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Agronomy News

The University of Maryland Extension Agriculture and Food Systems and Environment and Natural Resources Focus Teams proudly present this publication for commercial agronomic field crops and livestock industries.

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Agronomic Crop Insect Update

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Alfalfa

Be sure to check for alfalfa weevil adults and larvae within a week of cutting, especially if populations were above threshold before cutting. Feeding from both stages can hold back re-growth. After cutting, there needs to be enough "stubble" heat to control the weevils with a cutting. A stubble treatment will be needed if you find 2 or more weevils per stem and the population levels remain steady**.**

Field Corn

Be sure to watch for both cutworms and slugs feeding in newly emerged corn fields. As a general guideline, a treatment is recommended for cutworms if you find 10% leaf feeding or 3% cut plants. If cutworms are feeding below the soil surface, it will be important to treat as late in the day as possible, direct sprays to the base of the plants and use at least 30 gallons of water per acre. For cutworms, fields should be sampled through the 5-leaf stage for damage. If slugs are damaging plants, you will be able to see "slime trails" on the leaves.

Small Grains

We are just starting to find the first true armyworm moths in our light traps. As a reminder, both overwintering and migratory moth populations are responsible for our infestations. As indicated in previous newsletters, trap counts in Kentucky have been significantly greater than their rolling 5-year averages. The first grass sawflies and true armyworm larvae have been detected and cereal leaf beetle populations have increased in isolated field throughout the state. Research from Virginia and North Carolina indicates that the greatest damage from cereal leaf beetle can occur between flowering and the soft dough stage. Although armyworm can attack both wheat and barley, they can quickly cause significant losses in barley.

The first native brown stink bugs ***(not brown marmorated stink bugs)*** have also been found in barley and wheat. Information from states to our south indicates that wheat may be susceptible to native stink bug feeding at the milk and soft dough stages. Thresholds in the south for native stink bugs in wheat range from one per head to one per 5 to 10 heads. Currently, these detections are being found along field edges.

I have had a number of questions about an adult fly that can be easily found in no-till fields again this season. The fly is the banded wing /picture-wing fly and is present in fields due to the heavy covers in many fields. (http://bugguide.net/node/view/564782). Adult flies are generally attracted to rotting plant material and larvae develop on decaying organic material.

Cereal Leaf Beetle in Small Grains

By Ben Beale, Senior Agent
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Populations of Cereal Leaf Beetles have reached threshold levels in some wheat fields throughout Southern Maryland. Cereal Leaf Beetle larvae can damage small grain crops, particularly wheat, by removing green material between veins, leaving the plants with a bleached or white appearance. Larvae are slug like in appearance and are often covered with a layer of black slimy material. Eggs are elliptical in shape, laid singly in a row along leaf veins and are yellow to orange in appearance. Damage can occur quickly under higher populations and larger larvae. Growers are encouraged to scout fields to determine the level of cereal leave beetle larvae and eggs present. The new threshold level is **25 eggs or larvae per 100 stems, with more larvae found then eggs.** Note than cereal leaf beetle tends to show up unevenly throughout the field, so be sure to survey the entire field. According to North Carolina Extension, wheat is most sensitive to cereal leaf beetle at flag leaf emergence, followed by the boot stage. A good article on scouting Cereal Leaf Beetle is available from North Carolina here: http://entomology.ces.ncsu.edu/2015/04/should-you-spray-cereal-leaf-beetle/ A fact sheet on Cereal Leaf Beetle biology and management is available from Virginia/North Carolina Extension here: https://pubs.ext.vt.edu/444/444-350/444-350.html

Cereal Leaf Beetle Feeding Damage and Older Larva. Photo by Ben Beale 2015

Now is the Time to Finalize Plans for Scab Management in Maryland

By Arv Grybauskas, arvydas@umd.edu
Extension Plant Pathologist, University of Maryland

Wheat is beginning to head in southern Maryland and with warm weather will rapidly progress. Wheat will begin to flower later this week in southern Maryland and over the next two weeks enter the susceptible period from south to north. Currently conditions are too dry for significant disease development and fungicides are not required, but may change as thunderstorms and rainfall comes through. Check this website as your wheat approaches flowering to determine disease risk and whether or not there is a need for a fungicide application. Note the model this year has a new feature that incorporates varietal susceptibility. It can be changed in the Choose the Model section of the risk map. If you are unsure of varietal susceptibility go to www.scabsmart.org, click on the variety resistance section, and under SRWW - Southern region and click on the Virginia FHB data. The Maryland 2014 link at this site is observational information under low disease pressure.

The Virginia link may not cover all of our varieties. In that case go to www.psla.umd.edu/extension/md-crops and click on the link for small grains and get the 2013 Head Blight Evaluation. Variety resistance is more easily distinguished under higher disease pressure as in the 2013 MD evaluation and the 2014 Virginia report.

Remember if risk is high and wheat is flowering to about 6 days after flowering, a fungicide may be required to reduce toxin development in the grain. The small window for fungicide application requires pre-planning to be able to get effective suppression of the disease and of the toxin that can develop in infected wheat. The recommended fungicides are Prosaro and Caramba. Ground application must be made with nozzles facing forward (30 - 45 degrees forward) and traveling at least 6 mph to get adequate coverage of the heads. Similarly for adequate coverage of the heads air applications must be made at labeled volume rates.

For more details, go to the **FHB Risk assessment tool at http://www.wheatscab.psu.edu**

Wheat & Barley Scab Update

By Arv Grybauskas, arvydas@umd.edu
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For the latest news and updates from the U.S. Wheat & Barley Scab Initiative, go to http://www.scabusa.org

Here is the latest scab update:
Wheat has begun to flower in Southern Maryland and the Lower Eastern Shore and will progress through the state this week. The risk of a serious and widespread scab epidemic is low because conditions have not been favorable for high numbers of spores to be developed. However warm humid conditions coupled with showers that may develop over the next week to ten days will make it possible for some infection to occur on very susceptible and susceptible varieties. There is also an unconfirmed report of stripe rust in Southern Maryland. Therefore it is highly advisable to scout fields at or near flowering for signs of rust infection to determine your need for a fungicide application, and to continue to monitor this website for changes in scab risk. The fungicides, Prosaro and Caramba, registered for use at flowering for scab management are also effective against rust. See my previous comment posted on May 4 for sources of varietal resistance information and fungicide application comments. You can see the previous post by changing the Assessment date in the Weather Forecast Mode section of the risk assessment tool.

Small Grain Disease Scouting Update

By Nathan Kleczewski, nkleczew@udel.edu
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Stripe rust has been moving across Tennessee and was recently detected in Virginia. This is a cool season rust that does well when temperatures are between 60-70°F. However, it is still a good idea to keep an eye out for it because most of our varieties are very susceptible or lack information on susceptibility to this disease. Look for strips of light orange/yellow bumps on the foliage. If you rub these bumps between your fingers you likely will see an orange/yellow rusty residue. This will differ from common leaf rust, which tends to be scattered on the foliage and has a red/brown color and does better in warm temperatures. These pathogens most often blow in from warmer climates, so the upper canopy often is infected when they do occur.

Stripe rust on wheat foliage.


Close up of stripe rust on wheat. Note strips of yellow to orange pustules.


Common rust on wheat. Note scattered appearance and brown coloration of pustules.

Fusarium Head Blight Update

By Nathan Kleczewski, nkleczew@udel.edu
Extension Specialist, Plant Pathology;

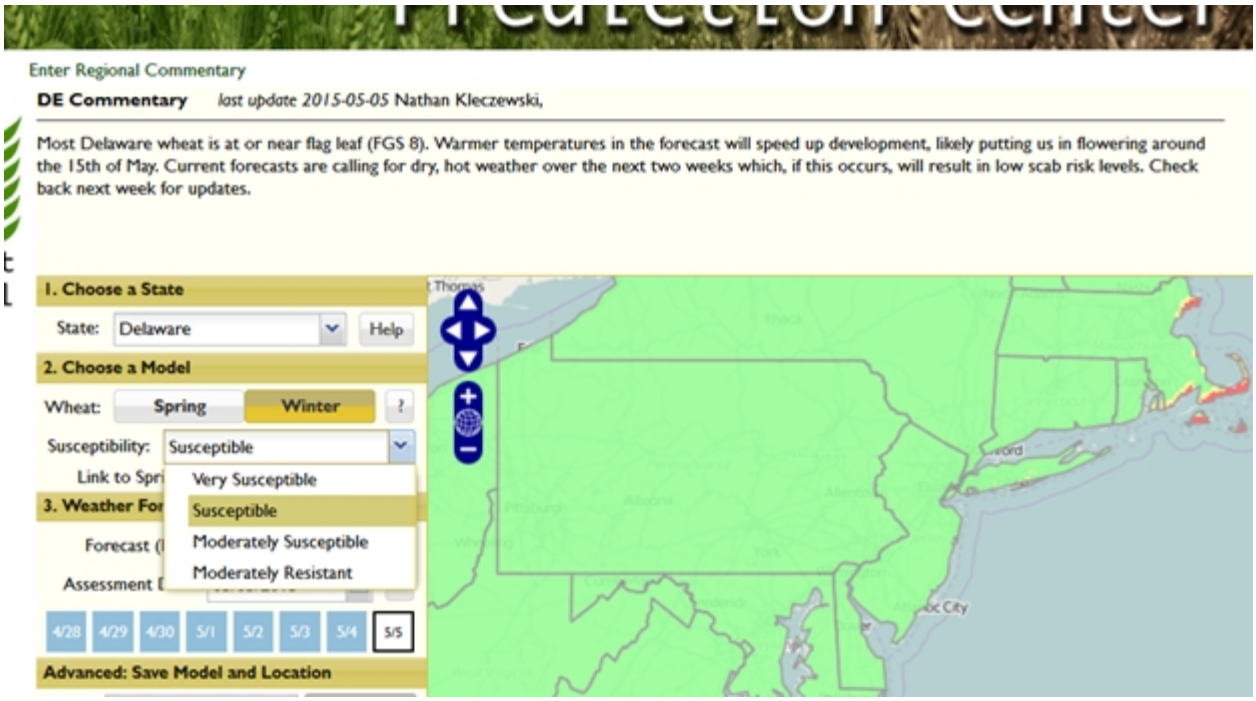
If you have not finalized your plans for Fusarium head scab, now is the time to do so. Wheat in Delaware is at flag leaf or just past, likely putting many people at the critical flowering period (FGS 10.5.1) right around the 15t^{h} of May. Overall this has been a quiet year for diseases of wheat and barley. Hopefully this will continue as we start filling grain.If you haven't done so already, make sure sign up for alerts from the Fusarium head blight prediction center (http://www.wheatscab.psu.edu/).

Don't forget to check this website regularly as your fields approach flowering. This year several changes have been made to the model. First, the group changed the model somewhat. This should improve the overall model accuracy. Second, you can now select a model based off of the susceptibility level of your wheat. Third, we have worked with the prediction center to have all of our DEOS systems integrated into the prediction model. This will greatly improve model resolution and accuracy for Delaware growers.

As far as management, you should already have your management strategy ready to go. Caramba and Prosaro are the most efficacious fungicides, reducing scab and vomitoxin by roughly 45-50% if applied at the proper timing and using recommended application strategies. The application window for head blight is at Feekes 10.5.1, when approximately 50% of the wheat heads in the field have started to flower. Applications can be made up to 6 days after the start of this time without significant dropoff in efficacy. Applications made earlier than flowering are not efficacious. If travelling over 10 mph application by ground rig should be made with nozzles facing forward (30-45 degrees) at 10-20 gallons

per acre. Aerial applications should be made at 5 gallons per acre. NIS at the lowest labeled rate may improve coverage. Also remember that products containing a strobilurin (QoI-FRAC group 11) active ingredient (e.g. Aproach Prima, Headline, Quadris, Quilt, Stratego, Priaxor) should not be applied to exposed heads as this may result in elevated vomitoxin in developing grain.

An example of the head blight prediction center webpage.
Note the new tab that allows you to select varietal susceptibility to head blight.



Corn Pre-Sidedress Soil Nitrate Test (PSNT)

By Brian Kalmbach, Nutrient Management Advisor, University of Maryland Extension – Talbot County
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Now that corn is in the ground and spring is beginning to give way to summer, it is time to start thinking about additional fertilizer needs for your crop. For many producers, the Pre-Sidedress Soil Nitrate Test (PSNT) can be a helpful tool in making sidedress nitrogen decisions in the best interest of both your grain or silage corn crop and your bottom line. The PSNT is a soil test that can accurately measure the quantity of nitrate in the soil available to your crop in fields that

- have received an organic nutrient source (manure or biosolids) within the last two years, or
- fields that had a forage legume grown in the past year.

The test is not recommended for fields where

- commercial fertilizer is the only nutrient source,
- on irrigated fields, or
- in fields where more than 50 lbs/acre of commercial nitrogen fertilizer was applied prior to sidedress.

The PSNT is conducted when the corn is between 6 and 12 inches tall and approaching its peak N uptake. Soil samples, collected from the top 12 inches of soil, can be tested at your county University of Maryland Extension office.

The following steps are important to insure accuracy.

- Collect 30-40 samples randomly throughout the field.
- Sample between corn rows, and be sure to avoid the fertilizer band and manure residues, as these may skew results.

Up to 3 fields may be combined for testing if they have:

- the same cropping history,
- the same fertility regime for the last 2 years, and
- the same application rate of the same manure this year.

Approximately 1 cup of soil from the composite samples is needed for the test. Soil should be air-dried as soon as possible after collection. Your Extension Nutrient Management Advisor will report the results of the PSNT and provide sidedress recommendations, if any. Contact your local Nutrient Management Advisor with any questions or to schedule a PSNT.

Offing Cover Crops for Weed Suppression: featuring the roller crimper and other mechanical contraptions

Cerruti R² Hooks, Amanda L. Buchanan, Guihua Chen & Armando Rosario-Lebron
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No-Till (NT) Cover Crop Termination

Cover crops are an integral component of conservation practices. As part of a vegetable or field crop's rotation system, cover crops are typically planted from late summer to early fall and terminated in the spring. The killed residue then acts as a dying mulch on the soil surface. Cover crops used as part of a money (cash) crop rotation system can provide a variety of ecosystem services, including enhanced soil quality and health, reduced nutrient losses via leaching, and pest suppression. In no-till cropping systems, producers generally use a "burn down" herbicide to off (terminate) their cover crops prior to planting their money crop. No-till and other conservation tillage practices may provide beneficial services that cannot be obtained from conventional tillage. No-till farming can reduce soil erosion, labor and fuel inputs, allow the build-up of soil organic matter and improve other soil features. In addition, NT cover crop rotation system may be a valuable tool for managing weeds. Research has shown that NT cover crop-soybean systems achieve greater weed suppression than intensively tilled soybean habitats.

While burn-down herbicides are common, there are non-chemical alternatives for offing cover crops that are compatible with no-till production. Mechanically offing cover crops limits soil disturbance and can help reduce synthetic chemical use. Mowing (e.g., bush hog rotary, flail mowing) is probably the most popular method for mechanically terminating cover crops. Another gadget, which is not as well known, is the undercutter-roller. This is a specialized implement, designed to slice shallowly through the soil and cut cover crop roots underground. It consists of a V-plow sweep blade mounted on a toolbar, followed by a rolling harrow to crimp and roll the cover crop as it falls to the ground, creating a thick and uniform mat of residue. Weed suppression was shown to be greater when an undercutter was used to off a cover crop versus a mower.

Enter the Cover-Crop Roller Crimper

One of the latest thingamajigs available for offing cover crops in no-till operations is the cover-crop roller-crimper (RC). The RC has made using cover crop residue to suppress weeds in NT operations more practical for organic farmers. While the act of terminating a cover crop with a roller-crimper, or what we refer to as "Big Crimpin", has not yet gone viral, it is steadily picking up steam. Though, the RC is sold at a limited number of establishments, its rapidly rising stardom should result in it being more widely accessible in the future. Roller crimpers are reported to have been adapted from equiment used in southern Brazil and Paraguay that lays cover crops down while crimping. A RC is essentially a cylinder with protuding fins that rotates on a lengthwise axis as it moves over the soil. It consists of a hollow drum (with the option of being filled with water for increased weight) and blunted blades meant to maximize force against cover crops without cutting their stems. The implement crimps the vascular tissue which leaves plants intact and attached to their roots. This results in a flattened uniform layer of mulch that persists on the soil surface since decomposition is slowed. Subsequently, weed suppression lasts longer than in mowed mulch habitats. In a study comparing rolled and flail-mowed rye, rolled rye had significantly fewer weeds during year 1, but were similar among the two tactics the following year. Still, RCs do not require an energy intensive power take-off (PTO) drive and thus require less fuel and energy than mowers; Additionally, RCs operate at much faster tractor speeds than flail mowers in effectively terminating cover crops. In addition, if a crimper is mounted on the front of the tractor, there is the potential to terminate the cover crop and plant the money crop in the same pass. Partially for these reasons, RCs are thought to be a more sustainable investment for offing cover crops.

Integrating Big Crimpin' with other tactics

To make the practice of cover cropping economically viable and more effective, additional management tactics may need to be added. Weed suppression through the use of cover crops should be used as part of an integrated weed management (IWM) program that includes numerous methods to help suppress weeds including ecological approaches. Timing of cover crop planting and termination can be used as an important tool to predict quantity and quality of cover crop biomass. Additional tactics could include adjusting crop row spacing and plant density, selecting competitive crop cultivars, adapting a high-residue cultivation system, and decreasing weed seed bank through intensive weed management in other crop sequence phases. Combining an effective herbicide with a roller crimper could offer the benefits of earlier and excellent cover crop control along with weed suppression. However, this may quicken residue breakdown. Multi-tactical weed management programs including rotational tillage (tilling soils every two years or less often), diverse crop rotations, and enhancement of money crop competiveness can play a role in IWM programs involving RCs and will be most effective if such acts concomitantly help deplete the weed seed bank. Further,

any management tactic that limits weed seed return to the soil is a vital component of IWM because it helps deplete weed seed banks and ultimately reduces weed pressure and management cost in the long run.

What cover crop should be used with the RC?

Most research conducted in the Northeast with respect to RCs has used cereal rye as the test cover crop. Many humans think of rye as a cover crop super hero. Rye doesn't wear a cape on the outside of its seed coat; however, rye is extremely cold tolerant so a cape is not practical. Other super natural powers of rye include: flexible establishment date, rapid emergence, ability to develop a fibrous root system, tolerance to low fertility soils, easy uptake of available nitrogen, weed suppression, and soil erosion prevention all in a single growing season. Grass cover crops such as rye, barley, spelt and triticale have a higher C:N compared to legumes (crimson clover, Austria winter pea, red clover, etc.). As such, residue mulches persist a considerably longer period of time after termination. The persistence of the grass residue results in longer-lasting soil coverage, which protects soils from erosion while preventing weed emergence. Further, grass cover crops are more capable of retrieving soil-applied nitrogen. The ability of grass cover crops to grow in winter/spring and sequester nutrients makes them an ideal RC partner, particularly in watersheds that suffer from excess nutrient runoffs such as the Chesapeake Bay Region of the United States. However, we tend to believe that the greatest amount of ecosystem services can be obtained by using cover crop mixtures and specifically mixing grass and legume species. Many legumes can be readily terminated with a RC at the flowering stage. Unfortunately, such mixtures especially those that include a legume may not be in compliance with state cover crop cost share programs.

Limitations of Physical Termination Methods

Each physical method used for offing cover crops has rewards and shortcomings. For example, mowing (e.g., rotary, flail, stalk chopper) may result in cover crop regrowth and unequal displacement of residue on the soil surface. Uniform ground cover is important if cover crop residue is to aid in weed suppression because weeds capitalize in niche spaces and germinate in areas without residue. In the past, producers wanting to suppress weeds mostly used a herbicide to off their cover crops. Mechanical methods were not cost effective and resulting cover crop residues were less persistent and uniform. Uniform ground cover can be obtained by using a flail mower with the appropriate cutting blades, but similar to other mowing instruments that macerate plant tissue, cover crop breakdown is hastened. Studies have shown that mowed mulch decomposition rate is accelerated compared to rolled mulches. Further, flail mowing requires a low tractor speed (2 to 5 mph) to effectively mow cover crop stands unless there is little biomass. Still mowers are versatile, easily available and more commonly owned.

Other potential disadvantages of using mechanical termination methods include cover crop "pop ups" (RC) and regrowth (mower) which may affect crop establishment. This generally occurs if the cover crop is mechanically terminated at an early development stage and/or in the case of the crimper there is not enough "crimper weight". These problems can be remedied by adding water inside the RC drum and offing the cover crop at the appropriate stage of development. For example, research has shown that it is important to delay mechanical termination of cereal rye until 50% of plants have reached anthesis (flowering) to prevent regrowth and ensure successful termination. In Pennsylvania, rye was consistently controlled at anthesis with a RC, but using a RC prior to this stage was less effective. Unfortunately, waiting for cover crops to flower can delay money crop planting. If the delay is significant, for example in the case of soybeans, yield reductions can occur. Further, soybean stands may be reduced if planted into a thick cover crop residue which decreases the seed-to-soil contact. This may be avoided by planting the soybean directly into standing cover crop and offing the cover crop while soybean seedlings are small enough to avoid being killed during cover crop termination. This tactic should reduce soybean seed-soil contact problems and subsequently improve weed management.

Recent advancements in crimper design has improved their efficiency and comfort. Tractor operators using older RC models felt they were riding an excessively vibrating dryer as opposed to big crimpin. Further, older RCs were less efficient in offing cover crops and planting into the cover crop mulch was not always easy. Despite improvements and the promise RC shows for cover crop termination, it is still not very effective in killing cover crops at earlier growth stages and is not useful for directly offing weeds; the sweep plow undercutter is likely a better bet for terminating young cover crops. Moreover, the RC is not as easily obtainable compared to other farming implements. Because a RC only crimps, it may not provide direct farm services beyond offing a cover crop and thus may not be a good investment for producers not cover cropping or using conservation tillage practices. Unlike mowers, RCs can't moonlight with landscapers.

How does the crimper compare to the burndown system

Successful weed management in no-till farming systems depends upon the use of reliable tactics that are not second-rate to synthetic herbicides. A study was conducted in Illinois to investigate the potential of the roller-crimper to inhibit weed development in a no-till soybean system with minimal or no reliance upon herbicides. As part of the investigation, they compared "Big Crimpin" with the "Burndown" tactic. Following

vetch or rye cover crop, crimping reduced weed biomass 26 and 56% more, respectively, than burndown. In contrast, burndown reduced weed biomass more in the no-cover crop control habitats, suggesting that the RC did not effectively kill weeds. Yield reduction caused by weed interference was unaffected by cover-crop termination method (RC or burndown) in soybean plots following rye, but yield lost was higher in RC than burndown treatment in both hairy vetch and control treatments. This study showed that using a RC to off a rye cover crop can reduce weeds and maintain high yields in no-till soybean. In production systems where herbicide use is an option, chemically offing the cover crop allows for termination at younger stages relative to mechanical termination and this reduces the risk of losing yield potential in some crops. However, using a RC to off a cover crop could be an important option for growers seeking a non-chemical method for managing weeds that minimizes labor, fuel costs and soil disturbances. This study found also that agronomic benefits of offing cover crops with a RC are contingent on cover crop species.

How do cover crops aid in weed management

Cover crops can aid in weed management as a living mulch by competing for resources such as sunlight, space and nutrients, and as a dead mulch on the soil surface that suppresses weed emergence. Surface mulch can inhibit weed growth by providing a physical barrier to weeds, intercepting light before it reaches weeds (reducing light availability), lowering soil surface temperature, physically blocking weed growth, and increasing weed seed predator populations. Cover crop mulches that reduce light levels at the soil surface slows photosynthesis and warming of soils in the spring. These conditions reduce weed seed germination and act as a physical barrier to their emergence. If weed management is mainly achieved by the cover crop physically blocking weed growth, cover crop biomass is critical. The level of weed suppression depends on the amount of cover crop biomass that accumulates prior to termination, with an exponential relationship between biomass and weed emergence. Depending on the amount of residue and termination method, sufficient weed control has been shown to last from 4 to 16 weeks into the season following cover crop termination.

Though biomass is critical for weed suppression, large amounts of cover crop residue at money crop planting time may be challenging to producers that direct seed. However, improvements in planter and drill technology have alleviated some of these NT planting pitfalls; and though excessive cover crop residue can be potentially challenging, more weeds may emerge in low levels of residue than in bare-ground plots. How is this possible? Low cover crop residue is not sufficient to inhibit weeds from emerging but can create environments more conducive for weed germination and emergence. Low residue can impede evaporation of soil moisture and thus provide more uniform moisture conditions for weed germination and emergence than would exist on the surface of bare-soil. Also, nitrogenous compounds released into the germination zone, particularly from legume cover crops, can stimulate certain weed species to germinate.

Some cover crops aid in weed suppression by releasing allelochemicals or allelopathic phytotoxins that are toxic to weed seeds. When residues of allelopathic cover crops decompose into the soil, phytotoxins may be released that inhibit the emergence and growth of many weed species. While allelopathic mechanisms of weed suppression have been well studied and are soundly understood for some cover crop species, there is little known about potential interactions between cover crop mixtures and weed seed germination and growth.

How to Better Manage Cover Crops for Weed Suppression

Termination technique. Cover crop choice is important, but cover crop termination technique and residue management are considered by some to be the most critical factors in successfully using cover crops for weed suppression. Cover crops can be terminated climatically (e.g., winterkill), naturally (e.g., senescent), chemically or via physical or mechanical tactics (e.g., plowing, disking, mowing, big-crimpin or undercutting). The most appropriate termination method will depend on the production objective and equipment fleet. For example, incorporation of cover crop (e.g., green manures) into the soil is most common when the goal is to increase soil nutrients. Weed suppression can be enhanced by incorporating cover crop residues that release greater amounts of allelochemicals within the soil. Tilling in the top growth of an allelopathic green manure causes an intense but relatively brief burst of allelopathic activity throughout the till depth but leaving the residue on the surface as an *in situ* mulch creates a shallow (less than one inch) but more persistent allelopathic zone that can last for 3 to 10 weeks depending on weather and soil conditions. Thus, no-till cover crop management offers a potential for selective suppression of small-seeded annual weeds in transplanted and large-seeded crops, whose roots grow mostly below the allelopathic zone. Thus, when weed management is a priority and allelopathy is needed to suppress shallow small-seeded weeds, termination of allelopathic cover crops resulting in maximum and extended surface residue and minimal soil disturbance has the greatest potential to inhibit weed seed germination, establishment and growth.

Cover crop biomass will vary widely depending on its growth stage at termination. The growth stage is partially influenced by timing of fall planting and spring termination. Most winter cover crops are not grown to full maturity, so achieving optimum biomass and soil coverage is difficult. Winter cover-crop biomass accumulates in spring, with low accrual early on and growth at break neck speed later in the spring. A study

showed that termination date in the spring had a greater influence on final cover crop biomass than planting date in the fall. For example, a delay in rye termination in the spring resulted in an increase in cover crop biomass and an associated decrease in summer annual weed populations. Rye termination delayed from May 01 to 30 resulted in an increase in cover crop biomass from 400 g m^{-2} to 1000 g m^{-2} and an associated reduction in weed density from 36 to 24 plants m^{-2}. In another study, delaying rye termination by 10 to 20 days nearly doubled its biomass, but did not consistently improve weed control. It was suggested that the earlier termination dates (April 24 to May 17) followed by soybean planting along with competitive rye contributed to these results. However, even at early termination, weed density and biomass were reduced compared with treatments without rye cover crop. In an effort to delay cover crop termination, the money crop could be sown into the living cover crop which is suppressed at a later date, or a shorter season money crop cultivar could be chosen which will allow it to be planted later in the season. If a cover crop has to be terminated early in the spring, another approach is to plant it early the previous fall and choose a cover crop that provides additional mechanisms of weed suppression such as allelopathic activity. Enhancing the synchrony between high cover-crop biomass and soil coverage, and weed emergence can improve weed management drastically.

Cover crop cultivar. Choosing the appropriate cover crop cultivar is critical. For instance, the problem associated with having to terminate a cover crop prior to it reaching maturity in spring may be overcome by using an early-maturing cultivar. This may allow greater flexibility of cover crop termination. Some cultivars may produce greater biomass compared to others. A study found that the rye cultivar 'Aroostook' consistently produced greater biomass than 'Wheeler'. Increasing cover crop seeding and fertilization rates are two additional tactics to increase cover crop biomass. However, applying fertilizer may be counter intuitive since cover crops are often planted to scavenge nitrogen from the soil profile. Further, it was shown that increasing rye biomass by applying poultry litter did not lower weed biomass. Weeds are known to disproportionately benefit from over fertilization, so that crop competitiveness can be increased by temporarily and spatially managing soil nutrient availability. Soybeans and other legumes that fix atmospheric nitrogen have a competitive edge over weeds when soil nitrogen levels are low.

Seeding rate. Increasing cover crop seeding rate can reduce weed biomass without an associated increase in cover crop biomass. An increase in rye seeding rate was shown to reduce weed biomass without an increase in rye biomass by time of termination. In the study, rye was planted at 90, 150 and 210 Kg seed ha^{-1} which is equivalent to 80, 135 and 185 lbs seed/a^{-1}, respectively. It is likely that the greater seeding rate increased cover crop residue coverage. It has been suggested that it is necessary to achieve 97% soil coverage with cover crop residue to reduce weed density by 75% with respect to light interception. Thus, tactics that increase the amount of soil surface coverage by cover crop residue could lead to greater and lengthy weed suppression.

Diversity. Increasing cover crop diversity may impact weeds differently as a mixture of cover crop species may more readily suppress a broader range of weed species. Using a single cover crop species is popular due to the simplicity of planting, uniform development, predictable growth stage and termination efficacy. However, mixed cover crop habitats may provide greater weed control by increasing the number of mechanisms that contribute to weed suppression. A mixture of cover crop species with complementary growth features could increase weed control by way of greater overall cover crop shoot biomass accumulation, appropriately timed degradation of residue, and a broader spectrum of allelopathic activity. Multi-species mixtures may enhance productivity, stability, resilience, and provide greater on-farm services than single species. In a study evaluating cover crop mixtures, it was found that increasing cover crop diversity increased biomass productivity in 2 of 3 study years and that diverse cover crop mixtures were more resilient following management error and severe weather disturbance.

Finishing statement

Whether conventional or organic, producers should rely on multiple weed suppression tactics. Various methods include crop rotation, flaming, weed seed predation, smother crops, competitive crop cultivars, cultivation, cover cropping and etc. Frequent cultivation is the core of many organic weed control programs. However, continuous cultivation has negative consequences on soil quality and health and increases input costs. Weed management tactics that integrates no-till practices with mechanically terminated cover crops should maximize ground coverage, minimize soil disturbances and avoid causing stand reductions of the money crop. In addition to manipulating cover crops for weed suppression, there is the potential to directly manipulate the money crop. For instance, planting soybean in narrower rows or increasing the seeding rate places greater emphasis on their competitive ability for weed suppression. This suggests that cover crops don't have to be a standalone approach and can be integrated with other tactics to formulate a successful IWM program that is less dependent on herbicide intervention.

Understanding the Lime Requirement

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Soil Buffering Capacity

Anyone paying close attention to soil test reports may notice several measurements for acidity, including a simple pH (water/soil mixture), buffer pH (mixed with a base), or Hydrogen (H) concentration. As a master variable, soil pH is immediately useful for predicting potential limits to agronomic yields. Ameliorating issues with pH is more complex though, as the chemistry of soils across Maryland will vary in their response to liming.

The issue with a simple soil pH is that it only measures "active" acidity, or what is in the soil water. There may also be additional acidity held in reserve on the soil's cation exchange capacity (CEC). This can mean that a simple pH may not measure the total amount of acid present, particularly in the soil has a high CEC. Any H neutralized by lime based on a simple pH measurement will be replenished by H (and Al) held in reserve on the CEC. Like all other soil properties, the amount of reserve acidity will vary between soil types and across the geologic provinces.

What does Buffer Capacity mean?

Grass strips are a conservation method to reduce the loss of soil through erosion, as well as "buffer" the stream from large influxes of sediment. For pH, buffering capacity is the ability of a soil to resist *rapid* change in pH through the addition of acids (fertilizers, organic matter) or bases (lime). If a soil has a *low* buffer capacity, the active acidity measured by a simple pH will closely match the total acidity, as well as the lime necessary to adjust the pH. However, if a soil has a large buffer capacity, lime will be needed to counter the active acidity, as well as the acidity held in reserve. This reserve acidity will slowly release from the CEC, also slowing the liming reaction. If the buffer capacity is ignored, then shortly after the active acidity is neutralized by lime, the reserve acidity will return the pH back to initial levels.

What are considered acids and bases in soils?

Soil pH measures the concentration of H in the soil water, which represents acidity. The counter ion, OH, is a base, and at equal concentrations (pH 7) they make water (H_2O). Aluminum (Al), while not actually an acid, produces acidity by splitting water (hydrolysis) and releasing additional H to the soil solution. This has led soil scientists to describe both H and Al as acidic cations (ions with a positive charge). To a smaller extent, Fe can also be considered an acidic cation, but most of the acidity in soils has been shown to be Al (even more than H).

All of the other cations measured for soil fertility (Ca, Mg, K, and Na) are considered basic, because they do not split water, and therefore do not contribute to acidity. If a soil has a base saturation of 80%, this indicates that the basic cations (Ca, Mg, K, and Na) make up 80% of the CEC, while H and Al make up the other 20%.

What causes some soils to be more acidic?

Soils with greater amounts of exchangeable Al on the CEC are more acidic, but how did they get this way? The simplest explanation is the leaching of basic cations, while will be greater the older and more weathered your soils are. Due to the greater temperatures and rainfall of the southeast, leaching of bases has led to more acidic soils. If the parent material a soil forms from (e.g. bedrock or sediments) can weather fast enough to add bases back to the soil, they maintain a moderate pH. Parent materials lacking a ready source of dissolvable nutrients (e.g. beach sand) are likely to be more acidic.

Agriculture can cause acidification of soils, as the removal of bases will occur with the harvest of crops, unless most of those residues are returned. Fertilizers, particularly those with ammonium (NH4), manure and organic matter may also add acidity to the soil in the form of H. The increased use of NH4 fertilizers and yields can lead to soil acidification, but the agricultural practice of liming soils can also ameliorate lower pH.

What soil properties increase buffer capacity?

Carbonates and aluminum hydroxides can be strong buffers at alkaline and acidic conditions, respectively. They exist at more extreme soil conditions than we see in Maryland, outside of soils forming from limestone. Instead, at our moderate pH (5.0-7.0), buffer capacity is determined by a soils ability to hold and exchange acids and bases (CEC). Therefore, soils with greater CECs can be considered to be well buffered. These will include soils with greater clay, oxides and humus (organic matter), which increase CEC and allow more acids (or bases) to be held in reserve.

Which reacts to lime first, active or reserve acidity?

When adding lime to a soil, pH can rapidly rise as it reacts with active acidity, possibly past the desired pH. Acidity held in reserve on the CEC will begin release slower, acidifying the soil solution and countering the lime. As long as the buffer capacity of the soil is well understood, the lime added will match the active and reserve acidity, and the desired pH will be achieved.

Al toxicity is a proven problem and liming can help

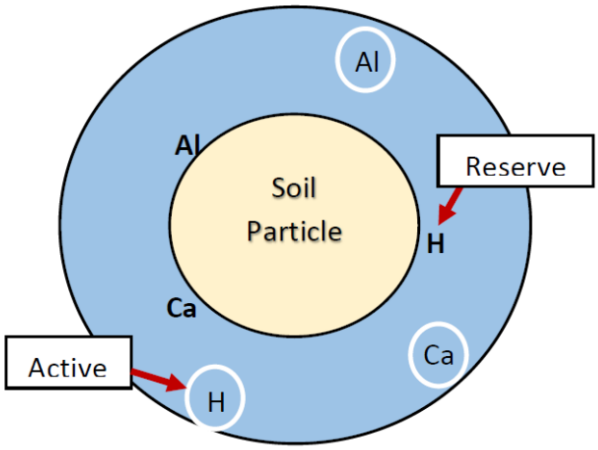
Aluminum in soils is complex, it can be exchangeable on the CEC, absorbed by organic matter, or in a less soluble solid form (hydroxide). The main concern for agronomic production is the exchangeable, free Al, which causes toxicity. Aluminum bound by organic matter or as a hydroxide is part of the *total* soil acidity, but it probably

doesn't affect plant roots. Exchangeable acidity is neutralized at pH 5.5, leaving organic bound and hydroxy Al as the remaining, less plant toxic acidity in the soil.

Soils can vary in the amount of exchangeable and non-exchangeable Al, and can be simplified by a discussion of parent material. Younger soils, with more complex minerals may need a base saturation of 80% to counter exchangeable Al and to reach a neutral pH. Older, weathered soils with simpler mineralogy and oxides will have more *non-exchangeable* Al, and can reach a neutral pH at lower base saturations. The same thing can be said for soils with greater organic matter, which will bind enough Al that lower pH's can reduce toxicity.

Acidity and Maryland Soils

As a general rule, soils on the Western Shore of the Bay have had more time to weather, while the Eastern Shore has soils formed from "newer" coastal sediments. The greater leaching of soils on the western side should increase their acidity, however, carbonate limestone in the ridge and valley may have more base cations than those soils forming from sandstones and shales. Piedmont soils have bedrock that can slowly replenish bases, but that may be occurring at depths below the plow layer. Eastern Shore soils, while forming in younger sediments, will also find themselves both lacking in bases and buffering capacity when their textures are dominated by quartz sands.



How do I use the buffer pH on my report?

Each lab in the Mid-Atlantic may perform a different test of a soils buffer capacity, based on the regional characteristics of their soils. Any recommendation for lime will be based on a target pH, such as 6.0 or 6.5. Any soil sample with a water pH above 7.0 will not have a buffer pH reported, as it is assumed you have no need to raise the pH further. If you do have a buffer pH within your soil analysis, the lower it is, the greater the exchangeable acidity is in your soil, and the more lime will be necessary. For example, a reported buffer pH of 6.9 may indicate little or no lime is needed, but a buffer pH of 6.0 indicates that your soil has additional reserve acidity.

Should I follow my lime recommendations?

Recommendations to raise the pH of your soil should be considered carefully. You may choose to follow the recommendations given, but be aware they may not reflect the conditions of your soil or crop needs, and are meant to be issued to a wide range of soil types.

Yield increases with lime have been tied to the amelioration of toxic Al, so that applying more lime than is necessary is not economic from an agronomic standpoint. Over-liming soils may also reduce the micronutrient content, creating a new and separate issue.

Therefore, as an agronomic producer, you should take time to understand the pH and buffer pH of your soil samples. Are you aware of fields where you had no time to bring to a higher pH prior to the growing season, but still yielded similar crops? Did you see micronutrient deficiencies at a field pH of 6.5 but not at 6.0. Were those similar soils? You can take the recommendations given and further define a lime program for your operation through an intimate knowledge of the landscape.

Star of Bethlehem Control

By Mark VanGessel
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Star of Bethlehem is a perennial with a very short life-cycle. It emerges in early spring and dies back about two months later. If fields have very high infestations the bulbs can interfere with planting, plants can compete with wheat, or plants can infest pastures. We initiated a trial last spring to examine Star of Bethlehem control in the spring and effectiveness of treatments one year later. Aim at 1.5 fl oz and Gramoxone at 2 qts were excellent for "burning down" emerged Star of Bethlehem plants last spring. Treatments of glyphosate at rates of 1.5 or 1.9 lbs ae/A [48 or 57 fl oz of Touchdown Total] were not effective for control of Star of Bethlehem in the spring. When rated this spring (April 6, 2015), Gramoxone treated plots had 93% Star of Bethlehem control, whereas two applications of glyphosate at 1.9 lbs ae each application provided 77% control and Aim did not reduce spring emergence the following year.

Gramoxone is often not considered an effective herbicide for killing bulbs or tubers. However, Gramoxone not only was highly effective for burning down emerged Star of Bethlehem, it also impacted the emergence one year later. Aim was also very effective for burning down Star of Bethlehem, but it had no impact on emergence the following spring.

Herbicide Choices for Palmer Amaranth

By Mark VanGessel
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"What is the best herbicide for use in fields infested with Palmer amaranth" has been a common question this spring. There are a number of products that could be used, the key is maximizing their effectiveness. Most of our Palmer amaranth plants are resistant to glyphosate and many are resistant to Group 2 herbicides, so we cannot rely on these products to provide control.

1. **Use the appropriate rate** (full rate for the soil type)

   For pre-packaged mixtures, examine what products are included and what rate of each product is being applied. There are a number of soybean herbicides that contain more than one active ingredient, but one or more of those active ingredients may be at a low rate. Sources for this information are the Corn or Soybean Weed Management Guide http://extension.udel.edu/ag/weed-science/weed-management-guides/. See table 3 page 8 in the Corn Guide or table 3 page 9 in the Soybean Guide as well as table 7 for typical use rates when used alone).

Soybean Herbicide Active Ingredients with Good Preemergence Control for Palmer Amaranth

Active Ingredient	Trade Name*
dimethenamid	Outlook
s-metolachlor	Dual Magnum
metolachlor	several
pendimethalin	Prowl
pyroxasulfone	Zidua/Anthem
flumioxazin	Valor
fomesafen	Reflex
linuron	Linex/Lorox
metribuzin	Tricor/Glory
sulfentrazone	Authority/Spartan

*Trade names given are only an example and others trade names may be available

Note many of the Palmer amaranth are Group 2 resistant so this group of herbicides was not included

Corn Herbicide Active Ingredients with Good Preemergence Control for Palmer Amaranth

Active Ingredient	Trade Name*
acetochlor	Harness/Surpass
alachlor	Intrro
dimethenamid	Outlook
s-metolachlor	Dual Magnum
metolachlor	several
pendimethalin	Prowl
pyroxasulfone	Zidua/Anthem
atrazine	several
isoxaflutole	Balance
mesotrione	Callisto
simazine	Princep

*Trade names given are only an example and others trade names may be available

Note many of the Palmer amaranth are Group 2 resistant so this group of herbicides was not included

2. **Apply the herbicides in a timely fashion.** Herbicides applied more than 7 days before planting means the postemergence herbicides must be applied earlier than normal. Be sure to use your residual herbicides close to planting so when the postemergence sprays are made about 4 weeks later, the crop is approaching canopy closure.

3. **Postemergence sprays will need to include a product that is highly effective on Palmer amaranth since most of our plants are glyphosate resistant. Applications need to be made to Palmer amaranth plants before they reach 4 inches; in most situations this is three to four weeks after the preemergence herbicide application has been made.**

   UD Weed Science has had consistent postemergence control in soybeans with PPO herbicides (Reflex, Blazer Ultra, or Goal); of these products Reflex will provide good residual control as well. Liberty (used with Liberty Link soybeans) has been very effective for Palmer amaranth, but does not provide any residual control.

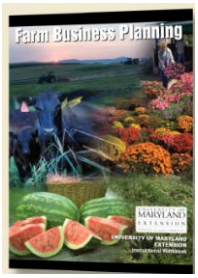
   In corn, HPPD herbicides such as Callisto, Impact/Armezon, or Laudis (all combined with 1 pt to 1 qt/A of atrazine) have provided very good control of Palmer amaranth. While all of these products will provide residual control, Callisto provides the longest residual control. If an HPPD herbicide (Group 27) will be used postemergence, refer to the herbicide labels

to determine if there are limits on use of an HPPD herbicide at planting. In most situations, if a HPPD-inhibiting herbicide will be use postemergence, there is seldom benefit for using one at planting. Dicamba is also effective for postemergnece control of Palmer amaranth, but it does not provide effective residual control.

4. **Finally, we have not seen any triazine-resistant Palmer amaranth in the region. But as we use more triazines (atrazine, metribuzin, and simazine) for Palmer amaranth control, we need to be sure we also incorporate other effective herbicide groups for our soil-applied treatments.**

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0124915
A news release is featured here:
https://cmns.umd.edu/news-events/features/3022

Farm Business Planning is a BIG Deal!



Farm Business Planning Workbook Revised, 2014 University of Maryland Extension is available in three formats:

1. PDF
2. Issuu (Digital Reader Platform)
3. MS Word Edition

Article of Interest

"The Contribution of Pesticides to Pest Management in Meeting the Global Need for Food Production by 2050"

The CAST (Council for Agricultural Science and Technology) article entitled, ***The Contribution of Pesticides to Pest Management in Meeting the Global Need for food Production by 2050*** summarizes topics and issues regarding the use of pesticides in a scientific and responsible manner.

View the article at:

http://www.cast-science.org/news/?new_cast_issue_paper_about_the_significance_of_pesticides&show=news&newsID=19397

MDA Revises Poultry Fair & Show Policy as High Path Avian Influenza Spreads in MidWest

All Poultry Must be Tested 10 Days Prior to Entry; Waterfowl Prohibited from Shows

ANNAPOLIS, MD (May 11, 2015) – As highly pathogenic avian influenza continues to spread in midwestern states, the Maryland Department of Agriculture, in an abundance of caution, has revised its 2015 Fair and Show Requirements for poultry.

Effective immediately, waterfowl will be not allowed to enter Maryland Fairs and Shows. All poultry both in state and out of state poultry must be tested for avian influenza within 10 days prior to entry, or originate from a NPIP Avian Influenza Clean or Monitored flock. The revised policy is available online at: http://mda.maryland.gov/Documents/MDAfairshowpolicyrev5.8.15.pdf

At this time, the MDA is not ordering the closure of Maryland Fairs and Shows to poultry other than for waterfowl. However, MDA is constantly monitoring the situation. If highly pathogenic avian influenza enters our region, MDA will order a complete closure of all poultry from Maryland fairs and shows.

Any questions, please call the MDA Animal Health Program at 410-841-5810.

Porcine Epidemic Diarrhea Virus (PEDv) Confirmed in Maryland

Swine Producers Alerted to Take Precautions

Annapolis (May 5, 2015) – The Maryland Depart. of Agriculture (MDA) has confirmed a new case of Porcine Epidemic Diarrhea Virus (PEDv) in Central Maryland and is alerting swine producers across the state to take proper precautions to protect their herds. PEDv only infects pigs, poses no known public health threat and is not a food safety concern. Mortality rates, however, can be as high as 100 percent in suckling and early weaned pigs.

PEDv was first diagnosed in Great Britain in 1971, and Europe has had periodic outbreaks ever since. The disease was confirmed in the United States in May 2013. It was confirmed in Maryland in November 2013. That case was contained. The latest case was confirmed in late April 2015 and a hold order has been placed on that farm to contain the disease.

Primary clinical signs of the disease are: severe diarrhea in pigs of all ages, vomiting and high morbidity and mortality. It is generally spread among pigs and by infected feces transported into pig areas by trucks, boots, clothing, and the like. Once infected, the

incubation period is very short (12-24 hours) and the virus is shed for 7-10 days. Producers who raise swine are encouraged to follow strict biosecurity methods and undertake disinfection procedures, which include the following:

- Limiting traffic (people and equipment) onto the farm;
- Thoroughly cleaning and disinfecting anything coming onto the farm;
- Enforcing downtime requirements and maintaining a log of visitors;
- Taking care when disposing of dead stock particularly if using a communal disposal method;
- Isolating newly arriving animals and continuing to vet discussions about animal health at the herd of origin; and
- Showering before going into the facility where practical and changing into clean boots and coveralls (veterinarians should also be careful not to track the virus between herds on their person, equipment or vehicles).

Producers who suspect their pigs are sick should contact their veterinarian immediately.

In June 2014, the USDA made PEDv a "reportable disease," which are diseases of great public health concern. PEDv cases must be reported to MDA and to District 1, USDA, APHIS, VS, Area Epidemiology Officer Dr. Gillian Comyn at 804-343-2563 or by e-mail gillian.a.comyn@aphis.usda.gov. More information and fact sheets on PEDv are available from the American Association of Swine Veterinarians here.
Contact: Maryland Department of Agriculture Animal Health Section, 410-841- 5810

JOB POSTING

The search for a Nutrient Management Advisor for the UME Queen Anne County office is underway. If you know of anyone who might be interested in the position, please refer them to https://ejobs.umd.edu/postings/33388

The closing date is June 12, 2015.

2015 International Year of Soils

BRANCHING OUT
Maryland's Forest Stewardship Educator

A new issue of Branching Out is now available!

The Spring 2015 issue is available through the website:
Branching Out Vol. 23, No. 1 ~ Spring 2015
https://extension.umd.edu/news/newsletters/spring-2015-0

Branching Out provides educational information and current news and events, and is intended to reach anyone interested in forest stewardship, including landowners and natural resource professionals.
We encourage you to share this free newsletter with others and to invite them to subscribe at http://extension.umd.edu/woodland/subscribe-branching-out View past issues at: http://extension.umd.edu/publication-series/branching-out
Visit the website: http://extension.umd.edu/woodland

Agronomy News

A timely publication for commercial agronomic field crops and livestock industries available electronically in 2015 from April through October on the following dates: April 16; May 14; June 11; July 9; August 13; September 10; and October 22.

Published by the University of Maryland Extension Focus Teams 1) Agriculture and Food Systems; and 2) Environment and Natural Resources.

Submit Articles to:
Editor,
R. David Myers, Extension Educator
Agriculture and Natural Resources
97 Dairy Lane
Gambrills, MD 21054
410 222-3906
myersrd@umd.edu

Article submission deadlines for 2015 at 4:30 p.m. on: April 15; May 13; June 10; July 8; August 12; September 9; and October 21.

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