Options for Freeze Damaged Wheat
Greg Halich, Extension Economist, University of Kentucky

This article was originally published on the March 29, 2017 University of Kentucky Grain Crops Update. Although our weather has been a little different, readers may find the economic analyses interesting.

A severe freeze in mid-March has likely damaged much of the wheat crop in Kentucky. The extent and severity of the damage will be better known one to two weeks after the freeze when baseline estimates can be made. Normally, producers would have three options to deal with wheat stands that have been damaged at this stage:

1) Stay the course, harvest the wheat and then double-crop soybeans.
2) Terminate the wheat stand and plant corn.
3) Terminate the wheat stand and plant full-season soybeans.

However, given the current profitability advantage of full-season soybeans over corn for the 2017 crop, the decision this year would mainly be keeping the wheat or terminating the crop and planting full-season soybeans (keeping the rotation). The best option will depend on the extent of the damage to the wheat crop and the relative productivity potential and price levels for wheat and soybeans.

Note that if you have forwarded-contracted a portion of your wheat crop your options will be limited by your forward contract obligations. Producers who have forward-contracted should contact the elevator to understand their options.

Soybeans are assumed to sell for $9.75/bu. and wheat at $4.45/bu. in this analysis. Table 1 shows the soil productivity levels used. Note that there are three primary productivity levels (one each for corn and full-season soybeans) and two wheat yield levels for each corn and soybean productivity level. This gives six productivity scenarios. Note that the corn yield levels are shown for illustrative purposes only as many farmers think of general soil productivity relative to corn yields. They are not used in the analysis as the comparison is between wheat + double-crop soybeans and full-season soybeans.

The estimated wheat yield loss will have the greatest impact on the analysis, and wheat yield losses from 20-50% are used. Obviously, the higher the wheat yield

<table>
<thead>
<tr>
<th>Table 1: Soil Productivity Levels and Yields</th>
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<td>Soil</td>
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loss, the more likely full-season soybeans would be the more profitable option. This estimate is the most critical portion of the analysis. Consult with your County Extension Agent to help with this estimate.

Soybeans double-cropped after wheat harvest will generally experience a yield decline over full-season soybeans due to the shorter growing season. Typically, the yield penalty for soybeans averages around 20% but there is concern that the wheat harvest could be delayed this year due to the damage, resulting in a shortened growing season for the double-cropped soybeans. Overall yield losses for double-crop soybeans from 17.5 to 25% are used in this analysis, allowing the reader to pick the estimate most representative for their situation.

Only those costs for wheat/double-crop soybeans that would be in addition to full-season soybeans should be included. Seeding costs for the wheat, previous applications of nitrogen, and previous applications of pesticides are not relevant at this point in time. The additional costs for the wheat crop would likely be herbicides/fungicide sprayings, harvesting, and trucking costs. Total additional costs of $75 for the wheat crop are used in this analysis. If your estimated costs are different, the results can be easily adjusted, as will be explained later.

The results are summarized in Tables 2 through 5 based on soil productivity levels. Tables 2 and 3 show 200-bushel corn and 60-bushel soybean (full-season) ground with two different wheat yields, 80 and 90 bushels. These wheat yields are what would normally be expected, and not the final yield after the freeze. The tables show expected wheat losses from the freeze from 20 to 50% compared to the base yield. The tables also show the double-crop soybean yields relative to what you would expect for full-season soybeans ranging from 17.5 to 25%.

The results for 200 bu. corn ground and 80 bu. wheat ground are show in Table 2. For example, if you expected a 30% wheat loss and a 20% yield drop in double-crop soybeans, the table shows $54. The $54 means that you would expect your net return to be $54 higher by keeping the wheat crop compared to terminating the crop and planting full-season soybeans. Positive values indicate an advantage to keeping the wheat crop; negative values indicate an advantage to terminating the wheat crop and planting full-season soybeans. Thus in this scenario, at a 40% wheat yield loss, double-crop soybeans would have to yield 25% less than full-season soybeans before it would make sense to terminate the wheat crop. With a 50% wheat yield loss, all the scenarios favored terminating the wheat crop.

Table 3 shows the results for the same scenario except that normal wheat yields are expected to be 90 bu rather than 80 bu. This will reduce the situations where terminating the wheat crop would be warranted. There are only two scenarios at 50% wheat yield loss where this would make sense with the higher wheat productivity.
Tables 4 and 5 show the next tier of soil productivity levels: 175 bu. corn, 55 bu. full-season soybeans, and either 70 or 80 bu. wheat. The results pretty much follow those for the previous two tables. There are just a few more scenarios where it would make sense to terminate the wheat crop.

<table>
<thead>
<tr>
<th>Wheat Yield Loss</th>
<th>Yield Loss Double-Crop Soybeans 17.5%</th>
<th>Yield Loss Double-Crop Soybeans 20%</th>
<th>Yield Loss Double-Crop Soybeans 22.5%</th>
<th>Yield Loss Double-Crop Soybeans 25%</th>
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<td>20%</td>
<td>$77</td>
<td>$64</td>
<td>$51</td>
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<td>40%</td>
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<td>50%</td>
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Note: Positive $'s favor Wheat/Soybeans; Negative $'s favor full season soybeans.

How to Modify the Analysis
This analysis used $75 in additional costs for the combined wheat and double-crop soybeans compared to terminating the crop and planting full-season soybeans. If your expected costs are different from this, the analysis can be easily modified. For example, if your estimates were $25 lower costs, then you would add the $25 to each cell in the summary tables. If your estimates were $25 higher costs, then you would subtract the $25 from each cell in the summary tables.

Producers may have the option of harvesting the damaged wheat for silage before planting full-season soybeans. If this silage has a positive net value (value of the silage minus the costs), you would subtract the net value of this silage (on a per acre basis) from the cells in the appropriate table. Aside from the obvious costs to making the silage, be sure to account for additional fertilizer value you would be removing from the silage crop (particularly K). Producers should make certain that any pesticides used in production of the wheat are labeled for feed use. Testing is also highly recommended to make certain that nitrate levels are safe for feed.

Crop Insurance
Producers need to factor in potential crop insurance payments. It is important to understand that insurance payments that affect all options equally should not be included in the analysis. If payments are received regardless of what the producer does, then they will not change the analysis to favor one option over the other. Only payment differences between terminating the wheat or keeping it full-term should be used.

First and foremost, producers with wheat that has been potentially damaged should contact their crop insurance agent. Preliminary discussion with some of these agents indicate they may not be as lenient in releasing wheat-damaged crops for other purposes as they were after the wheat freeze of 2007. Find out what your crop insurance options are likely to be taking the wheat to full term as well as terminating the wheat and planting full-season soybeans.

Summary
Without accounting for crop insurance differences or potential wheat silage value, it appears that wheat stand yields would have to be reduced by at least 30% and more likely 40 to 50% before it would be more profitable to terminate the wheat stand and plant full-season soybeans. Given these results, producers should be careful before spraying-down wheat stands before they get an accurate assessment of the damage. Wheat stands harvested after the 2007 freeze generally did better than initial predicted. Make sure you contact your crop insurance agent to find out what your options are this year.
Forage Crops and Micronutrients
Jarrod O. Miller, Extension Educator, Somerset County

In many cropping systems micronutrients may be overlooked until a problem arises. These nutrients are needed in such small quantities that it often takes certain soil types (e.g. sandy) or conditions for deficiencies to occur. There are seven commonly discussed micronutrients for crops, known as boron (B), chloride (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn). Other important micronutrients in forage systems is cobalt (Co) and selenium (Se). Of those two, Se is important for livestock, but not considered an essential plant nutrient.

Whether we are dealing with grain crops or forages, soil texture and pH can tell you a lot about micronutrient availability. Crops are more likely to show deficiencies in micronutrients (except Mo) when pH rises above 6.5. Sandy soils are naturally deficient in micronutrients due to parent material, increased drainage and minimal cation exchange capacity. In addition, both Mo and B are likely to leach from sandy soils due to their negative charge. Soils with high organic matter (peaty, swamp type soils) may also adsorb and limit micronutrient availability. At high pH (>7) in Maryland, Mn, Cu and Zn are the most likely to be an issue, even when soil levels may appear adequate.

Most forages shouldn’t have micronutrient issues if pH is managed properly, however, two of the micronutrients (B and Mo) can be a problem where legumes are planted. Research worldwide has observed that legumes (alfalfa, clover, soybeans) are more sensitive to B and Mo deficiencies than grasses. Both B and Mo are important in nodule formation and nitrogen fixation, so their lack will be noticeable in legume crops.

Boron tends to leach easily from sandy soils and is the only non-metal of the micronutrients. In alfalfa, B deficiency results in yellow/red young leaves and prevents flower formation. Alfalfa is more sensitive than clover to a lack of boron. Soil applications of 0.5 to 1.0 lb/acre of B on sandy (or soils low in B) can make up for deficiencies.

Molybdenum is the only micronutrient to become more available as pH rises. It readily adsorbs to iron oxides, so it can be a problem in acid, weathered soils. Oxides are typically higher in clay textured soils, which show a better response to Mo availability with liming than sandy soils. Grasses will respond to Mo fertilization, but not as much as legumes. Alfalfa is more sensitive than both soybeans and clover to a lack of Mo. Due to the low concentration of Mo in most soils, tissue test may be a better indicator of plant deficiencies. Seed treatments for Mo are recommended (0.5 oz/acre) or foliar applications of 2-3 oz/acre.

Tissue tests are also better indicators for Co and Se deficiencies in plants. While Co is essential to the nitrogenase enzyme for plant growth, Se has shown no essential plant function. Animals do require Se, and can receive it through mineral supplements as well as forages. Typically it is recommended to supplement animal diets, however soil fertilization has shown positive results. In Oregon, applications of 0.52 lb Se/acre increase the Se content of forage clippings as well as the blood levels of grazing animals. It was not recommended to both fertilize and supplement animal feeds though.

In summary, soil tests can reveal micronutrient deficiencies, but tissue tests can be more effective at determining actual bioavailability. In most cases maintaining a pH 6.0-6.5 will cover most micronutrient issues. Alfalfa, which prefers a pH close to 7 for nodulation, should be scouted more often on sandy soils if a higher pH is desired.

- Kelling, K.A. Soil and Applied Molybdenum (A3555). University of Wisconsin
Sorghum Growers Encouraged to Keep an Eye Out for Sugarcane Aphid this Season

Kelly Hamby, Extension Specialist, University of Maryland (kahamby@umd.edu)
Ben Beale, Extension Educator, St. Mary’s County (bbeale@umd.edu)

Sugarcane Aphid was found late last fall in Charles County, Maryland in a sorghum field that was being harvested for grain. Aphid populations were very high, with feeding present in the grain head and leaves. This is the first time that sugarcane aphid has been found in Maryland. While this aphid has caused substantial losses to sorghum in states to our South, it is unknown if the aphid will be present early enough and at high enough populations to cause significant injury in Maryland. Growers are encouraged to monitor sorghum fields through the summer for the presence of sugarcane aphid. We suspect sugarcane aphids are most likely to arrive later in the season in Maryland.

The sugarcane aphid is a relatively new pest of sorghum. As the name implies, the sugarcane aphid was historically only a pest of sugarcane fields. It was first found in the United States in 1977 in Florida and moved slowly throughout the sugarcane regions of the southeast. However, it started showing up as a major pest in sorghum fields in 2013 in the sorghum producing regions of Louisiana and Texas. It has since migrated through most of the southeast causing significant injury to sorghum. It was found as far north as Virginia in the 2015 and 2016 season. It is still unclear if this is a new biotype introduced from South America capable of infesting sorghum, or if there was a shift in the aphid populations in sugarcane in the southeast US adapted to sorghum. However the shift occurred, sugarcane aphid is now the most significant insect pest of sorghum in the US.

Lifecycle:
Sugarcane aphids require a living host to survive. The aphids will overwinter in the warmer regions of the southeast United States on volunteer sorghum, johnsongrass or sorghum-sudan grass. They begin their migration north as spring temperatures warm. The winged adults can be carried long distances on wind currents. Sugarcane aphids are all female who give birth to live pregnant young. Young immature aphids mature to adults in only 5 days and live for up to four weeks. These characteristics allow sugarcane aphid populations to increase very quickly, especially during the hot summer months. As with other aphids, sugarcane aphids have piercing/sucking mouthparts that are used to extract nutrients from plant sap.

Sugarcane aphids feed on the underside of leaves towards the base of the plants. Once the plants head out, the aphids will feed in the grain head. The sugarcane aphid produces large amounts of a sugary sticky substance called honeydew. Leaves will often appear glossy or shiny, gray or may be covered in a black sooty mold. The honeydew substance can gum up combine heads and prevent harvest. These aphids will feed on sorghum all the way through harvest. If infestation occurs early enough, sugarcane aphids can greatly reduce yield potential and even kill plants. In Maryland, we expect the aphid to occur much later in the season, if at all, with the potential to cause some yield loss, reduction in test weight and potential harvesting issues.

Identification:
There are several species of aphids capable of infesting sorghum. Sugarcane aphid can be distinguished from other aphids by black feet, antennae and cornicles (tailpipes) (See Figure 1). The overall body is normally a yellow, gray or tan color. Adults are typically wingless, however can develop wings, especially when confronted with stress or adverse conditions. If you find aphids in sorghum, please contact your local Extension Agent for help in confirming their identification.

Scouting and Management:
Because sugarcane aphid populations increase quickly and cause damage through harvest, growers must scout regularly for the presence of this new pest. Scouting should occur once a week, and once sugarcane aphid has been detected in a field scouting should take place at least twice a week. Keep an eye out for when the aphid arrives

Dectes Stem Borer Fields WANTED

UMD researchers are looking for soybean fields on the Eastern Shore of Maryland with a history of Dectes Stem Borer damage to conduct research on during the summer of 2017. Study objectives include: DSB adult emergence time and yield loss from DSB feeding.

For more information please contact Emily Zobel
410-228-8800
ezobel@umd.edu

Research funded by the Maryland Soybean Board
in Virginia because population levels in the south may also be helpful in predicting their arrival in Maryland. Researchers have evaluated sorghum varieties for resistance to the sugarcane aphid and have found some varieties that are more tolerant of aphid infestations. A list of available varieties may be found on the Sorghum Checkoff website at: http://www.sorghumcheckoff.com/newsroom/2016/03/28/sugarcane-aphid

Threshold levels:
Because the sugarcane aphid is a newer problem to our region, recommended threshold levels vary and are based on what is recommend in other areas. Treatment is justified when 50-125 aphids per leaf are present on 25% of plants. To avoid yield loss, insecticide applications must occur soon after threshold populations have reached. Texas A&M has produced a scouting guide to help estimate the number of aphids per leaf: http://ccag.tamu.edu/files/2016/04/NT0043.pdf

Treatment:
ALWAYS read and follow all instructions on the pesticide label; the information presented here does not substitute for label instructions. Sivanto 200 SL (IRAC Group 4D, Bayer CropScience) is registered for use in sorghum in Maryland and has a section 2(ee) label for reduced rates (a lower 4-5 ounce rate works well at threshold, for higher numbers a higher rate may be justified). Sivanto Prime (IRAC Group 4D, Bayer CropScience) may also be used (excepting sweet sorghum) but reduced rates have not been labeled. One application should be enough in most situations, unless populations are well above threshold during the first application. Control should be evaluated 4 days after application to ensure that populations have been reduced below threshold. It is important to obtain good spray coverage. A minimum of 10 gallons per acre spray volume is required for ground applications to ensure adequate coverage. 20 gallons per acres is preferred. Also note that Transform WG (IRAC Group 4C, Dow AgroSciences) is often recommended for use in other states but is NOT registered for use in sorghum in Maryland and thus cannot be used. Pyrethroids (IRAC Group 3A) such as Warrior, Baythroid or Asana are not recommended for sugarcane aphid as they are not very effective against this pest and may kill natural enemies resulting a spike in aphid populations after application.

References and Other Resources:
Agriculture Weather Report

CPC April 2017 Temperature Outlook

Temperatures in the region are predicted to be warmer than normal over the next month. Precipitation is expected to be normal over the next month, but below normal during the week most planting will begin.

CPC April 14-20 Precipitation Outlook

CPC April 2017 Precipitation Outlook

U.S. Drought Monitor
Maryland

Intensity:
- D0 (Abnormally Dry)
- D1 (Moderate Drought)
- D2 (Severe Drought)
- D3 (Exceptional Drought)
- D4 (Exceptional Drought)
Management of Palmer Amaranth
Ben Beale; UME Extension Educator St. Mary's County
Burkhard Schulz; UMD Weed Specialist

Palmer amaranth is a new aggressive pigweed that is now present throughout Southern Maryland and the Eastern Shore. All Palmer amaranth samples tested in Maryland were resistant to glyphosate and ALS herbicide chemistry. Palmer amaranth is native to the arid desert regions of the Southwest United States and Northern Mexico. It has gradually moved throughout the Southeastern Cotton belt as a major weed of soybean and cotton. The plant is well adapted to germinate and grow rapidly in the presence of moisture. In our region, Palmer amaranth germination begins in late April to early May and will continue throughout the summer. This weed is a prolific seed producer with female plants being capable of producing more than ½ million seeds of very small size. Due to its aggressive growth rate, high seed production and tolerance to both glyphosate and ALS chemistry, it has become a major weed of grain and vegetable crops in the region. Besides resistance to the two sites of action that are found on the Delmarva (glyphosate and ALS inhibitors), resistance against atrazine herbicides (NC), HPPD (NC), trifluralin (SC, TN) and PPO herbicides (NC, AR, MS) has been reported in many Southern states.

Key management steps:

• Learn to identify Palmer amaranth. The easiest way to manage Palmer amaranth is to recognize and eliminate Palmer amaranth plants before they produce seeds and proliferate. If you see pigweed plants that survive glyphosate application, be sure to take extra time to identify those plants. (For identification guide refer to UMD Agronomy News Oct. 2015 (https://extension.umd.edu/sites/extension.umd.edu/files/_docs/newsletters/AgronomyNews6-7.pdf)

• Start clean. Options for effective post-emergent control in soybean are limited and the few options available must be used when Palmer amaranth plants are less than 4 inches tall. Palmer amaranth plants bigger than 4 inches are often only partly suppressed by herbicides and will grow back after a period of recovery. Fields should be clean of all Palmer amaranth before the crop emerges. Gramoxone® is an effective burn down treatment for smaller plants provided it is applied with adequate water and coverage is good.

• Use an effective residual herbicide as close to planting as possible. Residual herbicides will provide 3-4 weeks of control in most cases. This added control might not seem like much, but it gives the soybean more time to establish a closed canopy and provides added time to apply post-emergent controls. Residuals need to be applied close to planting as possible to extend the period of control as far into the growing season as possible. Results from trials conducted in Maryland indicate significantly better control of Palmer amaranth with the use of any residual product when compared to a non-treated control. Products with flumioxazin (Valor) including premixes of Fierce or Fierce XLT or products with sulfentrazone (Authority) including premixes Broadaxe, Authority Elite, Authority MTZ provided the most consistent control. The use of a residual herbicides also provides significant differences in weed height over the length of the season. This is especially advantageous in that it provides a longer period for the timely and thus effective application of post-emergent herbicides. Be sure to read labels carefully for factors such as rates and plant-back restrictions.

• Table indicating the number of emerged Palmer amaranth plants over time. The number of emerged palmer plants was recorded from individual plots starting 10 days after treatment and every 7 days thereafter.

• Tank-mix residual products: Tank-mixing products with different modes of action often results in better control than either product applied alone. Dual®, Prowl®, Zidua®, and Metribuzin® are good examples of tank-mix partners for many residual products. There are many premix formulations currently available. Note the Dual cannot be tank mixed with Valor or crop injury may occur.

• Scout fields frequently for any emerged Palmer amaranth plants. It is critical to apply products on time before Palmer amaranth is too large.

• Apply an effective post-emergent herbicide before Palmer amaranth plants reach 3-4 inches in height. This means having a sprayer and operator ready to go when needed. For populations that are ALS resistant, the choices are limited to diphenylether herbicides such as Reflex®, Flexstar® (reflex + glyphosate), Cobra® or Ultra-Blazer®. These products require good coverage with at least 20 gallons of water and the proper adjuvant for effective weed control. For ALS susceptible populations, choices
include those above plus Pursuit®, Scepter® or Synchrony® (STS). It is advised to assume that Palmer amaranth in Maryland is ALS-inhibitor resistant, as all tested populations have been found to show dual-resistance against glyphosate and ALS-inhibitor herbicides.

- **Consider Liberty-Link® Soybeans**: Liberty-link soybeans are tolerant of the herbicide glufosinate, sold under the name Liberty®. Glufosinate is a contact herbicide, so good coverage is important to achieve weed control (at least 20 gallons of spray volume). It provides effective control of emerged Palmer amaranth plants if applied when the plants are still small up to 3-4 inches. Liberty® is weaker on grasses and perennial broadleaves than Round-up. Liberty-Link® beans are not tolerant to glyphosate, the active ingredient in Round-Up®. A residual program is still recommended when using the Liberty-Link® program.

- **Consider Roundup Ready 2 Xtend Soybeans**: RR2Xtend soybeans are tolerant to dicamba and glyphosate. Growers may only use dicamba formulations approved for use on RR2Xtend beans in their state. In Maryland the dicamba formulations Xtendi-max, Fexapan and Engenia have received approval. These products contain an improved anti-volatilization chemistry, which reduces carry-over from treated fields. The approved dicamba formulations provide effective control of emerged Palmer amaranth plants up to 4 inches tall. They may be used as a pre-plant burn-down or for in-season post-emergent application. There are a number of label restrictions such as buffer requirements, tank-mix limitations, tank clean out requirements, specific nozzle requirements and wind speed restrictions. Dicamba will severely injure most vegetable crops, non- Xtend soybeans, tobacco, fruits crops, landscape plantings and other sensitive plants. Growers are cautioned to only use these products according to label directions and to use due diligence to avoid off target movement of dicamba. Please read the label before using RR2Xtend soybeans with the approved dicamba herbicides. Non-approved dicamba products must not be used on RR2Xtend soybeans. A residual program is still recommended when using the Xtend program.

- **Manage escapes.** Hand pull any escaped plants before they go to seed. If escapes cannot be destroyed and Palmer amaranth is not present on other parts of the farm consider tillage to kill all plants and minimize the seed bank. Palmer amaranth seeds are relatively short-lived. If you are able to avoid new seed production for a few years the seed bank will be dramatically reduced.

- **When harvesting crops,** do not move equipment between infested and non-infested fields. Palmer amaranth seeds move readily in equipment, particularly the combine! Clean equipment between fields and harvest infested fields last.

*Table indicating the number of emerged palmer plants over time. The number of emerged palmer plants was recorded from individual plots starting 10 days after treatment and every 7 days thereafter.*
Early Aphid Occurrences: A Possible Result of Warmer Winter Temperatures
Veronica Johnson, University of Maryland Department of Entomology

Aphids are small, early season pests that can occasionally reach damaging levels in small grain fields in Maryland. Strategies to control these insects should begin with correct pest identification and field scouting to determine infestation levels within a particular field.

Pest Identification:
Aphids are soft bodied, pear-shaped insects with piercing-sucking mouthparts and a pair of “tailpipe-like” projections, or cornicles, emerging from their lower abdomen. Adults can be winged or wingless, and the vast majority of aphids are female. A number of aphid species have been documented as either direct or indirect pests of wheat in Maryland. These include the bird cherry oat aphid, English grain aphid, corn leaf aphid, and the greenbug aphid.

**Bird Cherry Oat Aphid:**
The bird cherry oat aphid is a large aphid species that varies in color based on growth stage and the temperature of the surrounding environment. Most commonly, it is an olive-green color with reddish-orange coloring along the base of the abdomen (Fig. 1). This species is one of the first to colonize small grain plants, and adults often persist late into the winter.

**Greenbug:**
Greenbugs are pale green aphids with a dark line running along the back center of their bodies (Fig. 2). Greenbugs often concentrate in large colonies and prefer to feed on the underside of the lower leaves. Feeding by large enough colonies can eventually cause leaves to turn yellow, then reddish-brown and eventually die (Fig 6-A). Larger plants are able to tolerate larger populations of greenbugs.

**English Grain Aphid:**
English grain aphids are one of the largest aphid pests of wheat and can be found in a variety of colors including yellow, green, orange or reddish-brown. They have long black legs and cornicles, and the antennae stretch nearly half the length of the body (Fig. 4). English grain aphids can be found in wheat through maturity and can directly damage kernels if they begin feeding within the heads. These aphids are relatively active and differ from other aphid species in that they generally do not form tight colonies.

**Corn Leaf Aphid:**
The corn leaf aphid is a blue-green or gray aphid with dark green or black cornicles (Fig. 5). Physical damage caused to small grains by this pest is generally minor, however the insect, along with most other aphid species, is capable of transmitted Barley yellow dwarf virus (BYDV). Thus, populations should be monitored in order to avoid disease transmission.
Winged and wingless female forms present
Continual summer generations develop on summer hosts
Overwinter as eggs
Mother hatches from egg in spring
Winged and wingless females produced. Winged forms disperse.

**Figure 5.** Generalized aphid life cycle. Image modified from Cranshaw & Redak, 2013.

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**Aphid Life Cycle:**

Aphid development is notably different than many organisms due to the almost complete absence of males, which are only produced during one generation in late summer (Fig. 5). After mating, the females in this generation lay eggs, the overwintering stage of most aphid species. These overwintering eggs will begin to hatch when springtime temperatures exceed 45°F. The emerging aphids are all female and, in the absence of males, will later give birth to live offspring that are genetically identical to the mother. At the time of their birth, these offspring are already pregnant and have begun to internally mature their own young. This rapid maturation and reproduction means that aphid populations can build very quickly, resulting in pest outbreaks that arise unexpectedly. This type of parthenogenic reproduction occurs throughout the summer, with an average of nine generations occurring before temperature and light changes in the environment signal the approaching arrival of winter, causing aphids to produce a single generation of both males and females.

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**Pest Damage & Disease Transmission**

In most cases, aphid populations do not become large enough to cause physical feeding damage that results in yield losses or significant plant death. An exception to this is greenbug aphids, who secrete a toxin into the leaves when feeding. Populations of greenbugs can occasionally build to large enough numbers to cause yellowing of the leaves, which will eventually progress to a reddish-brown color and kill the plant (Fig 6-A.). Additionally, large populations of bird cherry oat aphids feeding beyond the boot stage can cause the flag leaf to twist into a corkscrew shape that can trap the awns, resulting in “fish-hooked” heads (Fig 6-B). Finally, because the English grain aphid remains in wheat through physiological maturity, large populations feeding on the heads can potentially damage kernels, causing them to shivel. Scouting for English grain aphids is particularly important because heavy head infestations often occur in fields containing lower canopy infestations earlier in the season. Heavy head infestations of English grain aphids can reduce yields by up to 13%. The most damaging aspect of aphid feeding, however, is their potential to transmit Barley yellow dwarf virus.

Barley yellow dwarf virus causes stunting and yellowing of the plant leaves, and has the potential to significantly reduce grain yields. Early spring infections often resemble phosphorus deficiency and can be identified by the presence of purplish flag leaves (Fig 6-C). Differences in infection from one field to the next can be due to differences in aphid mobility and feeding habits, differences in weather conditions, the source and strain of the virus, as well as the age and susceptibility of plants when infected. Yield reductions due to BYDV are greatest when the infection occurs in the fall, or early stages of the plant.

**Figure 6.** (A) Reddish-brown damage resulting from intensive greenbug damage. (B) Right: Normal grain head; Left: Fish-hook deformation. (C) Leaf showing symptoms of BYDV
Thresholds & Management Options

**Natural Enemies:** Aphids are usually kept below economic injury levels via biological control by various natural enemies – primarily ladybird beetles, lacewings, hoverflies, and parasitic wasps (Fig 7). Begin looking for ladybird larvae and “mummies”, or parasitized aphid bodies (Fig 8), once springtime temperatures begin to increase. Most natural enemies become active around 50°F. Once parasitism levels reach between 10 and 15%, aphid populations usually begin to decline. Additionally, it is important to avoid nonessential pesticide applications once these natural enemies are observed in the field, as any sprays targeting aphids will also reduce natural enemy populations, often leading to secondary outbreaks and increased aphid numbers.

**Cultural Controls:**
In addition to biological control of aphids, a number of cultural controls can also be employed to help reduce damage associated with aphid pests. Greenbug-resistant wheat varieties are available, so consulting with seed suppliers about available cultivars can be helpful if fields are consistently prone to greenbug infestations. Additionally, no-till wheat has been shown to have fewer aphid outbreaks due to the large amount of residue remaining on the soil surface.

**Scouting & Insecticide Applications:**
Aphid numbers can vary greatly between fields, so it is important to inspect every field before applying any insecticides. Scouting for aphids in small grain fields should begin around mid-March, or once daytime temperatures begin to reach 45°F. At this point, scouts should examine one linear row foot at 10 sites within the field. The economic threshold for aphids in wheat in pre-heading stages varies based on the aphid species present. Treatment for greenbug aphids is justified if 25 to 50 or more aphids are present per linear row foot during the early seedling stage. Later stages of wheat rarely require aphid control. Bird cherry oat aphids are capable of transmitting BYDV, and therefore have a lower economic threshold. Treatment is justified when 12 to 25 aphids per linear row foot are found from fall seedling emergence through heading of plants the following spring. The English grain aphid, on the other hand, is not capable of transmitting the disease, and treatment for these pests is rarely necessary. Only when populations of 100 or more aphids per tiller are present is treatment required. Finally, corn leaf aphids are heavily impacted by predator and parasitoid populations, and therefore rarely reach high enough levels to require treatment. As such, no official economic thresholds have been determined for this pest. Once the grain head has begun to develop, 10 heads in 10 sites should be examined weekly, and treatment should be considered when 25+ aphids per head are found. In addition to noting the presence and abundance of natural enemies, the growth stage of the plant as well as additional stressors, such as drought, should be noted. Aphid outbreaks are often favored when an abrupt shift to colder temperatures occurs after a warm spell in spring.

Both seed treatments and foliar insecticides are available for aphid control in small grains. Seed treatments offer the greatest value for early planted winter wheat, protecting newly emerged seedlings for two to three weeks. Imidicloprid, thiamethoxam, and clothianidin are the primary active ingredients used for seed treatments in small grains. Aphid populations exceeding economic thresholds later in the spring, however, will not be affected by seed treated insecticides and may require foliar sprays to reduce population levels depending on the number of natural enemies present. For more information on chemical control of aphids, contact your local extension office.
The University of Maryland Extension has updated [www.extension.umd.edu/grainmarketing](http://www.extension.umd.edu/grainmarketing) site with new input data for 2017 crop budgets. Also posted is the 2017 Maryland Custom Rate Survey.

**Crop Budgets**
Cost of production is very important when making decisions related to your farm enterprise and grain marketing. Enterprise budgets provide valuable information regarding individual enterprises on the farm. This tool enables farm managers to make decisions regarding enterprises and plan for the coming production year. An enterprise budget uses farm revenue, variable cost, fixed cost and net income to provide a clear picture of the financial health of each farm enterprise.

The 2017 Maryland enterprise budgets were developed using average yields and estimated input cost based upon producer and farm supplier data. The figures presented are averages and vary greatly from one farm and region to the other. It is therefore crucial to input actual farm data when completing enterprise budgets for your farm.

**How to Use University Enterprise Budgets:**
The enterprise budgets can be used as a baseline for your operation. Make changes to these budgets to include your production techniques, inputs and overall management.

The budgets are available electronically in PDF or Excel online at [www.extension.umd.edu/grainmarketing](http://www.extension.umd.edu/grainmarketing). Use this document as a start or reference to create your crop budgets. If you have problems downloading any of these budgets contact information is located on the website.

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<th>Cost Per Acre 2017</th>
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<td>Corn - No Till</td>
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**2017 Custom Rate Survey Now Available**
Financial and economic considerations such as limited capital, untimely cash flow, insufficient labor, small acreage or other reasons require farmers to hire custom service for field operations. Custom work charges are determined by demand and supply and are negotiated between farmers and custom operators. The purpose of the publication is to provide information on custom work charges in Maryland and to provide data to assist in decision making regarding purchasing equipment.

**Custom Work Charges**
A mail survey was conducted in the fall of 2016 to determine custom works charges in Maryland. Rates were collected from 40 custom operators and farmers, and summarized for the state. Participants indicated the rates they charge for various field operations. The charges reported in this publication may serve as a guide in determining an acceptable rate for a particular job where little other information is available. The charges can also be compared with costs and returns and may be used as a basis for working out more equitable charges for both the custom operator and customer. These are available online at [www.extension.umd.edu/grainmarketing](http://www.extension.umd.edu/grainmarketing) or contact your local Extension Office.
Agronomic Research Updates

Response of Alfalfa Populations to Salinity Stress
Alfalfa was tested for its salt tolerance to Cl and SO₄ in irrigation water. The study suggested that Na exclusion from alfalfa roots would be a desirable trait to increase tolerance to saline soils and irrigation water.
Source: Crop Science Vol 57

Ammonia/Ammonium Fertilizers Induce Specific Root Toxicity Symptoms
Root damage several centimeters from banded fertilizer was observed due to the movement of ammonia gas and ammonium ions. Urea pellets and poultry litter induced more symptoms than polycoated urea and compost. Taprooted crops like canola suffered more damage than wheat.
Source: Agronomy Journal Vol 108: 2485-2492

Satellite and Ground Sensors for Yield Prediction
Satellite images were compared to ground based sensors to predict yield and make N applications. Satellite imagery was comparable to ground based sensors, but was limited by availability due to cloud cover early in the season.
Source: Agronomy Journal Vol 109(1): 299-308

AVAIL Copolymer Solubilizes Phosphate from Soil Binding
Phosphorus often binds with poorly crystalline iron and aluminum oxides in soils. When phosphate was added to soils along with AVAIL, dissolved phosphate was increased by up to 34%. This suggests AVAIL would be useful for banded fertilizer, but does not indicate if AVAIL would make phosphate already bound to the soil available without any commercial fertilizer co-applications.

Continuous Corn and Soybean Yield Effects Across Hundreds of Thousands of Fields
Over 750,000 field trial records were examined for yield effects across weather, soil and crop rotations. There was a larger yield penalty for continuous corn crops in dry years while continuous soybean suffered in high moisture areas.
Source: Agronomy Journal Vol 109

Green Manure Comparison between Winter Wheat and Corn
Red clover was interseeded into a winter wheat crop while hairy vetch and triticale were planted after winter cereal harvest. Red clover was harvested for hay in late fall before corn was planted in the spring. Both cover crops were terminated in the spring prior to corn planting. The red clover produced a continuous cover, forage and higher corn yields. Red clover also controlled weeds with less herbicide and increased profits.

Limiting Nitrogen Loss with Enhanced Efficiency Products
Overall N loss as ammonia was observed more on sandy loam than silty clay soils. Ammonia volatilization was decreased using N-(n-butyl) thiophosphoric triamide (NBPT or Agrotain) in both sandy loam and silty clay soils. Nitrarpyr and SuperU actually increased N loss as ammonia, but decreased losses as nitrous oxide in sandy loam soils. Polymer coated urea reduced both ammonia and nitrous oxide losses, but only from sandy loam soils. Texture and product have a strong interaction and soil types should be evaluated prior to application.
Source: Agronomy Journal Vol 109 (1): 47-57
**Western Maryland**

After an abnormally warm February, March settled into a little more normalcy. Temperatures and moisture were more seasonable and cereal grains and pastures are greening up nicely and manure application is in full swing. Once this front pushes out corn planters will be hitting the fields with reckless abandon.

**Southern Maryland**

Farmers are busy preparing for planting. Corn planting is set to start any day now and by the time you read this planting should be well underway. Moisture levels are still a concern with limited rainfall this spring. Spraying of burn down herbicides, pre-emergent corn herbicides and fertilizer application continues. Small grain fields are at the jointing stage now. Overall condition of small grains is good. Aphids have been a problem in some fields as well as powdery mildew. We have also experienced some issues with herbicide carryover injury in wheat following corn. Hay and pasture fields are also in good condition this spring. There have been reports of early alfalfa weevil damage in some locations.

**Northern Maryland**

Soil temperatures are hovering right between 50-55°F as I write this, so corn planting will be in full swing very shortly, as soon as field conditions are fit for planting. We received a significant amount of rain last week, with more predicted later this week. Other spring field work, such as herbicide application, topdressing and fertilizer application, has been largely uninterrupted due to the dry field conditions. We had a relatively dry winter and fall, putting the region under drought conditions, which has been partially alleviated with the recent precipitation. Wheat and barley is jointing and were mostly unaffected by our most recent March freeze, as plants had not yet begun to joint at that point. Some fields have a little foliar burn due to the frost, but there will be very little, if any, yield drag as a result.

**Upper Eastern Shore**

The dry weather has allowed farmers to do field work such as manure spreading and fertilizer/herbicide application on small grain. Both of these have been limited this year as we still have a shortage of manure, and small grain acres are down. Many cover crop fields have been burned down. Since most farmers are no-till, very little tillage has been done. There was very little freeze damage a few weeks ago and trees/plants are progressing normal. Without excessive rain or cold weather, corn planting will begin by the time most readers are getting a hard copy of this newsletter.

**Lower Eastern Shore**

Cover crops are being burned down and the sweet smell of poultry manure is in the air. Some rainfall is delaying field preparations, but most soils are dry enough for equipment to cross. Although stripe rust has been observed on the Eastern Shore of Virginia, it hasn’t shown up in the Lower Shore counties. Some reports of aphids in wheat have been made, but otherwise things are quiet. The warm February weather brought some early growth in the area, but freezes in March appear to have done minimal damage to wheat and our neighbors flowers. Farmers on the Lower Shore are hoping we skip the cold wet weather that pushed planting so far back last year.

Crop Report Regions: Western (Garrett, Allegany and Washington), Central (Carroll, Frederick, Howard, Montgomery), Northeast (Cecil, Harford, Baltimore), Southern (Anne Arundel, Prince George’s, Calvert, Charles, St. Mary’s), Upper Eastern Shore (Kent, Queen Anne’s, Talbot, Caroline, Dorchester), Lower Eastern Shore (Wicomico, Worcester, Somerset)