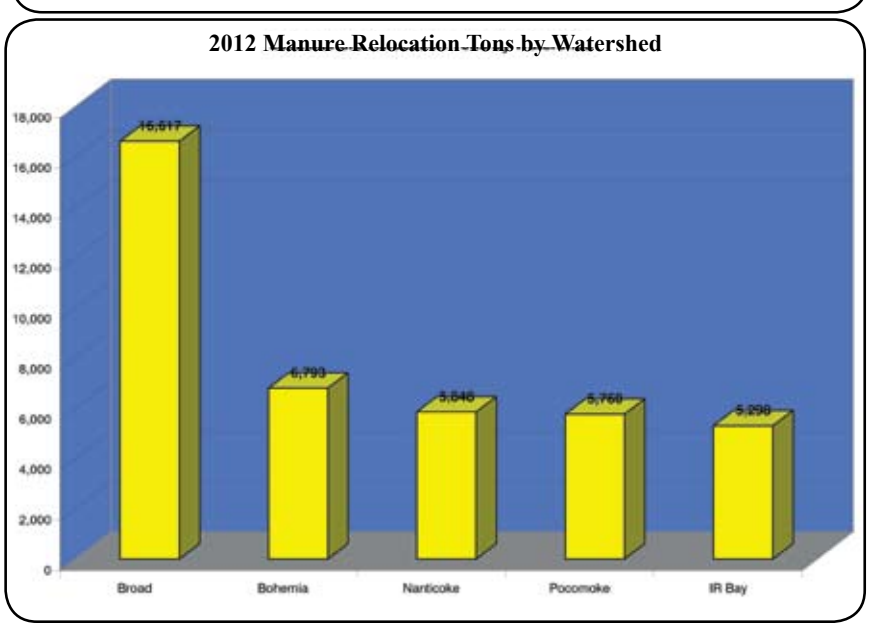
# Nutrient Management Relocation

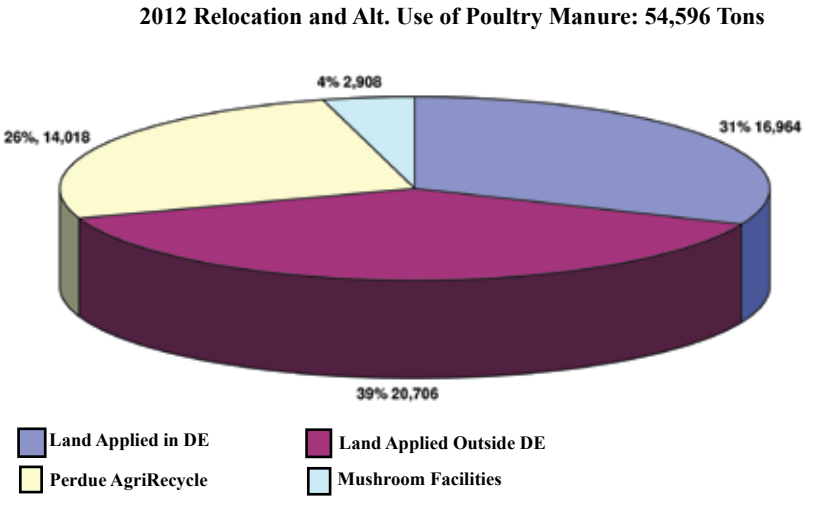
Managing excess poultry manure has been a priority of the Commission since inception. Many farmers who have land or high soil phosphorus levels must find alternative uses for poultry manure. Several businesses now help such farmers manage their excess manure. The Relocation Program is one of several effective solutions to excess manure generated in Delaware.

The Relocation Program provides financial reimbursement to farmers, brokers and trucking businesses for the transportation cost of relocating manure from Delaware farms to alternative use projects or other farms for land application. The application process validates eligible senders, receivers, truckers and alternative use projects. Excess manure continues to be transported for land application throughout Delaware as well as Maryland, New Jersey, Pennsylvania and Virginia. Alternative use projects are essential for managing excess poultry manure. In 2012, 54,596 tons of excess poultry manure was relocated, for an eight-year total of over 714,000 tons. During 2011, over 31% of the excess manure went to alternative use projects such as the Perdue AgriRecycle fertilizer plant in Blades, DE, and mushroom growers in Pennsylvania.

Farmers and others wishing to participate in relocation projects can contact the Nutrient Management Program at (302) 698-4556. The Relocation Program provides farmers with the option to move the manure themselves or hire a broker.




# FY 2012 Relocation Summary

| Relocation Category | Tonnage |
|---|---|
| Delaware relocation projects with financial assistance | 54,596 |
| Perdue AgriRecycle Inc. without relocation assistance | 23,406 |
| Ellis Farms Inc. Brokerage without relocation assistance | 9,000 |
| **Total Excess manure relocated** | 87,002 |
| DE Relocation Program (financial assistance) | 54,596 |
| Farm to Farm within DE | 16,964 |
| Farm to Farm exported from DE | 20,706 |
| Farm to Alt. Use: Perdue AgriRecycle | 14,018 |
| Farm to Alt. Use: Mushrooms | 2,908 |

**Relocation of manure to areas where it can be utilized in an environmentally friendly manner is an effective Best Management practice.**

# Markets for Excess Manure

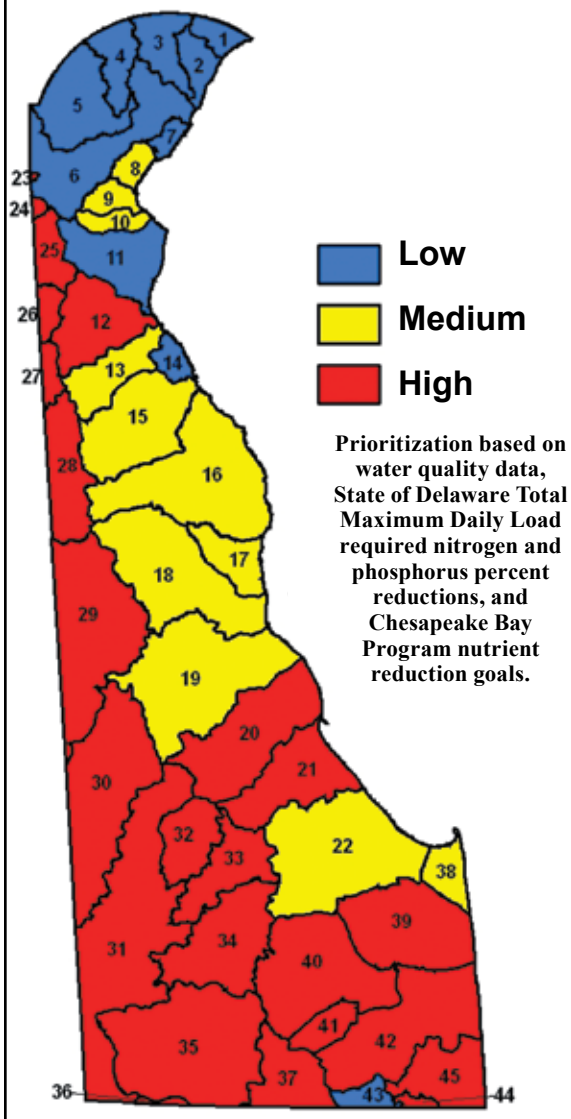
The following businesses have expressed interest in taking or buying excess manure for alternative use and/or brokerage. Please contact them directly:

| Manure Type | Company |
|---|---|
| Poultry | Bowles Enterprises LLC<br>Loveville MD 301-475-2139 |
| Poultry | Ellis Farms Inc<br>Millsboro DE 302-238-7275 |
| Poultry | Perdue AgriRecycle LLC<br>Blades DE 302-628-2360 |

# Nutrient Management Critical Areas

The Commission established a "critical areas" map for Nutrient Management. The Department of Natural Resources and Environmental Control (DNREC) provided significant input based on water quality data for Nitrogen and Phosphorus impairments.

## Nutrient Management Critical Area Priorities




**Prioritization based on water quality data, State of Delaware Total Maximum Daily Load required nitrogen and phosphorus percent reductions, and Chesapeake Bay Program nutrient reduction goals.**

***Piedmont Drainage***
**1. Naamans Creek**
**2. Shellpot Creek**
**3. Brandywine Creek**
**4. Red Clay Creek**
**5. White Clay Creek**
**6. Christina River**
**Delaware Bay Drainage**
**7. Delaware River**
**8 Army Creek**
**9. Red Lion Creek**
**10. Dragon Run Creek**
**11. C & D Canal East**
**12 Appoquinimink River**
**13. Blackbird Creek**
**14. Delaware Bay**
**15. Smyrna River**
**16. Leipsic River**
**17. Little Creek**
**18. St. Jones River**
**19. Murderkill River**
**20. Mispillion River**
**21. Cedar Creek**
**22. Broadkill River**
***Chesapeake Bay Drainage***
**23. Elk Creek**
**24. Perch Creek**
**25. C & D Canal West**
**26. Bohemia Creek**
**27 Sassafras River**
**28. Chester River**
**29. Choptank River**
**30. Marshyhope Creek**
**31. Nanticoke River**
**32. Gum Branch**
**33. Gravelly Branch**
**34. Deep Creek**
**35. Broad Creek**
**36. Wicomico**
**37. Pocomoke River/Indian Bays/ Atlantic Ocean**
**38. Lewes-Rehoboth Canal**
**39. Rehoboth Bay**
**40. Indian River**
**41. Iron Branch**
**42. Indian River Bay**
**43. Buntings Branch**
**44. Assawoman**
**45. Little Assawoman**

# Delaware Environmental Stewardship Program

During 2012 the Commission partnered with all four of the poultry companies that operate in Delaware to recognize the 2012 environmental stewards.

The environmental stewardship award was established in 2001 to recognize farmers whose stewardship and general farm practices contribute to the conservation of water quality and farmland. The program recognizes growers by evaluating nutrient management, best management practices, farm management, innovation, bio-diversity and wildlife habitat management.

The 2012 Delaware Environmental Stewardship Award was presented on January 17, 2013, during the Delaware Agriculture Week conference held at the Delaware State Fairgrounds in Harrington. Roland Lee and Marilyn Ellers of Houston were the winners. The Ellers were presented with a cash award of $1,000, a lane sign and a plaque. The Ellers grow for Amick Farms. Also nominated were Terry Paul Baker of Millsboro (Mountaire Farms), Kathy Willms of Bridgeville (Perdue) and Herman Smith Jr. of Clayton (Allens-Harim). All were presented with a check for $500, a lane sign and a plaque.

**From left: Larry Towle, NM Program Manager; Marilyn and Roland Ellers; Greg Tietmeyer, Amick Farms; Robert Baldwin, DNMC. The Ellers were the 2012 Environmental Stewardship winners.**

**Paul T. Baker with Beth Sise of Mountaire Farms**

**Herman and Rosemary Smith grow poultry for Allen-Harim Foods.**


**Also runner up in the Delaware Environmental Stewardship Program was Kathy Willms of Two Paws Farm, here flanked by Larry Towle, NM Program Manager; Michele Minton and Jeff Smith of Perdue Farms; and Robert Baldwin, DNMC.**

# Permits for Certain Animal Feeding Operations

Delaware's current CAFO Regulations were approved November 11, 2011. Since then the program has made significant progress. The Clean Water Act in conjunction with subsequent federal and state CAFO regulations require farms that meet the definition of a CAFO to apply for an individual NPDES permit. Farms operating under an individual NPDES CAFO permit will be allowed to have permitted discharges from their production areas in accordance with the requirements and conditions set forth in their permit and the regulations. The first CAFO permit issued under the new regulations will be to a horse racing facility and will be issued in early 2013.

**Many Delaware CAFO's have swales and ditches in the production area.**

## *Program Structure*

The EPA maintains oversight of the Delaware CAFO program as the federal agency responsible for implementing the Clean Water Act. The DNREC was delegated permitting authority in 1983, to administer the NPDES program for surface water discharges in Delaware. These permits are designed to limit discharges from "point sources" of pollution. These include combined sewage overflows, storm water construction projects, industrial activities, municipal treatment activities, and CAFOs.

The DDA Nutrient Management Section in cooperation with DNREC under the terms of a Memorandum of Agreement between the two agencies administers the CAFO permit program for the state of Delaware. Nutrient Management Program Staff are the primary contact with the regulated community. The staff conducts on-farm inspections, collects and reviews necessary farm records to ensure accuracy, and writes the permits.

## *Permit Applications*

Poultry farmers and other livestock operations in Delaware that were identified as CAFOs, or those with a discharge, needed to apply for a CAFO permit within 90 days after the effective date of the regulations. To apply for the permit, farmers were required to submit a signed Notice of Intent (NOI) and a copy of their most recent nutrient management plan (NMP) or animal waste management plan (AWMP) to the DDA.

Farms that are not currently defined as CAFOs but may become CAFOs in the future will need to submit an NOI at least 180 days prior to beginning operations or as designated by the Secretary of Agriculture.

Producers and the public that have questions about CAFOs and the regulations may go to the DDA website: www.dda.delaware.gov to find the most current CAFO regulations, "Frequently Asked Questions" (FAQs), and the NOI form. Those without computer access may call DDA directly for assistance and for copies of the regulations, FAQs, and the NOI.

## *CAFO Site Visits*

During the summer of 2011, Nutrient Management Staff began to conduct onsite inspections of farms that had submitted NOIs during the previous winter and spring. The purpose of these visits was to identify any concerns regarding the layout and operation of the farm's animal production area. Staff also briefed applicants as to what to expect during the permitting process. A total of 130 site visits representing 143 production areas were conducted during 2011.

CAFO site visits increased significantly during 2012 due to increased staff levels within the Nutrient Management Program. A total of 281 such visits were made during 2012. The majority of these site visits were to poultry farms. Farmers desiring to have Nutrient Management Program Staff make a visit can call (302) 698-4550 to schedule a visit. These initial site visits are meant to educate each grower on how the regulations will affect their operation. They also allow staff to become familiar with the layout and operational structure of each farm.

Staff began drafting poultry permit language in August 2012 using the CAFO Regulations, State Law, and EPA's Permit Writers Manual for CAFOs. Staff also met with nutrient consultants and farmers to review poultry permit language and take into account any of their concerns. It is expected that during 2013 we will finalize permit language and begin issuing permits to large poultry farms that have no cropland. Staff will work closely with farmers and their plan writers during the permitting process. Staff will also be visiting dairy and beef operations prior to developing permit language for such farms.

**Keeping the heavy use pads free from manure is an element of good manure management.**

## *State Technical Standards*

During 2010, EPA required all the Chesapeake Bay states to adhere to TMDLs for nitrogen, phosphorus and sediment. Each of these states were required to draft a Watershed Implementation Plan (WIP) laying out a path forward to meet water quality goals and the federally imposed TMDLs. Part of Delaware's plan for meeting the TMDLs was the successful implementation of the new CAFO regulations. Integral to the CAFO regulations are the state technical standards. These serve as a guide to the proper implementation of Best Management Practices, for both the production and manure application areas, required by the CAFO regulations. Such use by farmers and plan writers will ensure regulatory compliance when properly implemented.

In December 2012, EPA provided its draft report regarding its review of the technical standards to the State. The 42 draft standards address the following topics:

- Amendments: Treatment of agricultural waste
- Amendments: Feed related
- Animal mortality facility
- Calibrating fertilizer applicators
- Calibrating poultry litter and other solid manure spreaders
- Critical area planting
- Composting facility
- Conservation cover
- Corn stalk nitrate test
- Cover crop
- Deep tillage
- Fence
- Fertilizer storage
- Field application setbacks & justification for setback standards and alternative compliance practices
- Filter strip
- Grassed waterway
- Irrigation water management
- Manure incorporation
- Manure testing
- Nutrient management
- Nutrient management record keeping
- Nutrient management relocation
- Phosphorus saturation ratio
- Phosphorus site index
- Precision agriculture
- Pre-sidedress Soil Nitrate Test (PSNT)
- Processed wastewater testing for land application
- Production area risk assessment
- Residue management seasonal
- Residue and tillage management mulch till
- Residue and tillage management; no-till/strip till/direct seed
- Riparian forest buffer
- Roof runoff structure
- Sediment basin
- Soil testing procedures
- Stormwater management for existing source large CAFOs
- Stormwater management for new source large CAFOs
- Structure for water control temporary field staging
- Tissue analysis
- Waste storage facility
- Windbreak/shelterbelt establishment

# Nutrient Management and the Equine Industry

The equine industry is one of the fastest growing sectors of Delaware agriculture. The state is home to many commercial and hobby stables as well as several large racing training facilities and three public racetracks. Facilities that house horses with a cumulative weight of 8,000 lbs. (about seven horses) or those that apply nutrients to greater than 10 acres need a Nutrient Management Plan. This plan allows the operator to better manage the handling of manure and used bedding. Such manure or used bedding should be stored under cover or in a manner to prevent runoff. Horse facilities also need to handle waste from animal wash down areas in such a way that it doesn't discharge into nearby ditches or other waters.

**At right: Horse manure and wash down water should be managed in a way to prevent nutrients from entering public waters.**

# Complaint Resolution

Complaints related to manure management and general nutrient management practices are handled and resolved by Program Staff. Actions against any alleged violation of the Nutrient Management Law, regulations or standards are investigated by Program Staff and recommended for action by the Commission.

Twenty-eight public complaints were received and resolved by Program Staff relating to manure management, livestock management, odor and nutrient management certification. The categories of complaints and operation types are as follows:

| | |
|---|---|
| **Complaint Category** | |
| Manure management | 42% |
| Mortality Management | 2% |
| Odor | 54% |
| Fertilizer Management | 2% |
| **Operation Type** | |
| Poultry | 28% |
| Horse | 4% |
| Field Crop Only | 68% |
| Swine | 0% |
| Dairy | 2% |
| Beef | 0% |

# Comparison of Methods for Estimating Poultry Manure Nutrient

## Modeling the Chesapeake Bay Watershed

• As part of the Chesapeake Bay Program, the U.S. EPA has developed watershed models for estimating Nitrogen (N) and Phosphorus (P) loading into the Chesapeake Bay. *
• These models include algorithms for estimating manure generation from poultry production using manure excretion and chemical composition coefficients from the 2003 ASAE Standard 381.4.
• These coefficients are based upon studies performed about 20 years ago, and as a result, do not reflect recent innovations in bird genetics, nutrition, and production practices.

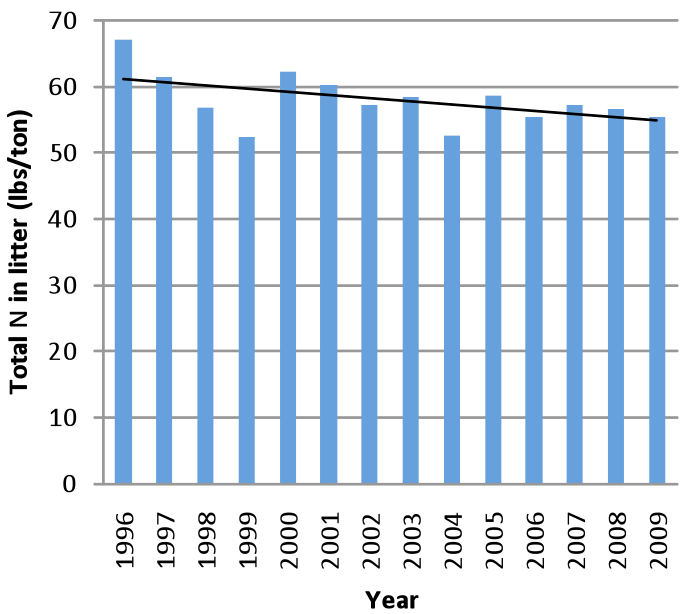
## Objectives of this study

• Determine best estimates for modern poultry production manure and nutrient generation.
• Use this information to estimate current N and P generation within the Bay watershed.

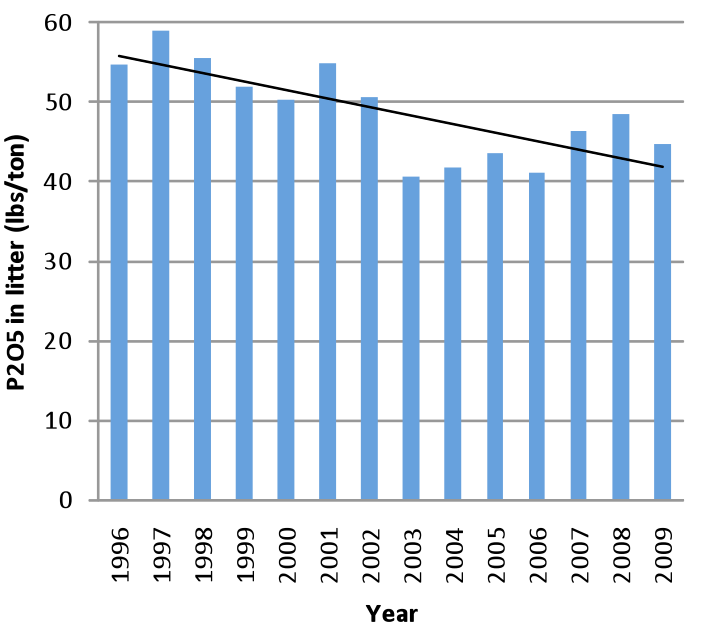
**The Chesapeake Bay watershed is the largest estuary in the United States, and includes more than 64,000 square miles encompassing parts of six states - Delaware, Maryland, New York, Pennsylvania, Virginia and West Virginia - and the entire District of Columbia.*

## *Manure Characteristics from Modern Poultry Production*

### Trends in Litter Nutrient Content




Trend line slope equal to zero statistically significant at the 95% level.




Trend line slope not equal to zero statistically significant at the 95% level.

Wet basis data from 3,400 manure samples analyzed by the Delaware Department of Ag from 1996 through 2009. Average moisture content from 2002 to 2009 was 31.5%.

## *Survey of Manure Generation Estimates from Poultry Production*

- University of Delaware ..... 1.25 tons per 1000 birds
- University of Maryland ….. 1.0 tons per 1000 birds
- Penn State ……1.07 tons per 1000 small birds
  1.65 tons per 1000 large birds
- NRAES ……1.25 tons per 1000 birds
- 2004 ASAE STANDARD ….85 lbs wet excretion per 1000 lbs of birds (~ 5.2 tons of wet excretion per 1000 birds)
  (EPA current reference)

## *Summary of key findings*

Analysis of more than 3,400 manure samples by the DDA laboratory from poultry farms in Delaware revealed a significant trend downward in Phosphorus. A similar trend did not exist for Nitrogen.
The reduction in Phosphorus content is the result of improvements in genetics, nutrition and production practices adopted by growers and integrator over time.
Comparison of current manure generation estimates among several universities and poultry producing states indicates a range from 1.0 to 1.7 tons per 1,000 birds produced. These numbers are substantially lower than the 5.2 tons of wet excretion predicted using the ASAE Standard.

## *Conclusions*

Over 3,400 manure samples taken from 1996 to 2009 were analyzed for trends in N and P concentrations. While there was no significant change in N concentrations over this period, there was a statistically significant decrease in P concentrations.

A survey of production estimates from various poultry producing states was made and revealed that rates of production range from 1.0 to 1.7 tons of manure per 1,000 birds produced.

A case study (see next page) was performed for Sussex County, DE, showing that about 260,000 tons of litter is produced annually in the county; approximately 20% of the 1.46 million tons of fresh wet manure estimated from the 2004 ASAE standard.

Using the manure N and P concentrations previously stated, actual N generation in the county was calculated to be about 15 million pounds which is 40% of the estimate using the 2004 standard. The actual P generation was calculated to be about 5 million pounds which is approximately 60% of the current estimate using the 2004 standard.

## *Acknowledgements*

The authors would like to thank Mark Dubin and Chris Brosch from the Chesapeake Bay Program and University of Maryland for their cooperation during this study.

**— James Glancey & Bill Brown, University of Delaware**
**Edwin Kee, Mark Davis & Larry Towle, DDA**
**Jennifer Timmons, University of Maryland**
**Jennifer Nelson, USDA NRCS Maryland**

# *Case Study: Manure and Nutrient Generation in Sussex County, DE*

## Estimates Using the ASAE Standard

| | EPA/ASAE Approach | units |
|---|---|---|
| Bird Inventory | 43,620,576 | # of birds on any given day (2007 Census) |
| Animal Unit Definition | 455 | # of birds per 1000 lbs of animal mass |
| Total Animal Unit Inventory | 95,869 | animal units on any given day |
| Manure Production | 85 | lbs of manure per animal unit per day |
| Total Manure Produced | 1,487,174 | tons wet excretion per year |
| Nitrogen Concentration | 0.0129 | lbs TKN per lb of manure |
| Phosphorous Concentration | 0.0035 | lbs Total P per lb of manure |
| Total Nitrogen Produced | 38,491,563 | lbs Total N per year |
| Total Nitrogen Not Volatized | 35,332,221 | lbs Total N per year |
| Total Phosphorous Produced | 10,497,699 | lbs Total P per year |
| Total Phosphorous Produced with 16% phytase credit | 8,818,067 | lbs Total P per year |

- The table above uses coefficients and nitrogen and phosphorus concentrations from the ASAE standard.
- Finished bird weight according to the 2003 standard is 4.4 lbs.
- Volatized nitrogen was computed using the method in CBP Watershed Model.
- The CBP model applies a 16% credit to $P_2O_5$ due to phytase in poultry diets.

## Estimates Using Current Generation Data

| | UD/DDA/UMD Approach | units |
|---|---|---|
| No of Birds | 43,620,576 | # of birds |
| No of Flocks per Year | 4.8 | flock per year |
| Total Number of Birds Produced | 209,378,765 | birds per year |
| Manure Production | 1.25 | tons per 1000 birds |
| Total Manure Produced | 261,723 | tons per year |
| Nitrogen Concentration | 56.80 | lbs Total N per ton |
| Phosphorous Concentration | 19.50 | lbs Total P per ton |
| Total Nitrogen Produced | 14,839,720 | lbs Total N per year |
| Total Phosphorous Produced | 5,103,607 | lbs Total P per year |

- The table above uses typical manure generation rates and current average nitrogen and phosphorous concentrations.
- The average finished bird weight on Delmarva is 7.1 lbs. Broilers finish at 5.7 lbs and roasters finish at 8 lbs.
- Comparison of the total manure, total nitrogen, and total phosphorous reveal significantly lower values compared to the values estimated with the ASAE standard.

# Evaluating Excess Poultry Litter-Manure in Delaware

## *Poultry Manure Generation*

Delaware growers produced 245.8 million broilers/roaster chickens in 2007 according to the Delaware Agricultural Statistics for 2007-2008. An industry-adopted litter-manure generation calculation is to multiply 1.25 tons per 1,000 birds. This calculation accounts for the size variation of poultry, namely broilers and roasters, and the bedding material typically consisting of wood shavings. Poultry litter-manure generation is estimated at 307,250 tons annually.

This annual generation does not necessarily indicate the amount available for disposition. The annual disposition is dependent on cleanout cycles such as three-year total cleanouts, annual cleanouts, center cleanouts and crust-outs. Other variables that influence disposition include the availability of bedding litter and disease pressure. It should be acknowledged that if disposition for one particular year is below average, there will be another year in which disposition is above average. It will be assumed that the generation is equal to the amount available for disposition.

## *Nutrient Value*

The current nutrient value of poultry litter-manure is 57-44-45 pounds per ton of Total Nitrogen (TN), Phosphate ($P_2O_5$) and Potash ($K_2O$). Pounds per ton are illustrated as (TN-$P_2O_5$-$K_2O$). The nutrient values of interest are nitrogen and phosphate and are utilized in evaluating the N and P balance for Delaware crop production.

## *Nitrogen and Phosphorus Mass Balancing*

The fundamental tenet of economically and environmentally sound nutrient management is the strategic approach of nutrient mass balancing. Dr. Tom Sims and colleagues published a mass balance report in 2008 titled *Nutrient Mass Balances for the State of Delaware*. The concept is simple but difficult and expensive to implement. Nutrient inputs to a farm, watershed, county or state should be balanced by nutrient outputs from the area of interest. Preventing a nutrient surplus should prevent the scenario where manure-nutrients are treated as a waste and not a nutrient. Furthermore, preventing a nutrient deficit is important for the economic value of nitrogen and phosphate. Nitrogen and phosphorus fertilizers are significant costs in grain production and should be equally valued when in the form of litter-manure.

Excess poultry manure currently supplies several alternative use markets. Most of the excess poultry manure originates from Sussex County. The primary market drivers for excess poultry litter-manure are:

1. Phosphorus-limited nutrient management regulations;
2. Relocation funds to assist in the transportation cost of moving excess poultry manure to crop farms low in soil-phosphate or alternative use projects;
3. Perdue AgriRecycle demand for manure as a processed organic fertilizer; and
4. Mushroom industry demand for a nitrogen compost source.

## *Excess Poultry Litter Evaluations*

The assessment of excess poultry manure was conducted using three different methods:

1. Marketplace: The marketplace method was simply evaluating the amount of excess poultry manure moving to alternative markets. These markets include land application on fields that have soil phosphorus levels less than 150 fertility index value within Delaware, relocation for land application outside of Delaware, Perdue AgriRecycle pelletizing plant and the mushroom industry located in southeast Pennsylvania. The three-year average for excess poultry litter entering the marketplace is 96,436 tons.
2. Phosphorus crop removal balance as required by the Nutrient Management Law: The Nutrient Management Law limits the application of phosphorus, primarily as animal manure, to a crop uptake level. As long as the expected crop has the capability to take up the phosphorus, it can be applied. This zero balance calculation prevents the over-application of phosphorus and permits application regardless of the phosphorus available in the soil from historical over-applications. According to the mass balance report, the phosphorus input in the form of poultry manure is 66 percent and applies to excess poultry manure proportionately. The 2006 total phosphorus excess of 590 tons calculates to be 389.4 tons (66 percent of phosphorus as poultry manure, or 40,533 actual tons of poultry manure (Sims, 2008). This surplus along with the 2006 relocation projects result in a total gross surplus tonnage of 118,257.
3. Agronomic recommendations for economically optimum yields: This method accounts for the agronomic demand of the plant and accounts for the presence of phosphorus stored in the soil. This method assumes that adequate phosphorus soil levels will result in no application of phosphorus in the form of poultry manure or commercial fertilizer. This agronomic threshold method calls for application rates that are recommended by the University of Delaware and balanced between crop uptake and nutrient inputs. According to the mass balance report, the agronomic assessment accounts for 66 percent of the excess phosphorus (3,490 tons), which is 2,303 tons (Sims, 2008). When converted to a poultry manure value, it represents 239,721 tons of manure still surplus, or 78 percent of all manure generated in one year.

In conclusion, methods #1 and #2 appear to be the realistic methods for determining excess poultry manure. The average between method #1 and method #2 is 107,346 tons and should be used for planning purposes:

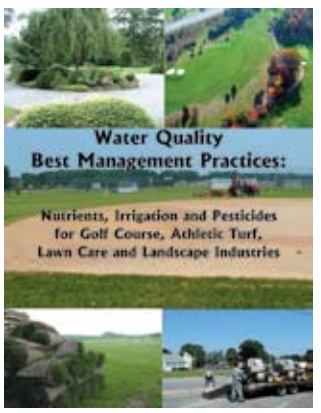
| *Delaware Poultry Litter/Manure and Mass Balance Data* | |
|---|---|
| 2007 statewide poultry production | 245,800,000 birds |
| 2007 manure generation | 307,250 tons |
| Method #1: Marketplace excess poultry litter/manure (07,08,09 average) | 96,436 tons |
| Method #2: Mass balance report for implementing the NM law | 118,257 tons |
| Method #3: Mass balance report for agronomic P demand | 239,721 tons |
| **Recommended planning figure for excess poultry litter/manure** | **107,346 tons** |

# Best Management Practices

The Delaware Nutrient Management Program has two Best Management Practices (BMPs) booklets, available free of charge to anyone requesting them. These BMPs are endorsed by the Commission and are designed to reduce nutrient runoff. These booklets are valuable training tools for nutrient handlers and are often found as a component of the nutrient management plan. For more information or to obtain a copy of these informative booklets contact the Nutrient Management Program at (302) 698-4500.

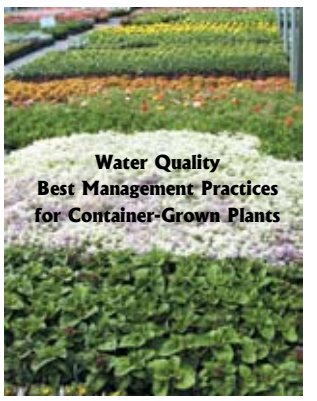
## *Golf Courses, Athletic Turf, Lawn Care and Landscape Industries*

The Commission recommends BMPs for non-agricultural businesses such as golf courses and lawn care companies. The BMP booklet consists of six chapters that include: Introduction; Nutrient Management Certification; Nutrient Management BMPs; Fertilizer; Irrigation & Fertigation Management; and Pesticide Handling. This booklet is an invaluable resource that outlines who must be certified, how to become certified, and how to follow Best Management Practices in daily non-agricultural applications.




## *Container and Nursery Industries*

The Commission recommends this BMP booklet for the greenhouse and nursery industries. The booklet contains several chapters which include: Nutrient Management Certification; Nursery Site Selection for optimum BMP usage, Irrigation and Water Conservation Strategies; Collection Basins; Stormwater Management; Fertilizer Application; Pesticide Application and more.




**Proper fertilizer application rates are important when managing golf courses and other urban turf facilities.**

# County Conservation Districts

The Commission works cooperatively with County Conservation Districts to promote and implement nutrient related Best Management Practices. Many practices that are coordinated by the Conservation Districts result in success that helps both the environment and the farmer. Kent and Sussex Conservation District offices staff a total of 10 Conservation Planners who develop nutrient management plans. The following is a 2011 summary of the Districts' accomplishments:

**NEW CASTLE COUNTY**
***Construction/Planting Contracts***
- Manure storage – 3
- Cover crop – 6,551 acres
- Roof runoff structures – 0
- Stream fencing – 0

***In-House Accomplishments***
- Comprehensive Nutrient Management Plans (CNMPs) planned — 0
- Conservation Plan development – 155 "planned" totaling 15,821 acres with 148 "applied" totaling 16,400 acres

**KENT COUNTY**
***Construction/Planting Contracts***
- Manure storage – 1 Dairy, 0 Horse/Other, 4 Poultry
- Mortality storage – 4
- Cover crop (planted) – 15,943 acres
- Concrete pads for manure handling – 44

***In-House Accomplishments***
- Nutrient Management Plan development – 3,311 acres
- Animal Waste Plan/CNMP development – 7
- Conservation plan development – 39,318 acres
- Pre-side dress soil nitrate test – 137 tests representing 5,559 acres

**SUSSEX COUNTY**
***Construction/Planting Contracts***
- Manure storage – 15
- Mortality storage – 19
- Cover crop – 32,495 acres
- Concrete pads for manure handling – 200

***In-House Accomplishments***
- Nutrient Management Plan development – 36 plans at 5,583 acres
- Animal Waste Plan / CNMP development – 108
- Conservation plan development – 53 plans at 3,790 acres

# Field Staging of Poultry Manure

The most efficient method of handling and storing poultry litter results from handling the poultry litter as few times as possible. Ideally, total cleanouts and crust outs are immediately land-applied, transported to an alternative use facility, or moved to a storage structure. However, timing considerations may require temporary, outdoor storage of the total cleanout of litter before use and must be conducted according to the Commission standards. In situations where temporary field staging is needed, litter may be stored temporarily to preserve litter quality and prevent application at the wrong time of the year. Temporary field staging is the least preferred storage practice.

**At right, keeping manure to be applied to cropland under roof is the preferred method of field staging.**

# Winter Application of Fertilizer and Manure

Winter application regulations continue and limit the application of commercial and manure- based fertilizer during the time of the year that is most vulnerable for nutrient runoff. The purpose of the regulation is to limit the application of Nitrogen (N) and Phosphorus (P) fertilizer and manure applications as follows, unless specified in the nutrient management plan that the application is necessary:

- The application may not occur between December 7 and February 15;
- The application may not occur on snow-covered or frozen ground;
- The application may not occur on impervious surfaces such as sidewalks, roads and other paved areas and the misdirected fertilizer must be removed on the same day of application.
-

Failure to comply with these and other regulations of the Commission may result in a compliance and enforcement hearing of the Commission.

**Timing manure cleanouts to coincide with field application to crops is the best strategy to limit field staging.**

# Handling Catastrophic Mortality

Every animal operation's nutrient management plan is designed to address daily and catastrophic mortalities. Most daily mortalities are handled in environmentally friendly manners such as composting. Most farms are not designed to handle large-scale mortality events such as what Delaware experienced during the winter of '09/'10. Many farmers faced the challenge of handling large amounts of mortalities from roof collapses caused by snow accumulation. The following recommendations were provided to the poultry industries and growers as they dealt with catastrophic mortalities. Compost all mortalities onsite in:

• A covered structure such as a manure shed. It is important that the proper amount of carbon is used in order to rapidly heat the pile and promote the breakdown of the birds. In general the mortality to carbon ratio is one to one. Acceptable carbon sources are straw, woodchips or shavings.
• Relocate the mortalities to a commercial composting site.
• Relocate the mortalities to a landfill. This option requires coordination and approval with the landfill.

# Budget

The Nutrient Management Commission's accomplishments were made possible by funding provided by the Legislature. The Nutrient Management Program continues to implement nutrient planning, relocation and mandated activities as required by the Nutrient Management Law.

The following budgets are represented as fiscal years.

| | FY 2010 Budget | FY 2011 Budget | FY 2012 Budget |
|---|---|---|---|
| Program Operating Costs: | | | |
| Personnel | 130,400 | 240,700 | 299,800 |
| **Federal Funds Section 319 (Clean Water Act)*** | **30,000** | **30,000** | **30,000** |
| Travel | 600 | 600 | 600 |
| Contractual | 17,000 | 16,000 | 16,000 |
| Supplies | 4,000 | 4,000 | 4,000 |
| Information/Education/Certification | 221,000 | 172,500 | 172,500 |
| Nutrient Relocation Program | 246,000 | 246,000 | 246,000 |
| **Federal Funds section 319 (Clean Water Act)*** | **200,000** | **200,000** | **100,000** |
| **Federal Funds Ches. Bay Program*** | **150,000** | **150,000** | **150,000** |
| **Poultry Companies*** | **176,011** | **164,000** | **187,000** |
| Nutrient Management Planning | 451,800 | 411,800 | 411,800 |
| Demonstration and Research | 0 | 0 | 0 |
| Penalties Collected | 1,906 | 1,906 | 0 |
| **TOTAL** | **1,588,717** | **1,637,506** | **1,617,700** |

* All bold text represent funds that are not appropriated by the State of Delaware.

# Background and Contacts

## *What is the Delaware Nutrient Management Commission?*

The Nutrient Management Law established a 19-member Commission that is charged to develop, review, approve and enforce regulations governing the certification of individuals engaged in the business of land application of nutrients and the development of nutrient management plans. The members of this Commission come from many different backgrounds and professions.

## *What are the Commission's Responsibilities?*

The Delaware Nutrient Management Commission will:

1. Consider establishing critical areas for voluntary and regulatory programs.
2. Establish Best Management Practices to reduce nutrients in the environment.
3. Develop educational and awareness programs.
4. Consider incentive programs to redistribute excess nutrients.
5. Establish the elements and general direction of the State Nutrient Management Program.
6. Develop nutrient management regulations.

# *Members of the Nutrient Management Commission*

**William Vanderwende,** Commission Chairman, was appointed to the Commission by the Senate, and was named Chairman by the Governor. He is a full-time Sussex County dairy producer who represents the state's dairy industry. He operates a farm with 700 head of dairy, and 3,000 crop acres. He can be reached at (302) 349-4423.

**David Baker**, Commission Vice Chairman and Chairman of the Personnel and Planning Subcommittees, was appointed by the Senate as a representative of the New Castle County grain industry. He is a full-time grain farmer of 3,000 acres. He can be reached at (302) 378-3750.

**Mark Adkins** was appointed by the Governor to represent swine farmers. He operates a 900-acre family grain farm and 1,000-head swine farm and is a director for the Delaware Swine Producers. He can be reached at (302) 732-3007.

**Robert Baldwin** is the Agricultural Liaison for the Department of Natural Resources and Environmental Control and is appointed by the Nutrient Management Law. He can be reached at (302) 739-9921.

**Chris Bason** is the representative of an environmental group. He was appointed by the Senate Minority Leader. He is the Executive Director of the Delaware Center for the Inland Bays, one of the state's two National Estuary Programs. A biologist with 14 years of experience in wetlands and estuarine science, he can be reached at (302) 226-8105.

**F. Kenneth Blessing, Jr.** was appointed by the Senate to represent Kent County vegetable farmers. Kenny is part of a diversified farming operation consisting of approximately 3,500 crop acres including vegetables, grain and beef cattle. He can be reached at (302) 422-5746.

**Jim Elliott** was ap-pointed by the House of Representatives as an Envir-onmental Advocacy Group representative. Former Mayor of Fenwick Island, he is no stranger to public service. He can be reached at (302) 337-3653.

**Laura Hill** was appointed by the House of Representatives to represent Sussex County poultry farmers. She is part of a family farm that operates a 130,000-capacity broiler operation and farms 3,000 acres of grain and vegetable crops. She can be reached at (302) 945-0725.

**Larry Lee** was appointed by the House of Representatives. He was appointed to represent commercial applicators in Delaware. Larry is employed with FS Growmark in Milford, DE. He can be reached at (302) 424-2835.

**Lisa McCormick** was appointed by the Governor as a Sussex County public citizen representative. She is part of a family sod farm in Sussex County. She can be reached at (302) 988-8235.

**Bud O'Neill** was appointed by the Governor as a representative for the golf course/lawn care industry. He owns an agronomic service firm that plans and manages turfgrass for golf courses, athletic complexes and lawns. He is past chairman of the Delaware State Golf Association greens section and can be reached at (302) 653-8618.

**Richard Sterling** was appointed by the Governor as a representative of the commercial nursery industry. He operates a 75-acre nursery specializing in evergreens. He can be reached at (302) 653-7060.

**Scott Webb** was appointed by the House of Representatives to represent Kent County poultry farmers. He is part of a family farm that operates a 119,000-capacity broiler operation and farms 1,000 acres of grain crops. He can be reached at (302) 381-0402.

**Edwin Kee**, Secretary of the Delaware Department of Agriculture, is an ex-officio member of the Commission. He can be reached at (302) 698-4500.

**Dr. Rick Perkins** serves for Secretary Rita Landgraff and is currently a staff member of the Office of Health Environment at the Division of Public Health, within the Department of Health and Social Services. His position is ex-officio and he can be reached at (302) 744-4876.

**David Small,** Deputy Secretary of the Delaware Department of Natural Resources and Environmental Control, is an ex-officio member of the Commission. He can be reached at (302) 739-9000.

# *Delaware Nutrient Management Program Staff*

**W. Larry Towle** is the Program Administrator of the Delaware Nutrient Management Program and an ex-officio member of the Nutrient Management Commission. He can be reached at (302) 698-4500 or larry.towle@state.de.us.

**Bob Coleman** is the Environmental Co-ordinator for the Delaware Nutrient Management Program. He can be reached at (302) 698-4556 or robert.coleman@state.de.us.

**Judy Baines** is the Administrative Assistant for the Delaware Nutrient Management Program. She can be reached at (302) 698-4558 or judy.baines@state.de.us.

**Lauren Torres** is an Environmental Scientist for the Delaware Nutrient Management Program. She can be reached at (302) 698-4628 or lauren.torres@state.de.us.

**Ben Coverdale** is also an Environmental Scientist for the Delaware Nutrient Management Program. He can be reached at (302) 698-4627 or michael.coverdale@state.de.us

# *University of Delaware Staff*

Several specialists from the University of Delaware provide certification training for the Nutrient Management Program. They also assist the program by providing technical recommendations and by conducting research and demonstration projects on nutrient management practices. They are:

**Phillip Sylvester**, Kent County Extension Office at (302) 730-4000.
**Shawn Tingle,** Extension Associate, at (302) 856-2585, Ext. 572.
**Corey Whaley**, Sussex County Extension Agent at (302) 856-2585, Ext. 594.
**Sydney Young Riggi**, Extension Associate, at (302) 856-2585, Ext. 571.
**Dr. Amy Shober,** Assistant Professor Plant and Soil Science, at (302) 831-2882.
**Jennifer Volk**, Environmental Quality Extension Specialist, at (302) 831-2531.

***'Water Quality is Everyone's Responsibility'***

# *How to Contact Your Conservation District*

The Conservation Districts provide technical agricultural professionals who can assist in nutrient management strategies and recommendations. All nutrient consultants are certified, and in most cases, are certified crop advisors.

- **New Castle County: (302) 832-3100**
- **Kent County: (302) 741-2600**
- **Sussex County: (302) 856-3990**

# *How to Contact the Nutrient Management Program*

Information about the Nutrient Management Program can be found on the Internet at www.state.de.us/deptagri/nutrients/index.shtml.