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UNIVERSITY OF MARYLAND
COLLEGE OF AGRICULTURE
AND NATURAL RESOURCES
HELPING CITIZENS MANAGE
NUTRIENTS SINCE 1989

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The fiscal year 2013 Nutrient Management Annual Report highlights the programs of the University of Maryland's College of Agriculture and Natural Resources (AGNR), which include nutrient management in field and vegetable crops, animal production, nursery and greenhouse industries and urban environments.

The guiding principle behind nutrient management planning and implementation, as outlined in the Maryland Water Quality Improvement Act of 1998, is that nutrients applied in any form should balance with plants' nutrient needs. In agricultural production systems, managing nutrients to meet, not exceed, crop needs may increase profitability and improve the health of the Chesapeake Bay and its tributaries.

Regardless of land use, improperly or excessively applied nutrients can leach into the groundwater or exit landscapes via runoff from precipitation, and then migrate into Maryland's waterways. Once in the water, excess nutrients upset the Bay's ecological balance by causing algal blooms and contributing to eutrophication and degradation of wildlife habitat.

For more information on the College of AGNR, visit www.agnr.umd.edu

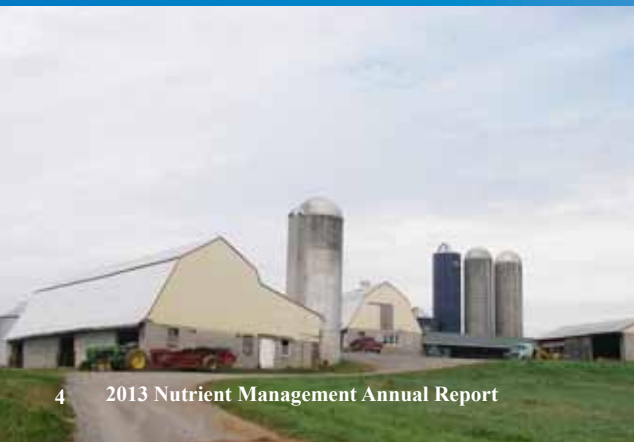
AGRICULTURAL NUTRIENT MANAGEMENT

The University of Maryland Extension's (UME) Agricultural Nutrient Management Program (ANMP), which is funded by the Maryland Department of Agriculture (MDA), provides (1) nutrient management planning services to Maryland farmers through a network of nutrient management advisors located in all county Extension offices and (2) continuing education and technical support to certified nutrient management consultants and certified farm operators via nutrient management specialists.

2013 Priorities

A formal agreement between the MDA and the University of Maryland details the nutrient management planning priorities for the ANMP. The agreement targeted several groups of farmers for assistance with development or updating nutrient management plans in fiscal year 2013:

1. farmers who have filed a notice of intent (NOI) as a Concentrated Animal Feeding Operation (CAFO) or who were designated a CAFO by the Maryland Department of the Environment (MDE) or the Environmental Protection Agency;
 - a. and whose Comprehensive Nutrient Management Plan (CNMP) was being prepared by their Soil Conservation District; or
 - b. who need an updated nutrient management plan to remain in interim compliance while they awaited the development of the CNMP by their Soil Conservation District; or
 - c. who had previously developed a CNMP with a nutrient management component that required updating.
2. farmers who have filed a NOI as a Maryland Animal Feeding Operations (MAFO) or who have been designated a MAFO by MDE who require a current nutrient management plan to complete permit requirements;
3. farmers with pollution problems or designated as non-compliant by MDA through an enforcement procedure;
4. farmers participating in the Manure Transport Project and those with a Maryland Agricultural Cost-Share (MACS) application pending for animal waste storage and poultry mortality composters;
5. updating nutrient management plans for the existing clientele with animal operations and expired plans developed by the nutrient management advisors; and
6. first come, first serve for any other farmer who must comply with the Water Quality Improvement Act.



2013 Progress and Achievements

Under the ANMP, UME nutrient management advisors:

- prepared nutrient management plans for 40 Manure Transport Project clients, allowing transportation and application of manure on 9,347 acres;
- wrote nutrient management plans or updated them to partially fulfill permit requirements for 76 CAFO or MAFO clients;
- conducted the Phosphorus Site Index for 282 clients on 1,601 fields;
- performed 12 yield checks and calibrated 35 manure spreaders;
- implemented the Pre-Sidedress Nitrate Test for 59 producers with a total of 6,173 acres. This resulted in an estimated reduction of over 85,000 pounds (or approximately 14 pounds per acre) of nitrogen;
- wrote 323 new nutrient management plans for 185 Maryland producers for more than 14,000 acres. The nutrient management advisors updated 6,398 plans for 1,500 clients for approximately 308,000 acres (Figure 1).

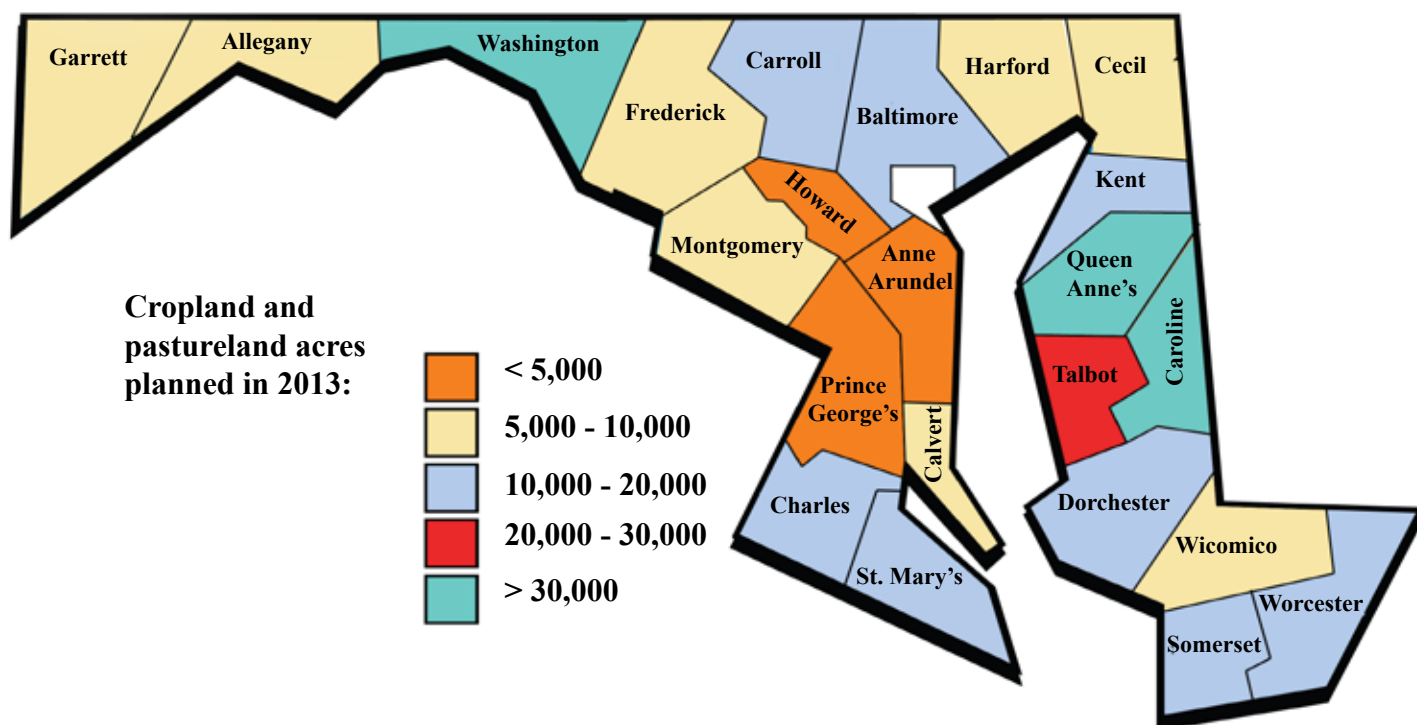


Figure 1. Farmland acres planned per county in fiscal year 2013 by University of Maryland Extension nutrient management advisors.



(Photos courtesy of Anastasia Vvedenskaya, ANMP Communications Specialist)

AGRICULTURAL NUTRIENT MANAGEMENT, Continued



Continuing Education

MDA and the College of AGNR co-sponsored continuing education programs to help certified nutrient management consultants and certified farmers meet their continuing education requirements in 2013.

- Fifty-two (52) people attended the annual nutrient management field day, *Practical Experiences in Nutrient Management* (PENM). Workshop topics included:
 - writing plans for perennial fruit operations, calibrating manure spreaders, soil nitrate testing, corn silage and corn grain yield checks, field data collection for phosphorus risk assessments, introduction to the new Phosphorus Management Tool, and using drive-on scales for yield checks and equipment calibration.
- Twenty (20) face-to-face workshops had 562 attendees. Workshop topics included:
 - *How to Write a Nutrient Management Plan; Small Scale Anaerobic Digesters for Dairies; Revised Universal Soil Loss Equation Version 2 (RUSLE2); and Organic Grain and Vegetable Production.*
- Four online sessions had 355 attendees. Sessions were offered via the College of AGNR's web conference system in 2013. The topics were:
 - *Nitrogen Fixation 101, Cover Crops – History and Current Practice, Non-Nutritive Aspects of Manure Utilization, Update on the New Phosphorus Management Tool, Understanding the New Nutrient Management Regulations, and Nitrogen Management of Small Grains.*
- UME coordinated with other organizations to provide Maryland certified clients with continuing education opportunities, such as eXtension's Livestock and Poultry Environmental Learning Center (LPELC), the American Society of Agronomy's webinars, and the USDA-Natural Resources Conservation Service's (USDA-NRCS) East Technology Support Center webinar series.



For more information on the ANMP, visit <http://extension.umd.edu/anmp>



Pre-certification Exam Training

- Thirty-four (34) individuals attended *Fundamentals of Nutrient Management*—a course designed to help participants prepare for the MDA nutrient management certification exam.
- Twenty-one (21) individuals enrolled in the on-line exam review course.

Farmer Training and Certification

- Thirty-two (32) farmers were certified through the Farmer Training and Certification (FTC) initiative to write their own nutrient management plans. To date, 488 farmers have been certified through this training initiative.
- After initial certification, University of Maryland nutrient management specialists assisted farmers with updating nutrient management plans and using *NuMan Pro* software.
- Six plan writing help sessions were offered at five different locations to provide certified farmers with assistance in updating their nutrient management plans.

ANMP Web Site

The ANMP web site (<http://extension.umd.edu/anmp>) provides users with access to general information about the program, training materials, publications and resources for nutrient management plan development. The ANMP also maintains a web page of training opportunities and current events on the social media site, Twitter (www.twitter.com/UMANMP).



NUTRIENT APPLICATOR TRAINING

- Twenty-eight (28) face-to-face Nutrient Applicator Training sessions were held and 3,179 operators either received or renewed their nutrient applicator vouchers.
- One online session was held and five operators either received or renewed their nutrient applicator vouchers.

2013 MID-ATLANTIC PRECISION AGRICULTURE EQUIPMENT DAY



The University of Maryland, University of Delaware, Pennsylvania State University and Virginia Polytechnic Institute and State University organized the August 2012 Mid-Atlantic Precision Agriculture Equipment Day. Scientists and agricultural engineers from Oklahoma State University, and University of Tennessee and representatives from industry showcased practical information on sprayer and planter section control, variable rate seeding, economics and practical implementation of satellite navigation technology and GPS, soil mapping, and using technology for on-farm research and developing variable rate prescriptions. Continuing education credits were awarded to 287 participants.

POULTRY FARM MANAGEMENT WORKSHOP

UME, in cooperation with Soil Conservation Districts, USDA-NRCS, Delmarva Poultry Industry, MDE and MDA, offered a Poultry Farm Management Workshop and Certification course designed to help new and existing poultry growers comply with their National Pollutant Discharge Elimination System (NPDES) CAFO permit.

Workshop topics included:

- basic farm management;
- site management and maintenance of poultry houses, pump rooms, manure sheds, composters, etc.;
- manure and mortality handling;
- vegetative environmental buffers;
- nutrient management and financial record-keeping;
- the CAFO permitting process;
- comprehensive nutrient management planning; and
- the Environmental Protection Agency inspection process.

Maryland certified farmers, certified consultants and applicator voucher holders received four continuing education credits for attending this workshop. In 2013, poultry farm management workshops were held on Maryland's Eastern Shore with 25 participants.

NUTRIENT MANAGEMENT SOFTWARE

In 2013, UME updated the Nutrient Management for Maryland Professional Edition software version 3.2.2 (*NuMan Pro 3.2.2*) and developed new features and capabilities:

- phosphate and potash recommendations for fertigated crops are now soil-test based;
- up to four split applications of organic nutrient sources are now allowed;
- recommendations for many crops were updated; and
- the program was adapted to work with Windows 8.

NuMan Pro 4.0, which will allow calculation of the *University of Maryland Phosphorus Management Tool (UM-PMT)*, was readied for release in July 2013. Its release is pending, awaiting adoption of the *UM-PMT* by MDA. Work was initiated on a stand-alone version of the Maryland Phosphorus Site Index which is anticipated to be released fiscal year 2014.

NUTRIENT MANAGEMENT PUBLICATIONS

UME and UMD's Departments of Environmental Science and Technology and Plant Science and Landscape Architecture collaborated to release:

- ***EBR-15: Fall Soil Nitrate Test (FSNT)***

UME, MDA, and the turfgrass industry collaborated to release:

- ***Maryland Professional Lawn Care Manual***

UME collaborated with MDA to release:

- ***Monthly Horse Pasture Management Guide***

Home and Garden Information Center (HGIC) specialists revised:

- ***HG #18: Lead in Garden Soils***

(Photo courtesy of Anastasia Vvedenskaya, ANMP Communications Specialist)



NUTRIENT MANAGEMENT RESEARCH FOR AGRONOMIC

Researchers in the University of Maryland's Department of Environmental Science and Technology and Plant Science and Landscape Architecture have on-going projects designed to improve the understanding and management of nutrients in crop production.

Agronomic Crops On-going Projects

- **Subsurface injection of poultry litter to minimize nutrient losses;**
- **Development of a second-generation phosphorus risk assessment tool, University of Maryland Phosphorus Management Tool (UM-PMT), for predicting the relative risk of phosphorus transport from agricultural land;**
 - UM-PMT is under regulatory consideration by MDA and it is anticipated that it will be implemented within the next year.
- **Effectiveness of *in-situ* treatment of agricultural drainage ditch water to remove nutrients and other pollutants and reduce off-field nutrient transport;**
- **Utilization of variable rate nitrogen application in the Mid-Atlantic region to increase nitrogen use efficiency in corn;**
- **Estimation of an agronomic nutrient mass balance for nitrogen and phosphorus in Maryland;**
- **Effectiveness of a broader array of cover crops, such as forage radish, that are effective nutrient scavengers, weed suppressors, and subject to winter kill;**
- **Efficiency of fertilizer nitrogen use in corn:**
 - It is difficult to accurately measure the uptake of fertilizer nitrogen by corn in a field situation. Nitrogen use efficiency (NUE) is a measurement that assesses how efficiently a crop utilizes nitrogen. Typically, NUE is evaluated by using a range of nitrogen rate treatments applied to the corn crop. Whole plant and grain samples are collected and each is analyzed for their nitrogen concentrations. This approach measures the total amount of nitrogen consumed but does not identify the sources, i.e. if the nitrogen was obtained from the fertilizer supplied or from either residual nitrogen present at corn planting or mineralization of organic matter during the growing season. To accurately identify the nitrogen contribution from fertilizer nitrogen, a study using labeled nitrogen (N-15) started in 2012. This project will continue for at least three years and will include nitrogen uptake measurements for corn as well as the following rotation crops of winter wheat and double crop soybean.
- **Optimum application time of spring nitrogen for winter wheat:**
 - Wheat growth after planting is related to temperature. A study was initiated during the 2010-11 wheat production year to identify the optimum time for spring nitrogen application using the accumulation of growing degree units (GDU). The study was conducted at five Maryland sites representing a range of plant dates during 2011-2012 and four sites in 2012-2013. This project will conclude after assessment of four locations in the 2013-2014 crop year.

AND VEGETABLE CROPS

Vegetable Crops On-going Projects

- **The effect of plastic mulch color on soil temperature, potassium uptake, and tomato ripening:**

Adding large amounts of potassium fertilizer to the soil helps reduce the problem of potassium deficiency, but introduces excessive amounts of potassium into the environment. UME research has demonstrated that the low potassium levels in tomato plants are due primarily to reduced potassium uptake by plant roots when soil temperatures reach 93 degrees F or above. Soil temperatures usually reach this temperature range when black plastic is used as a mulch, as is the case in most commercial fresh market tomato fields. Over the last five years, the trend toward soil heating has increased uneven ripening, yellow shoulders, and blotchy ripening on tomato fruit.

Research shows that using white plastic mulch can decrease soil temperatures enough to allow potassium levels to stay at or just below adequate levels, reducing the incidence of fruit ripening problems without adding more potassium. UME researchers will continue assessing the effect of white plastic and other more reflective mulches on various cultivars of tomato and foliar potassium use.



- **The effect of low rates of compost or manure as a “microbial starter” when cover crops of hairy vetch or hairy vetch and rye are used as a primary nitrogen source for many vegetable crops:**

Preliminary results indicate that a “microbe starter” more than doubles the soil microbial population and enhances the active decomposition and release of nitrogen from the cover crops.



To learn more about vegetable production practices and on-going vegetable research at the University of Maryland, visit <http://extension.umd.edu/mdvegetables>



Photo: hairy vetch cover crop

ANIMAL NUTRIENT MANAGEMENT

Researchers in the University of Maryland's Department of Animal and Avian Sciences are studying how nutritional factors and feed management interact to effect phosphorus and nitrogen digestibility and retention in animals.

For more information, visit <http://ansc.umd.edu>

Poultry On-going Projects

- Causes and solutions for late lameness in broilers;
- Effectiveness of currently used and new forms of phytase enzymes in decreasing phosphorus in diets fed to broilers;
- Impact of dietary calcium and phosphorus on effectiveness of phytases;
- Availability of calcium from limestones and impact of limestone particle size on calcium and phosphorus availability as well as effectiveness of different phytases;
- Development of *in vitro* fast assays to determine calcium availability from limestone, based on correlations with *in vivo* work;
- Development of methodologies that will allow determination of ingredient nutrient (calcium, phosphorus, energy, and amino acids) digestibility in one assay, in the presence or absence of one or several enzymes;
- Exploration of how management tools such as lighting programs and diet particle size can be used as tools to improve diet nutrient utilization by broilers. The goal of this research is to maintain or improve productivity while decreasing the nutrient excretion;
- Use of the dietary imprinting concept where changes in early nutrition could improve the broilers' ability to:
 - perform well when low phosphorus diets are fed in the finisher and withdrawal phases, and
 - deposit breast muscle such that breast yield does not change when low protein diets are fed in the finisher and withdrawal phases. This would allow producers to decrease the amount of phosphorus and nitrogen in 70 percent of the broiler feed without negatively impacting performance. The ultimate goals are to decrease phosphorus and nitrogen in litter;
- Determination of the impact of high copper concentrations used in poultry diets as growth promoters or antibacterials on phytase efficacy and on intestinal microbial populations;
- Investigation into proteases that might help improve protein availability from diets, thus allowing formulation of diets with lower protein, and ultimately lower levels of excreted nitrogen and lower nitrogen volatilization;
- Examination of amino acid digestibility in ingredients, their variability and how proteases can increase their utilization by poultry; and
- Defining requirements for calcium and phosphorus as affected by age and breed.





Equine Rotational Grazing Demonstration Site

Since initiating the Horse Pasture Management Training series in 2009, there have been 18 events with a total of 698 visits by participants from 6 states. In 2013, there were two events with 69 attendees.

- At the *Kicking the Hay Habit: How to Use Pasture to Reduce Feed Costs*, 30 participants learned how to create and maintain thick productive pastures to use in their horse's nutritional program as well as to protect the environment.
- The *Horse Pasture Management Seminar* focused on increasing outreach in the state to encourage more horse farm operators to adopt environmentally-friendly best management practices.
 - Thirty-nine (39) participants attended sessions covering pasture soil fertility, forage species selection, weed control, manure management, and tips for controlling water and soil erosion on horse farms. During the tour of the equine rotational grazing site, participants performed soil sampling, measured plant height, examined vegetative cover, and identified current pasture management issues.

Post-event surveys confirm that these educational events are increasing awareness of farm owners' role in environmental stewardship and expanding their use of best management practices. The training series sparked renovation of more than 200 acres of pasture, which ultimately will help to protect the Chesapeake Bay from excess nutrients and sediment.

In 2013, UME collaborated with MDA to write the *Monthly Horse Pasture Management Guide*. This guide is designed to help horse farm operators make wise and timely decisions about horse pasture management. By following the tips featured each month, horse farm operators should see increased forage production from pastures, reduced use of hay and/or grain to meet their horses' nutrient requirements, and lower soil and nutrient loss from their pastures.

To learn more about horse management and upcoming educational events, visit the University of Maryland's Equine Rotational Grazing Demonstration site website: www.ansc.umd.edu/ERG



(Top left and middle photos courtesy of Jennifer Reynolds, Coordinator - Equine and Poultry Extension Activities; right top photo courtesy of Edwin Rensberg, photographer; background photo courtesy of Anastasia Vvedenskaya, ANMP Communications Specialist)

NURSERY AND GREENHOUSE NUTRIENT MANAGEMENT

Under provisions of the Water Quality Improvement Act of 1998, Maryland's nursery and greenhouse operators must develop water and nutrient management plans to ensure that nitrogen and phosphorus are not lost to surface and groundwater from production sites in the state. The University of Maryland's Nutrient Management Program for the Nursery and Greenhouse Industry works with the industry to help develop these plans and promotes other sustainable practices that minimize environmental impacts through education and research.

Training

A number of nutrient management training opportunities were offered for nursery and greenhouse operators in 2013:

- **Farmer Certification Training:** Growers were certified to write their own nutrient management plans. Trainings were held east and west of the Chesapeake Bay. Eight operators and consultants attended these certification programs; seven growers were certified at the follow-up sessions in May and September at MDA in Annapolis.
- **Advanced Applicator and Consultant Training:** A total of 21 people attended three advanced applicator training programs held around the state and focused on soil and substrate management. Each of the programs offered 3 continuing education units (CEU) or voucher credits.
- The team also conducted six other nutrient management programs (for a total of six CEU or voucher credits) throughout the winter, spring and summer of 2013, reaching a total of 103 attendees.



Photo: Charles and Matt Bauer grow hydroponic snapdragons at the Bauer Greenhouse in White Hall, MD.



Research and Extension

- **Wireless Sensor Networks for Irrigation and Nutrient Management:** The fourth year of a 5-year US-DA-funded national specialty crops project was completed. Four commercial nursery and greenhouse operations are actively involved in this research in Maryland (Raemelon Farm, Waverley and Moon Nurseries and Bauers Greenhouse). A new low-power sensor node that can independently monitor and control irrigations based on sensor readings was tested during 2012/13. Irrigation water applications were reduced by an average of 40 to 60%, with no measurable effect on crop growth rates.

A full description of project results to date can be found online: <http://www.smart-farms.net/impacts>

- **Integrated Management of Zoosporic Pathogens and Irrigation Water Quality for a Sustainable Green Industry:** This national specialty crops project involves a team from the University of Maryland and two nursery operations (Moon, Tidal Creek) in Maryland and three nursery operations in Virginia (Colesville, Bennett's Creek and Lancaster Farms). Containment ponds and irrigation systems are being actively monitored for water quality and pathogen status at each operation, to understand the dynamics of nutrient loading on water quality and pathogen survival. The overall goal is to elucidate better disease management and water treatment strategies, since this is a key barrier to using recycled water for many growers.

A full description of the project objective and current results can be found at <http://www.irrigation-pathogens.info>

- **Knowledge Center for Water, Nutrient and Plant Health Management:** There are currently over 1,150 registered users in the Knowledge Center, which has over 25 learning modules on various aspects of substrate, irrigation, nutrient and pathogen management for nursery and greenhouse operations.

General information can be found at <http://waternut.org> and learning modules can be accessed at <http://waternut.org/moodle>

- **Maryland Nursery and Landscape Association Five-Year Economic Survey:** A five-year Economic Survey of nursery, greenhouse and landscape industries in Maryland is being conducted. Over 1000 surveys were mailed out in July 2013 to businesses across the state. Follow up continued through October 2013. The final report will be distributed at the Mid-Atlantic Nursery Trade Show in January 2014.

URBAN NUTRIENT MANAGEMENT

Master Gardener Program



UME Master Gardeners teach residents how to become soil stewards and minimize the negative impacts of fertilization practices on water quality. Master Gardeners are trained by UME field and campus faculty to “educate Maryland residents about safe, effective, and sustainable horticultural practices that build healthy gardens, landscapes, and communities.”

- Currently there are active programs in 20 of 23 counties and Baltimore City.
- Master Gardener trainees receive basic and advanced training in soils, fertilizers, and composting.
- One thousand, six hundred eighty-eight (1,688) volunteers donated over 104,000 hours of volunteer service to the state of Maryland.
- Master Gardeners operated 17 compost demonstration sites to educate homeowners about recycling yard and food waste. Five hundred forty-two (542) compost bins were distributed around the state.



The Home and Garden Information Center (HGIC) has 8 video clips and 11 fact sheets related to soils and fertilizers. HGIC’s Certified Professional Horticulturists answered 904 (7.6% of total) homeowner questions related to soil, fertilizer, and composting via a telephone and web-based question and answer service.

UME organized a one-day training class, *Better Yields through Better Soils Class* in February, 2013 at Cylburn Arboretum that attracted 143 registrants, including Master Gardeners, urban farmers, and community gardeners. Field and campus faculty gave all presentations and hands-on demonstrations.

For more information about the Master Gardener program, visit <https://extension.umd.edu/mg>



Photos from top to bottom: Compost bins help turn yard waste into compost at the Master Gardener demonstration site at the Frederick County extension office, red worms turn food scraps into vermicompost, and a master gardener shows how red worm composting turns food scraps into vermicompost.

Sheridan Street Community Garden

Staff in AGNR are facilitating the Sheridan Street Community Garden, located at the Center for Educational Partnership (CEP) in Riverdale, Maryland. As a part of the College of AGNR's outreach efforts, the community garden builds effective relationships among gardeners, encourages environmentally sound food production practices, and improves the nutrition of gardeners' families. Since its inception, community workshops provided opportunities to learn about nutrient management topics such as soil sampling and testing, using cover crops, and small-scale composting. The *Growing Community Gardens* conference, open to all community gardeners in Prince George's County, was held at the CEP and included information about rain barrels, weed identification and caring for home gardens year round. In addition, AGNR offered a rain barrel construction workshop at CEP. A UMD student intern at the CEP was invited to present her research to the Prince George's County Council about rain barrel use in urban areas, which resulted in the Council adopting legislation to offer a tax credit program for local residents who include rain barrels in their home and business landscapes.



Urban Agriculture

Baltimore, like many cities in the United States, is home to a nascent urban agriculture movement, often on park land or former home sites. Outreach by Extension staff to urban farmers provided information on sound cropping practices, business management and nutrient management regulations.

Photo: An urban garden in Baltimore, Maryland.

URBAN NUTRIENT MANAGEMENT, Continued

Fertilizer Use Act of 2011

The Fertilizer Use Act is a Maryland law that became effective October, 2013. HGIC faculty and Master Gardeners have been educating residents around the state about the new law. The statute institutes new guidelines for lawn fertilization, including:

- lawn fertilizer products sold in Maryland cannot contain phosphorus (with certain exceptions);
- new label requirements will ensure that no more than 0.9 pounds of total nitrogen is applied per 1,000 square feet and at least 20 percent of this nitrogen must be in a slow release form;
- all lawn care professionals must be certified to apply fertilizer; and
- fertilizer use will be prohibited between November 15 and March 1, within 15 feet of a waterway, or when heavy rain is predicted.

HGIC faculty and Master Gardeners worked closely with MDA staff in 2013 to review and distribute MDA outreach materials for homeowners.

*MDA's Fertilizer Use Act Fact Sheet can be found online:
http://www.mda.state.md.us/pdf/FertilizerLaw_Facts_final.pdf*

Turfgrass Nutrient Management

The Fertilizer Use Act of 2011 requires that professional lawn care companies have personnel certified as nutrient applicators. UME and MDA completed the Maryland Professional Lawn Care Manual, which resulted from a cooperative project among UMD, MDA, and members of the turfgrass industry.

*The Maryland Professional Lawn Care Manual is available can be found online:
<http://mda.maryland.gov/SiteAssets/MDAProLawnCareManual6.24.13.pdf>*

Bay-Wise Landscape Management

Bay-Wise training in 2013 focused on: the history and condition of the Chesapeake Bay; hydrology; wells and septic systems; lawn fertilizers, the Bay and the new Fertilizer Use Act of 2011; living roofs and walls; critical areas and coastal zone management; soil compaction; stormwater management; integrated pest management; and ecologically sound landscape maintenance.

- Seventy-four (74) new Master Gardener volunteers were trained in Bay-Wise Landscape Management techniques. To date, 1089 Master Gardeners from 21 counties and Baltimore City have been trained in Bay-Wise techniques.
- Thirty-six (36) additional Bay-Wise Master Gardeners had their personal landscapes certified as Bay-Wise demonstration sites by the Bay-Wise Landscape Management program, bringing the total to 476.
- To date, 1126 private properties (residential landscapes) have been certified as Bay-Wise by Master Gardeners in nineteen Maryland counties. An additional 146 public landscapes have also been certified as Bay-Wise by Master Gardeners throughout the state.

Behavioral changes resulting from learning Bay-Wise best management practices were highlighted in chapter 8 of the book, “Encouraging Adoption of Integrated Pest Management in Non-Agricultural Settings,” published by the American Chemical Society, ACS in December, 2011.

*For more information about the Bay-Wise Landscape Management Program, visit:
<http://extension.umd.edu/baywise>*



IN CLOSING

In 2013, the College of Agriculture and Natural Resources' nutrient management programs continued to conduct research on nutrient utilization in agronomic and horticultural crop production and animal nutrition, as well as educate the public on fertilizer management and sustainable horticultural practices. These research and education efforts allow the College's nutrient management initiatives to continue achieving their goal of improving and protecting the health of the Chesapeake Bay and Maryland's tidal and nontidal waterways while maximizing the state's economic potential.

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