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## General Information

### **First brown marmorated stink bug trap-catch of the season**

*By: Janet van Zoeren and Christelle Guédot, UW-Extension*

Brown marmorated stink bug (BMSB) continues to be more prevalent in Wisconsin. We have already caught the first BMSB in a monitoring trap this year. A single male BMSB was caught in a trap in a Dane County apple orchard on May 17<sup>th</sup>, 2018, nearly a month before the first orchard trap catch of 2017.

This is not yet cause for immediate alarm. We still have not yet reached the action threshold for BSMB management in any orchard in Wisconsin, and early season BMSB activity generally is not tied to serious economic damage in apple orchards. However, we do recommend that growers of apples and other susceptible crop in Wisconsin begin monitoring for BMSB, and some growers may reach the action threshold in their orchard either this summer or in coming years. The action threshold is the point at which it is economically advantageous to control for the pest because significant damage is expected to take place if you allow the population to continue to grow uncontrolled.



Brown marmorated stink bug newly hatched nymphs, surrounding the empty egg cases.

We will continue to monitor for BMSB this summer and the summer of 2019. We will also be conducting preliminary research into possible biological

control agents for BMSB in Wisconsin. We hope to identify some egg parasitoids that are helping to control BMSB populations, as well as looking for a possible attractant to help growers monitor for these BMSB biocontrol agents.

Below is some information previously published in this newsletter about BMSB monitoring, action thresholds, and control. This information was first published in a [June 13<sup>th</sup> supplemental issue](#), available on our website ([fruit.wisc.edu](http://fruit.wisc.edu)):

Growers are strongly advised to monitor, either with commercial traps and lures, or by visual inspection for BMSB adults, nymphs, or egg clusters on the underside of leaves. At this stage, the insects should still be overwintering adults, which are looking for food and egg-laying sites. Immatures (called nymphs) will also feed on plants and fruits with their sucking mouthparts, and thus may cause damage. Damage from BMSB cannot be distinguished from the damage by other stink bugs.



**Brown marmorated stink bug adult.**  
Photo courtesy of Susan Ellis,  
[Bugwood.org](http://Bugwood.org).

Research in apple orchards has shown an action threshold of 10 BMSB adults per trap per week from border (edge) rows. BMSB are likely flying into orchards from the surrounding landscape, and so will arrive earlier and be more abundant on the edges of the orchard. No specific action threshold has yet been set for other fruit crops.

If chemical controls need to be applied (if you reach the action threshold mentioned above), some insecticide classes known to provide good control of BMSB include pyrethroids (IRAC code 3A), carbamates (IRAC code 1A), and neonicotinoids (IRAC code 4A). In general, the choice of which insecticide to use should take into account the pre-harvest interval and re-entry restrictions, other pests present, and effects on beneficial insects and the environment. Once you reach the threshold, spraying an effective insecticide two times at a seven-day interval has shown high efficacy against BMSB. Because BMSB tend to prefer the outer edges of the orchard, spraying just the outer rows can provide up to 85% effectiveness.

## **Worker protection update and another rule revision on the horizon**

By: Jane Larson, Worker Protection specialist

Wisconsin Department of Agriculture, Trade and Consumer Protection

As you have been working through the requirements for the federal worker protection standard, you will have another chance to share your thoughts on the rule. Later this year, the Environmental Protection Agency will request public comment on additional proposed changes to WPS. The EPA will not look at the entire regulation but will only focus on three specific issues: minimum age for pesticide handlers; the designated representative and the application exclusion zone. At one time EPA stated they hoped to make the rule proposal available by September. When it does happen, the Wisconsin Department of Agriculture, Trade and Consumer Protection will share this information widely so interested parties can review and make comments on the proposed revisions. Any rule changes would take effect in 2019 or 2020.

### ***What's New for Worker Protection in 2018***

If you recall, the revisions to worker protection were phased in. The majority of the rule changes took effect in 2017 with just a few revisions required for 2018. However, of the three new requirements for this year, one was postponed. Let's review the three requirements for 2018.

### Worker Protection Safety Poster

The worker protection safety poster was redesigned to include additional safety information for agricultural workers and pesticide handlers. There are a few options to get copies of the poster.

- (a) Pesticide Educational Resources Collaborative or PERC (<http://pesticideresources.org/wps/cp.html>): You can print your own copies or purchase laminated posters. Posters come in two sizes and are available in English, English/Spanish, Spanish or English/Spanish/Karen.
- (b) Gempler's ([gemplers.com](http://gemplers.com)) has created their own WPS safety poster which is approved by EPA and is available for purchase.

### Pesticide Handlers Suspend Applications

Handlers must suspend pesticide applications if a worker or another person is in the application exclusion zone or AEZ. An AEZ is an area up to 100 feet around the application equipment. Other persons can include family members, the public or people on adjoining property. For more information on the application exclusion zone, check pages 37-38 in the How to Comply manual or check the information on PERC at <http://pesticideresources.org/wps/guide/aez/index.html>.



### Expanded Training Content Delayed

The EPA intended to increase the number of pesticide safety topics to be covered in worker and handler WPS pesticide safety training. The expanded training has been delayed. Keep in mind that owners and managers of farms, forests, nurseries, greenhouses and other enclosed space production areas are still required to *annually* train their agricultural workers and pesticide handlers unless those workers or handlers are currently certified as applicators of restricted-use pesticides. Although the expanded training content has been delayed, I encourage you to use the new training videos and training material that is available.

Speaking of training videos, the Pennsylvania State University recently released a WPS pesticide training video specifically for orchards called “Safety in the Orchard: Understanding and Applying the Worker Protection Standard.” The EPA-approved video for training agricultural workers is available in English and Spanish. The video can be downloaded or viewed on YouTube and it can be accessed through PERC at <http://pesticideresources.org/wps/training/workers.html>. And finally, a reminder about the qualifications to train workers and handlers. Currently certified pesticide applicators are considered qualified to train workers and handlers. If you’re not a certified applicator, you have two other options. To become a qualified trainer of *workers* you may take an on-line course offered by the Iowa State University at <https://www.extension.iastate.edu/workerprotection/>. There is no charge and it takes 1-2 hours to complete. To become a qualified trainer for workers, the EPA offers a PowerPoint slide presentation. If you deliver the presentation to handlers, you are considered a trained handler training. For more information check <http://pesticideresources.org/wps/ttt/pres/index.html>.

If you have questions about worker protection, please contact Jane Larson, 608-224-4545, [jane.larson@wisconsin.gov](mailto:jane.larson@wisconsin.gov) or visit our website at [https://datcp.wi.gov/Pages/Programs\\_Services/WorkerProtection.aspx](https://datcp.wi.gov/Pages/Programs_Services/WorkerProtection.aspx).

## UW-Madison/Extension Insect Diagnostic Lab update

By: PJ Liesch

Insect activity has definitely increased around the state over the past two weeks. Despite the slow and cool start to spring, Growing Degree Day models now show that we have caught up and are slightly ahead of the 30-year average in much of the Midwest. Many insects are becoming active as a result. A summary of insect activity over the past two weeks based on cases at the UW Insect Diagnostic Lab can be found below:

**Grape Flea Beetle** continues to be active with reports recently coming in from far northern parts of the state (Iron County). These insects have been active in the southern part of the state for several weeks.

**Tarnished Plant Bugs** have been reported by several gardeners in the southern part of the state. These insects can feed on a wide variety of plants, including fruits ranging from fruit trees to strawberries. The May 24th edition of the Wisconsin Pest Bulletin indicates that numbers have generally been low thus far, but growers should be aware that this insect is now active in the state.

We're in a key time period for both **Plum Curculio** and **Codling Moth** around much of the state, as apple and other fruit trees are blooming and petal fall nearly at hand. Growers should be scouting for activity, such as crescent-shaped scars (for plum curculio) and their pheromone traps (for codling moth).

**Rose chafers** are starting to become active for the year based on a recent report from Columbia County. Growers with a history of rose chafer problems or those located in parts of the state with sandy soil should be on the lookout for these beetles over the next month. These native beetles feed on a variety of fruit crops including tree fruit, grapes, caneberries and strawberries and cause damage somewhat similar to the Japanese beetle. Ornamental/landscape plants can also be attacked. **Japanese beetle** beetle activity is expected to begin approximately a month from now.

Reports of the invasive **Brown Marmorated Stink Bug** continue to come in from homeowners in the southern part of Wisconsin. Orchard and vineyard managers should be on the lookout for these insects.



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### **Bonus:**

**Mosquitoes:** If you're wondering why the mosquitoes have been making outdoor work miserable lately, much of the activity is associated with the "inland floodwater mosquito" (*Aedes vexans*). This species has taken advantage of the rains in late April and early May and mosquito pressure is very high in much of the state. Unless things dry out for the year, mosquitoes will almost certainly continue to pester those working outdoors for the foreseeable future.



## UW-Madison/Extension Plant Disease Diagnostic Clinic (PDDC) update

By: Brian Hudelson, Sue Lueloff, John Lake and Ann Joy

The PDDC receives samples of many plant and soil samples from around the state. The following diseases/disorders have been identified at the PDDC from May 19, 2018 through May 25, 2018.

<b>PLANT/ SAMPLE TYPE</b>	<b>DISEASE/ DISORDER</b>	<b>PATHOGEN</b>	<b>COUNTY</b>
<b>FRUIT CROPS</b>			
Plum	<a href="#"><u>Black Knot</u></a>	<i>Apiosporina morbosa</i>	Outagamie

For additional information on plant diseases and their control, visit the PDDC website at [pddc.wisc.edu](http://pddc.wisc.edu).

## Berry Crops

### Organic management of spotted wing drosophila in berry crops

By: Christelle Guédot, UW-Extension

Spotted wing drosophila (SWD) is now the number one insect pest of berry crops in Wisconsin, most other states, as well as many parts of the world. Management practices are pretty labor intensive and costly and tend not to provide adequate control. Many growers rely primarily on insecticides to manage this pest.

In organic production, an emphasis should be placed on monitoring, sanitation, regular picking, exclusion netting, strategic selection of cultivars, and finally chemical controls.

Monitoring, using homemade or commercial trap and baits, should be implemented to monitor for first occurrence and to help determine the efficacy of, and when to reapply, management practices. For more information on this refer to the [SWD website](#).

We discussed several of these topics in previous articles. Sanitation was discussed along with the importance of timing in harvest schedule in a previous [article](#). The main points there are: to harvest every 1-2 days for optimal yield and minimal SWD infestation, and to bag culled fruit for 32 hrs to kill 99% of the larvae, regardless of the color of the plastic used to bag the fruit.

A physical barrier such as exclusion netting can prevent flies from reaching the fruit. A mesh size of less than 1mm can provide 100% protection against SWD when applied adequately. More detail on exclusion netting can be found [here](#). We also discussed how certain varieties may avoid SWD infestation by ripening earlier than the peak of SWD populations. Earlier fruiting cultivars of raspberry and blueberry have showed overall lower levels of infestations and some may completely avoid infestation if harvest occurs before July. More can be found on this topic [here](#).

When it comes to chemical control in organic production, there are few NOP-approved insecticides available that provide some control of SWD. These include Entrust (spinosad), Grandevo (*Chromobacterium subtsugae*) and Pyganic (Pyrethrins). Entrust is the most effective OMRI-approved insecticide and must be rotated with another insecticide, such as Grandevo or Pyganic, after two applications of Entrust, to achieve some resistance management. There are several restrictions on the use of Entrust that vary per crop, so please check the label carefully and follow the instructions.

Insecticide application intervals should be short, every 4-5 days and spray coverage and timing is critical to achieve optimal control. Applications should be done early morning in the bottom part of the crop or late afternoon throughout the crop, to target prime activity time and location of the flies, and avoid pollinator activity during the day.

Finally, picked berries should be cooled to 35°F as soon as possible to stop further development of the immature SWD inside the fruit. We recommend to cool fruit for three days to increase mortality of larvae present inside the fruit. If you sell fruit directly to consumers, advise them to keep fruit in the refrigerator. Freezing fruit will kill all stages of SWD. All these management practices are compatible and should also be considered in conventional production to optimize management of SWD.

Other resources include: A recent webinar on organic management of spotted wing drosophila is available at this [link](#) from eOrganic. This webinar discusses the latest research on organically approved management strategies for SWD. And more information on organic management can be found in [this article](#) from Michigan State University.

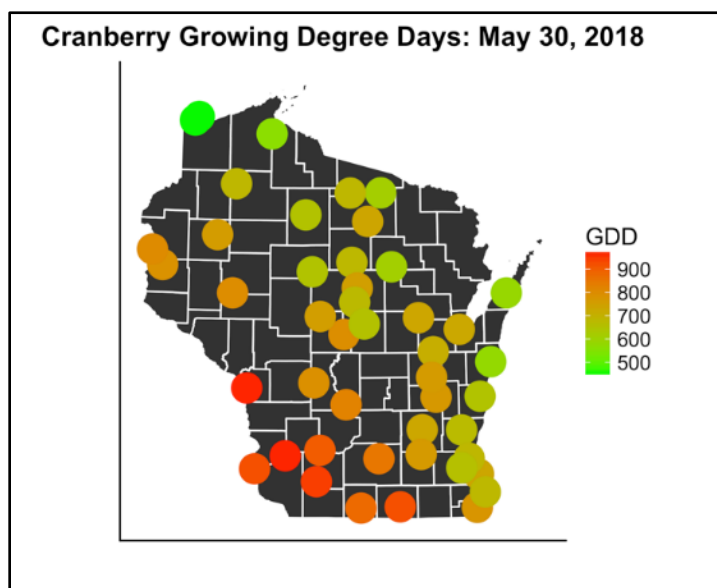
## Cranberries

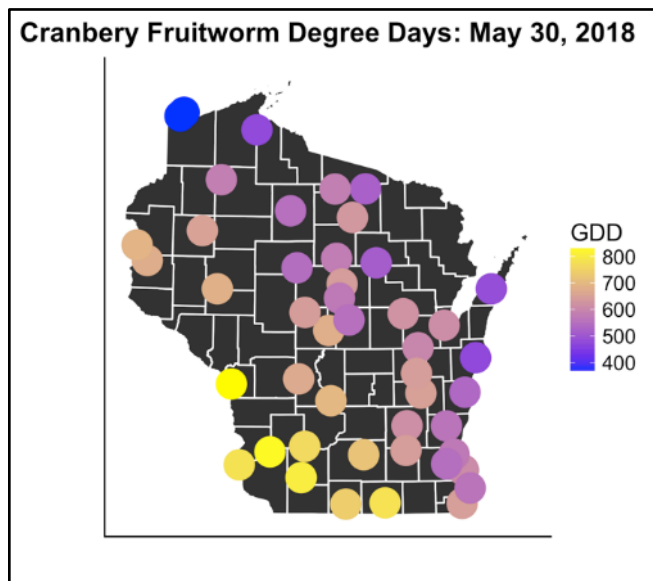
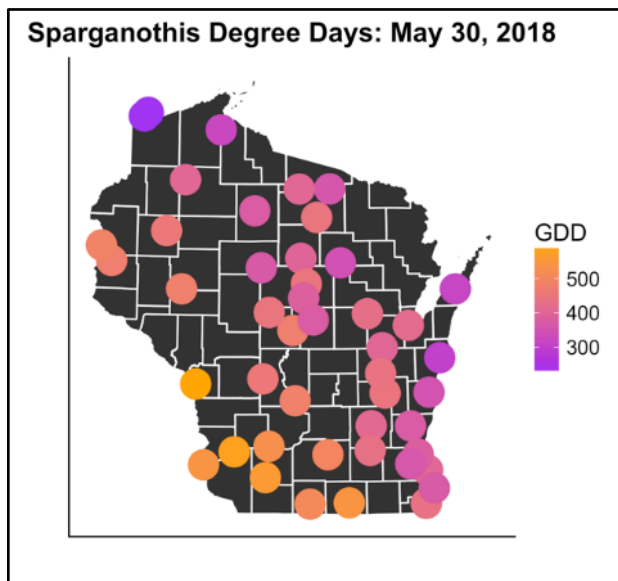
### Cranberry plant and pest degree-days: May 30, 2018

By: Elissa Chasen and Shawn Steffan, USDA-ARS and UW Entomology

Well, we breezed through spring and went right on to summer.

Check out the maps below for the degree-days of the cranberry plant and associated pests. Recall that degree-days are calculated based on the daily high and low temperature accumulations and that they vary by species according to species specific temperature thresholds. Developmental thresholds for each species are: cranberry plant - 41 and 85°F; sparganothis fruitworm - 50 and 86°F; and cranberry fruitworm - 44 and 87°F. Interactive maps are posted online. The interactive feature allows you to click on the map locations, prompting a pop-up that names the location and gives exact degree-days. These are available through the Steffan lab website (<http://labs.russell.wisc.edu/steffan/cranberry-growing-degree-days/>). Once on the website, follow the link to the interactive maps.











While two weeks ago, we were still behind last years' DD accumulations, we have now surpassed them. You can see that in the table below.

May 30	Cranberry DDs			Sparg DDs			CFW DDs		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
<i>Northern WI (Minocqua)</i>	656.3	516.4	690.2	320.7	208.9	408.3	526.6	395	587.3
<i>Central WI (Wisconsin Rapids)</i>	844.3	752.9	792.6	437.7	352.1	473.7	686	600.7	675

Moth flights will be starting shortly. Our models predict that Sparganothis flight begins around 600 Sparg DDs. See table at right. If temperatures stay warm, this could happen within a week.

Event		DDs from March 1 (approximate)
	Flight initiation	595.7
	First eggs laid	681.0
	Peak flight	884.12
	First egg hatched*	895.4
	End of egg laying	1,634
	Last egg hatched*	1,890
* Egg hatch window: 895 – 1,890 DDs		

## Grape shoot thinning for crop load adjustment

By: Amaya Atucha, UW-Extension Fruit Crop State Specialist

Shoot thinning is the first canopy management technique that we can apply during the growing season to adjust crop load and allow a better airflow and light exposure of the canopy, allowing us to achieve the desired vine balance. In highly vigorous cultivars, such as Marquette or La Crescent, retaining a higher number of shoots per vine will help reduce vegetative growth, resulting in shorter shoots and less lateral shoot production. On the other hand, in less vigorous cultivars, such as Maréchal Foch and Petite Pearl, retaining a lower number of shoots per vine have resulted in higher yields and better shoot growth for next year's production. When we keep too many shoots in less vigorous cultivars we end up with poor shoot growth and fruit that takes much longer to ripe.

A general rule is to aim for an average density of 6 shoots per foot of cordon. Based on our research observations at WMARS, we recommend a density of 5 shoots per foot of canopy for less vigorous cultivars, such as Maréchal Foch and Petite Pearl, 6 to 7 shoots per foot canopy for Frontenac and Marquette, and 7 to 8 for La Crescent. This is a general recommendation for mature vines, and you will have to adjust it depending on the specific conditions of your vineyard.

The best timing for shoot thinning is when shoots are 5 to 10 inches long. At this stage, the shoots can easily be removed by snapping them from the base, if you wait longer you will need pruners to remove them and shoots will have developed tendrils, making it more difficult to remove them. In addition, it is easier to make the decision of which shoots to remove when the shoots are shorter and you can visualize how the shoots are distributed along the cordon. Shoots growing from non-spur positions or from the trunk can be removed at this time, except if they will be used to renew a spur. When thinning it is important to keep in mind the spur position and avoid removing all the basal shoots because these basal shoots will allow us to keep spur closer to the cordon (Figure 1).



Figure 1. Before (left) and after (right) shoot thinning. The picture on the left shows a spur of a vine trained in VSP with 4 shoots, when ideally, we would only have 2 shoots per spur. Shoot # 4 is a good, healthy, and fruitful shoot that we would normally leave. However, if we keep shoot #4, during next year's pruning the spur will "creep" further away from the cordon. It is important to keep these in consideration so that we do not end with very long spurs. Shoot #1 was also removed, because it was a basal shoot that was not carrying an inflorescence.



## What is THAT???

By: Patty McManus

This photo was shared with me earlier this spring. The orange slime was seen on a few Marquette vines during late winter pruning. It is likely the fungus *Fusarium merismoides*, which is not believed to be a pathogen of grape but rather an opportunistic fungus that likes to grow on the sap of recently pruned grapevines and other woody plants. Wendy McFadden-Smith of Ontario Ministry of Agriculture, Food, and Rural Affairs observed this in 2004 and 2014, and describes the fungus and other opportunistic fungi in an article here:

<http://blogs.cornell.edu/nygrapeupdate/2014/05/23/return-of-the-orange-slime/>

The bottom line is that this is somewhat rare, very bizarre in appearance, but not a serious problem.



## Grape variety developmental stages: June 1, 2018

By: Janet van Zoeren, Annie Deutsch, Jacob Scharfetter, and Amaya Atucha

At the West Madison Agricultural Research Station (WMARS), flowers are just beginning on the earliest vines. Cultivars range from developmental stage E-L 17 (“12 leaves separated, inflorescence well developed with single flower separated”) to E-L 20 (“10% of flower caps off”). Shoots have been elongating quickly at the Peninsular Agricultural Research Station (PARS). Varieties now range from E-L 9 (“2-3 leaves separated from the shoot tip”) to at E-L 12 (“5 leaves separated from the shoot tip, inflorescences clear”).

Throughout the state, shoots have now developed beyond the period where they are susceptible to cutworm or flea beetle bud damage. There may be some slight leaf damage caused by grape plume moth or grape flea beetle larvae, but those are unlikely to cause economic damage. So far at least, this year seems to be a low-pressure year for grape phylloxera. At the moment, based on scouting at WMARS and PARS, insect pest pressure seems to be minimal.

*E-L stands for Eichhorn-Lorenz Phenological stages to describe grapevine development*

Following photos taken on May 29<sup>th</sup> at West Madison Agricultural Research Station.



Brianna at WMARS;  
"first flower caps  
loosening"  
E-L number = 19



La Crescent at WMARS;  
"inflorescence well  
developed"  
E-L number = 17



La Crosse at WMARS;  
"inflorescence well  
developed"  
E-L number = 17



Itasca at WMARS;  
"inflorescence well  
developed"  
E-L number = 17



Marquette at WMARS;  
"inflorescence well  
developed"  
E-L number = 17



Frontenac at WMARS;  
"10% flower caps off"  
E-L number = 20



Foch at WMARS;  
"inflorescence well  
developed"  
E-L number = 17



Petite Pearl at WMARS;  
"inflorescence well  
developed"  
E-L number = 17

Following photos taken on May 29<sup>th</sup> at Peninsular Agricultural Research Station (PARS)



Brianna at PARS;  
"2-3 leaves separated"  
E-L number = 9

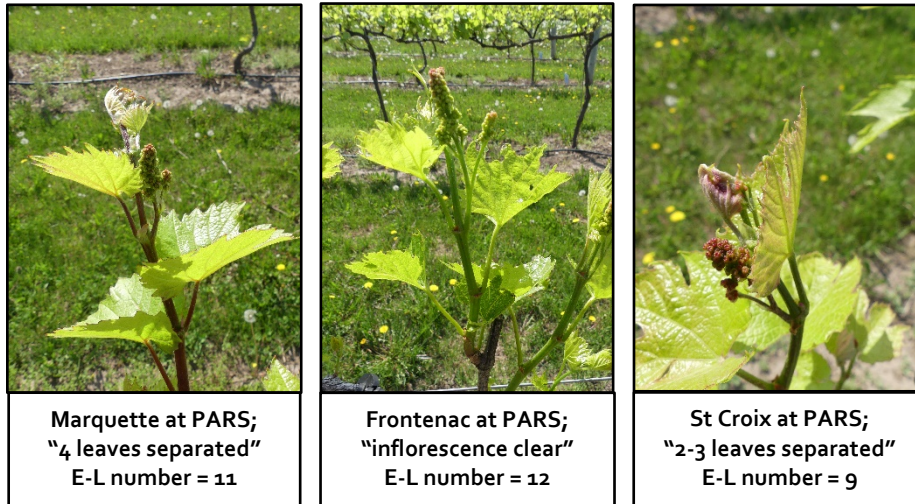


La Crescent at PARS;  
"2-3 leaves separated"  
E-L number = 9



La Crosse at PARS;  
"4 leaves separated"  
E-L number = 11





Grape Growing Degree Days (Base 50, BE)			
April 1 - May 30			
	2018	2017	2016
WMARS	501	354	415
PARS	302	175	227

The growing degree-day accumulations as of May 30<sup>th</sup> for this year are: 501 GDD at WMARS and 302 GDD at PARS. We have definitely passed the degree day accumulations from this date in 2017 and 2016, and have moved from a slow, chilly spring to an early, hot summer.

We calculated degree-days using a base of 50°F, starting on April 1<sup>st</sup> as a biofix. "BE" (Baskerville-Emin) refers to a specific way in which to calculate degree days, using a sine wave instead of a simple average temperature calculation – this gives a somewhat more accurate estimation of degree days. We calculated degree days using the NEWA website, and you can visit their "About degree days" page to learn more about the formulas they use for their calculations (<http://newa.cornell.edu/index.php?page=about-degree-days>).

## Post-bloom fire blight management

By: Patty McManus

Apple bloom for 2018 is history for most of the state. Exceptions are parts of Door County, and newly planted orchard blocks that might be lagging established blocks. Wet weather during bloom in some regions and warm to hot weather in late May have set the stage for fire blight. Fire blight is caused by a bacterium, *Erwinia amylovora*, which makes management quite different from managing fungal diseases such as scab, rust, and powdery mildew.

The most reliable strategies for managing fire blight are 1. Use of relatively resistant cultivars and rootstocks; 2. Late winter pruning to remove infected branches; 3. Use of antibiotics during bloom to prevent infection of flowers; and 4. Reigning in shoot growth by use of Apogee and not over fertilizing trees with nitrogen. There are other options (e.g., copper applied at green tip), but the four points listed are backed up with substantial research and grower experience. The only one on that list that comes after bloom is the last point—reigning in shoot growth with Apogee and avoiding too much nitrogen. However, even though your best window for fire blight control might be past for 2018, you should be aware of the pros and cons of remaining options.

**Apogee (prohexadione calcium)** inhibits production of gibberellin, a plant hormone that causes shoots to elongate. Fire blight loves soft, lush, rapidly growing shoots in late May and through June. By inhibiting shoot growth, Apogee reduces shoot susceptibility to fire blight. In young trees, you don't want to stunt growth, but in trees that have filled their space, Apogee can be a useful tool. The first application is made at the time of king bloom petal fall. It takes about 10-14 days for the inhibition of growth to take effect. Often, one application is enough to curtail fire blight development, but additional applications are permitted and might be beneficial on very vigorous trees of varieties that are highly susceptible to fire blight. See pages 28-29 of the 2018 Midwest Fruit Pest Management Guide for details on timing, rates, and precautions about what not to mix with Apogee. The guide is free online and can be found by searching that title.

**Fertility.** After a period of rapid shoot growth in May and June, apple trees set terminal buds in early July. At this stage, they are almost resistant to new fire blight infections. As a rule of thumb, nitrogen should not be applied after July 1. If nitrogen is applied in July, however, shoots remain soft and highly susceptible to fire blight.

**Winter pruning.** Removing branches with fire blight during winter pruning is essential. While it's impossible to remove all infected tissues, you can reduce overwintering inoculum substantially and protect not only the pruned block but also any nearby young, high-value plantings. Old fire blight cankers are often colonized by fruit rot and canker fungi, so that's another good reason to get rid of infected branches.



Classic "shepherd's crook" symptom of fire blight.



Shoot blight symptoms in June. In addition to orange/brown discoloration of shoot tips, note browning at leaf base near petiole in both photos. This indicates that the pathogen is in vascular tissue and is moving systemically.



Canker that developed on a large limb after an attempt to prune out fire blight the previous growing season. Although all visible signs of fire blight were removed the previous year, and an “ugly stub” was left behind, the pathogen apparently had already invaded the larger limb at the time of pruning.

**Pruning active fire blight infections** is a controversial subject, but most researchers and experienced growers agree that it’s better to prune what you can rather than do nothing, especially in young plantings and in established blocks that are near young plantings. The advantage of pruning active cankers is that you are removing large loads of *Erwinia*, which at least in theory, reduces the risk of disease spread. The disadvantage is that you risk spreading disease on pruning tools, and aggressive pruning can invigorate trees and make them more susceptible to fire blight. Some generally agreed upon pruning strategies for pruning out active infections:

Make cuts at least 12 inches below visible symptoms, but leave an “ugly stub” of about 4-6 inches in 2-year-old or older wood. The idea is that a small canker will form on the stub, but because older wood is not highly susceptible, the ugly stub will be a dead end for infection. Then, during winter pruning, the ugly stubs are removed by making horticulturally-correct cuts near the base of the branch union. Disinfecting tools by immersing in 10% bleach for 30 seconds or spraying with Lysol or similar products is recommended to avoid spreading *Erwinia* on tools. A shortcut approach to the “ugly stub” method is to break out shoots by hand. Either way, pruning should be done during dry conditions, because the pathogen is easily spread in water. Prunings can be left in the row middles to dry. After they are dry (bark no longer slips), they won’t be a source of fire blight, but prunings should be mowed so that they don’t become a reservoir for canker and fruit rot fungi.

**NEWA fire blight forecasts** can help predict “trauma blight” outbreaks and alert you to be looking for symptoms after a trauma event such as hail or a

thunderstorm with strong winds. If you are near a weather station in the NEWA network, log onto the fire blight risk prediction page. Enter the date of the trauma event, and then the model will tell you how close you are getting to the 100 degree-day threshold for symptom appearance. Because of error in the model, I would suggest scouting for shoot blight once you reach 75 days rather than waiting for the 100-DD trigger. In valuable young plantings of susceptible cultivars, you should monitor as often as possible in late May through June, regardless of NEWA warnings.

**Copper, antibiotics, and other chemicals after bloom?** As a rule, use of chemicals other than Apogee after bloom is not recommended for fire blight control. Unlike most fungal diseases, fire blight is nestled within vascular tissues and therefore out of reach of chemicals. Streptomycin is locally systemic, but it does not move around much in vascular tissue. Nevertheless, some research and circumstantial evidence suggests that spraying streptomycin within 24 hours of a hailstorm or windstorm reduces fire blight spread by protecting wounded shoots. Likewise, in non-bearing plantings where we’re not concerned about fruit russet, trees can be sprayed with copper. Although there’s scant data to prove it, this should prevent trees from fire blight infection and it doubles for scab control. Kari Peter of Penn State University has tested coppers for blossom blight control and reports that NuCop XLR at 4 qt/acre is the most effective. Copper doesn’t usually injure apple leaves, but it’s best to apply it alone rather than in tank mixes that sometimes lead to plant injury. Risk of copper injury is greater at low pH, so it absolutely should not be mixed with phosphorous acid (e.g., Aliette, ProPhyt AgriFos, Phostrol).

**Biocontrols, resistance inducers, and other “soft” products**, such as Serenade, Double Nickel, Regalia, and Oxidate have been tested for fire blight control, mostly by spraying during bloom. These products often provide control better than the untreated check, but they usually are not as effective as spraying streptomycin during bloom. Trials in which products are applied after bloom are lacking, but knowing the systemic, fast-growing nature of *Erwinia*, I am not optimistic any of these products applied after bloom would work.



**Control potato leafhopper**, as this insect has been implicated in spreading the fire blight pathogen as it feeds. Aphid outbreaks often coincide with fire blight epidemics, but this is probably because both aphids and fire blight prefer soft, rapidly growing shoots, rather than one leading to the other.

**Keep calm and carry on.** Almost everyone who has grown apples for a few years in the Midwest has been haunted by fire blight. With susceptible cultivars and rootstocks, it is almost inevitable in certain years. While this disease can kill entire blocks of trees within a couple of seasons, those cases are the exception and not the rule. Fire blight deserves your respect and attention, but orchards can and do recover from serious outbreaks. Growers need to take a long-term view and not get too discouraged by current events.

## Precision apple thinning part V: *Measuring fruitlets and using the MSU excel spreadsheet*

By: Janet van Zoeren and Amaya Atucha

This article is part of a series we are running this spring discussing the precision apple thinning process. Previously we have discussed: [what precision apple thinning is](#) and how it works, [how to calculate the target crop load of a tree](#), [running the carbohydrate model](#), and [how to decide what, when and how much thinner to apply](#). Today we will discuss **how to measure fruitlets**, and how to enter data into and use the **MSU precision thinning spreadsheet**.

### ***The Fruitlet Growth Model:***

The fruitlet growth model, developed by Dr. Greene at the University of Massachusetts, is a way to determine how effective the thinner program has been so far, by estimating the number of fruitlets that will drop within eight days after the thinner application. The fruitlet growth model is based on the fact that fruitlets that will drop have a growth rate about half or less than the fruitlets that will persist to harvest. This allows for multiple thinner applications with frequent and accurate check-ins of the actual crop-load still on the tree. Using this information, Dr. Greene developed a model to determine which fruitlets will abscise, and Dr. Philip Schwallier at Michigan State programed a downloadable excel spreadsheet for easy computation of fruit set (you can download the excel spreadsheet at: <https://fruit.wisc.edu/apples-and-pears/#pruning>).

### ***Timing:***

Make your first measurement 3-4 days after the first thinner application, and again 7-8 days after that first thinner application. If another spray is necessary, continue making measurements 3-4 and 7-8 days after each thinner application, until you have reached your target % fruit set and no longer need to continue thinning.



Give each fruitlet in a cluster a number using a permanent marker. Using a consistent pattern (such as '1' for the king flower, '2' for the fruitlet on the north side of the cluster, and continuing around clockwise) will help if numbers wash off or become illegible.

### ***Choosing and marking representative fruitlets:***

You may have already flagged and numbered 15 representative clusters per tree, on five trees per block, when you were counting clusters and estimating target crop load. If you didn't do so already, that is the first step in the fruitlet growth. I made laminated cards and zip-tied them to the branch near each cluster. Next, carefully write on each fruitlet in each of those clusters using a sharpie or other permanent marker, so that the fruitlets are numbered 1-5 (or however many are in each cluster), beginning with one as the king fruitlet.

### Measuring Fruitlets:

Using calipers, measure the diameter of each fruitlet in the cluster, and record each diameter. Because each fruitlet is not a perfect sphere, it is important to always take the measurement on the same section of the fruitlet each time you measure – to make that easy it is best to always measure each fruitlet so that the arm of the calipers covers the number written on the fruitlet.

### Using the MSU spreadsheet:

Once the diameter of each fruitlet has been measured and recorded, transfer those data into the MSU spreadsheet (which you can download at <https://fruit.wisc.edu/apples-and-pears/#pruning>). Note that it is possible to “break” the spreadsheet if you insert or delete rows (i.e. if there are more or fewer than five fruitlets per cluster). Instead of inserting or deleting entire rows, simply manually change the numbers on the left three columns of the spreadsheet to reflect the number of fruitlets per cluster (you can manually change any of the numbers in the left three columns, as they are there only to allow you to keep track of which numbers go where, and are not used at all in the calculations). If some fruitlets have already fallen off by the time you get around to the first measurement, you can either type an arbitrary, low number for each fruitlet that has already fallen off, or enter the rest of the data first and then use the “mean of all fruitlets (from the summary sheet) for each fruitlet that has already fallen off. However, if you leave those blank or do not record them, the predicted % setting calculation will be artificially high, so you may thin more fruit than your target.



**Measure the diameter of each fruit using calipers. Always put the arm of the caliper directly over the written number on the fruitlet, to be sure to be consistent in where the measurements take place each time you come back to measure.**

Target Fruit Number			253		Target % Fruitset				10%	
Sampling			Diameter (mm)		Diameter Growth (mm)		Number of Fruit			Predicted % Setting
Number	Date	Days between sample dates	Mean of 20 largest fruitlets	Mean of all fruitlets	Mean of up to 20 fastest growing fruitlets	50% fastest growing fruitlets	>50% fastest	<50% fastest	Measured	Based on Original # of Fruit
1	5/27	0	9.45	5.56					335	
2	5/30	3	13.04	7.08	4.25	2.13	106	160	266	31.6
3	6/2	3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0	0	0.0
4	6/5	3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0	0	0.0
5	6/8	3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0	0	0.0
6	6/11	3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0	0	0.0
7	6/14	3	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0	0	0	0.0

**MSU spreadsheet output after two days of sampling. Note that the current predicted % of fruit setting (31.6%, red circle) is significantly higher than the target % fruitset (10%, blue circle), so another thinner application is necessary. Also note that the number of fruitlets measured decreased (from 335 to 266, orange oval), because some fruitlets fell off between the sampling dates.**

Once you have entered all the fruitlet diameters in to the spreadsheet, go to the “summary” tab and click the “calculate fruit set” button. This will run the algorithm to calculate the 20 fastest growing fruitlets, and to compare the other fruitlets to these, in order to determine which are likely to continue to grow and which are likely to abscise. The “predicted % setting” number, toward the right-hand side of the spreadsheet, can be compared to your target % fruitset, to let you know if you need to make another thinning application, or, if those numbers are close, when you’re finished with thinning for the year.

### Relevant Literature:

Greene, D.W. et al. 2013. [Development of a Fruitlet Growth Model to Predict Thinner Response on Apples](#). HortScience 48: 584-587.

Lake Ontario Fruit Program. 2015. [Learning Precision Apple Thinning](#). (YouTube video in Spanish with English subtitles). **Beginning at minute 2:45.**

Schwallier, P. and A. Irish-Brown. 2015. [Predicting Apple Fruit Set Model](#). New York Fruit Quarterly 23: 15-18.

## Current carbohydrate model outputs

Following are screen shots of the current NEWA carbohydrate model outputs from across the state. The green bar shows the current day's temperature and solar radiation data, and the model's estimate of tree's carbohydrate balance. Below the green bar, in tan, is the forecasted weather data and corresponding forecasted carbohydrate balance.

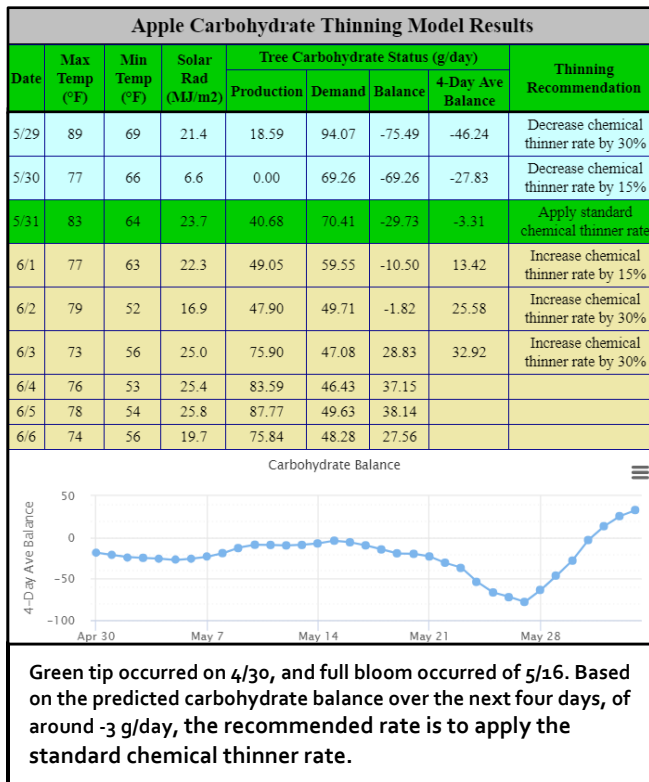
As the weather moves toward cooler and sunnier days, the trees are building up a better carbohydrate reserve, meaning they will become less sensitive to the chemical thinners. That is why for this week the model results for some of the sites presented below suggest using a *standard* rate or even **increasing** the rate (by 15%) of chemical thinner **more** than what you would normally use, whereas other sites still recommend **decreasing** the rate (by 15%) of chemical thinner **less** than what you would normally use.

### Richland County

Current phenological stage: 7mm – 14mm fruit

Green tip: 4/30

Full bloom: 5/16

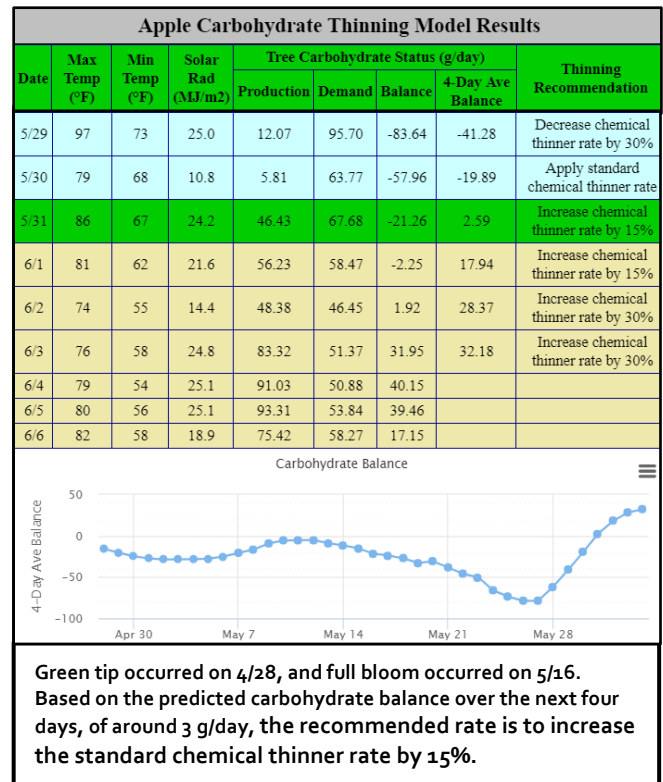


### Trempealeau County

Current phenological stage: 7mm – 14mm fruit

Green tip: 4/28

Full bloom: 5/16

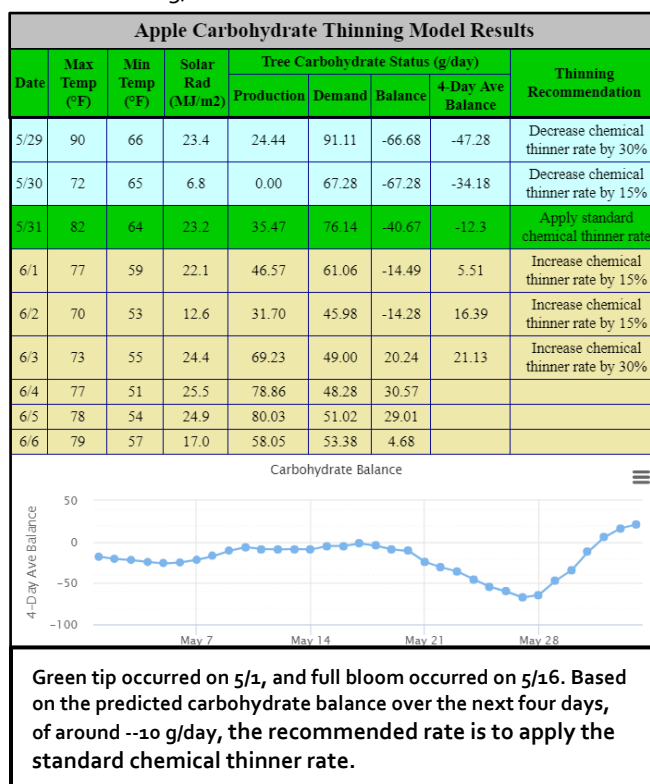


## Eau Claire County

Current phenological stage: 7mm – 14mm fruit

Green tip: 5/1

Full bloom: 5/16

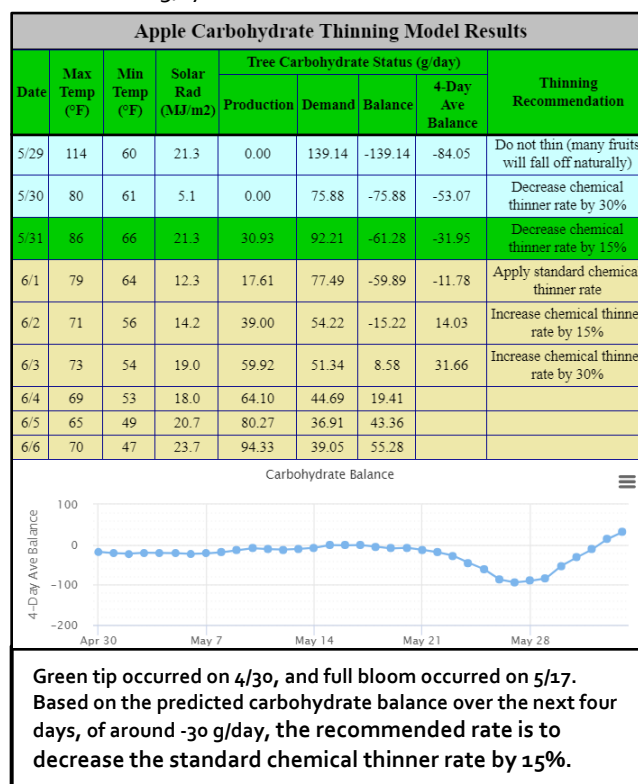


## Racine County

Current phenological stage: 7mm – 14mm fruit

Green tip: 4/30

Full bloom: 5/17

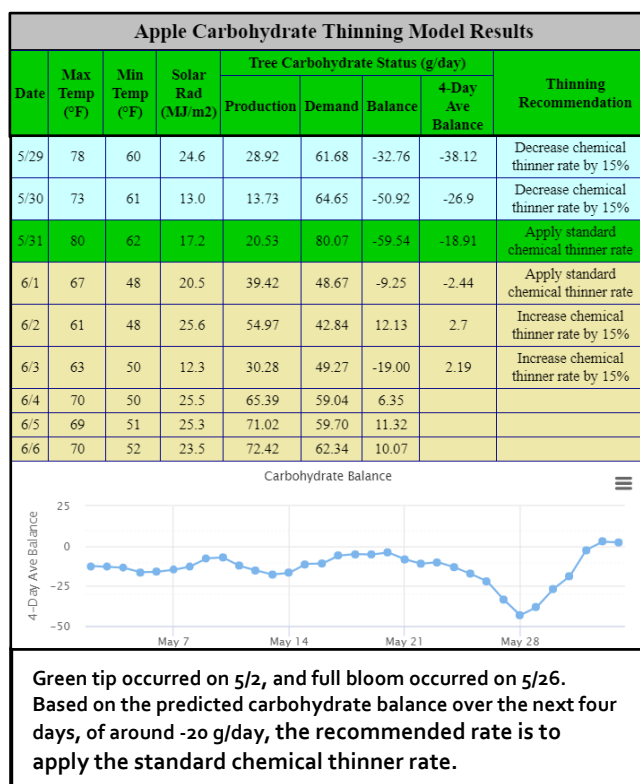


## Door County

Current phenological stage: petal fall – 6mm fruit

Green tip: 5/2

Full bloom: 5/26

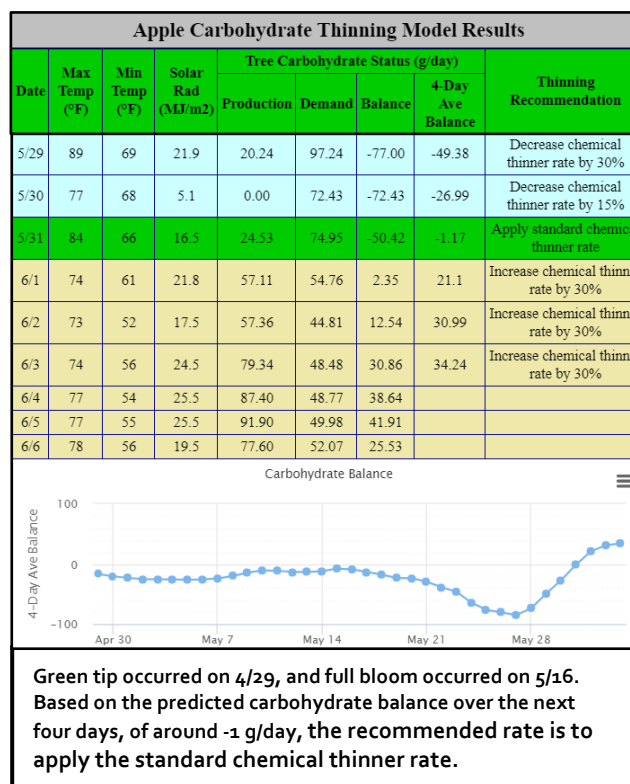


## Dane County

Current phenological stage: 7mm – 18mm fruit

Green tip: 4/29

Full bloom: 5/16



## Calendar of Events

### June 14, 2018 – [Berry Grower Field Day](#)

9 am – 11 am, Zielsdorf Blueberries, W12630 River Road, Black River Falls, WI

### June 14, 2018 – [Grape Grower Field Day](#)

1 pm – 3 pm, Elmaro Vineyard N14756 Delaney Road, Trempealeau, WI

### July 18, 2018 – [Summer Apple Growers Field Day](#)

8 am – 5 pm, Oakwood Fruit Farm, 31128 Apple Ridge Rd, Richland Center, WI

### August 13, 2018 – [PARS Vineyard Walk](#)

1 pm – 4 pm, Peninsular Agricultural Research Station, 4312 Hwy 42 N., Sturgeon Bay, WI

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### Useful Links:

**Wisconsin Fruit Website:** <https://fruit.wisc.edu/>

You can purchase (\$10) the 2016 Midwest Fruit Pest Management Guide from the UW Learning Store:

<http://learningstore.uwex.edu/Midwest-Fruit-Pest-Management-Guide-2016-P1785.aspx>

Insect Diagnostics Lab: <http://labs.russell.wisc.edu/insectlab/>

Plant Disease Clinic: <http://labs.russell.wisc.edu/pddc/>

Soil and Forage Analysis Lab: <https://uwlabs.soils.wisc.edu/>

Weed Identification Tool: <http://weedid.wisc.edu/weedid.php>

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*Edited by:* Christelle Guédot, Entomology Specialist, UW-Madison and Amaya Atucha, Horticulture Specialist, UW-Madison. *Formatting by:* Janet van Zoeren, Fruit Crops Extension Intern, UW-Extension. Articles provided by other sources as attributed. Funding provided by the University of Wisconsin-Extension. *Email Questions to:* vanzoeren@wisc.edu.

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If you have any questions or comments about the Wisconsin Fruit News issues, please contact Janet van Zoeren: vanzoeren@wisc.edu.