

Cranberry Crop Management Journal

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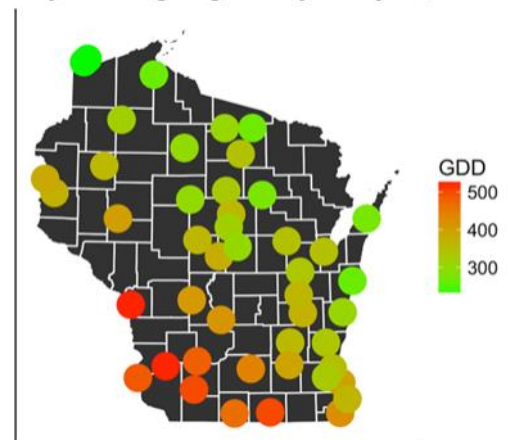
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CRANBERRY PLANT AND PEST DEGREE DAYS– MAY 16, 2018

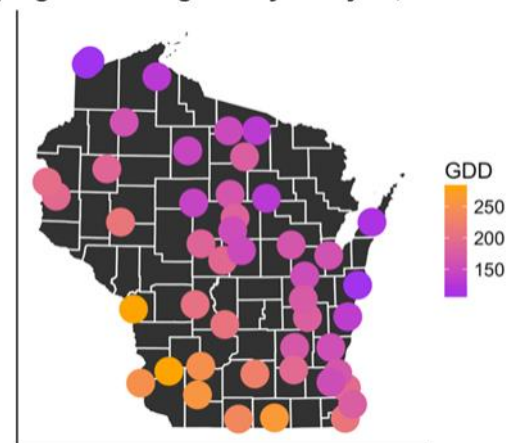
by Elissa Chasen and Shawn Steffan
USDA-ARS and UW Entomology

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.

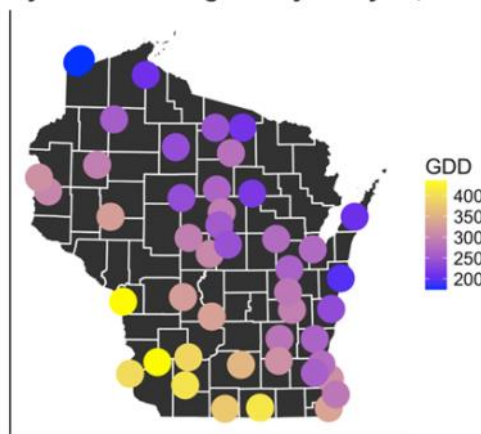
Cranberry Growing Degree Days: May 15, 2018



Sparganothis Degree Days: May 15, 2018



Cranberry Fruitworm Degree Days: May 15, 2018



We are still lagging a bit behind degree-day accumulations from the last couple of years, but with the warm days we are having now, it is still possible to catch up. You can see that in the table below.

	May 15			Cranberry DDs			Sparg DDs			CFW DDs		
	2016	2017	2018	2016	2017	2018	2016	2017	2018	2016	2017	2018
<i>Northern WI (Minocqua)</i>	368.4	318.9	310.5	145.6	117.3	154.4	277.8	236.8	250.8			
<i>Central WI (Wisconsin Rapids)</i>	501.7	508.5	375.1	215.7	230.3	188.6	385.4	399.9	302.5			

USING GROWING DEGREE DAYS AS A MANAGEMENT TOOL—

A GROWERS PERSPECTIVE

by Steve Habelman

Habelman Bros-Tunnel City

We at Habelman Bros- Tunnel City have always been progressive in all areas of cranberry production. We have been collecting Growing Degree Day (GDD) data for the past 10 years.

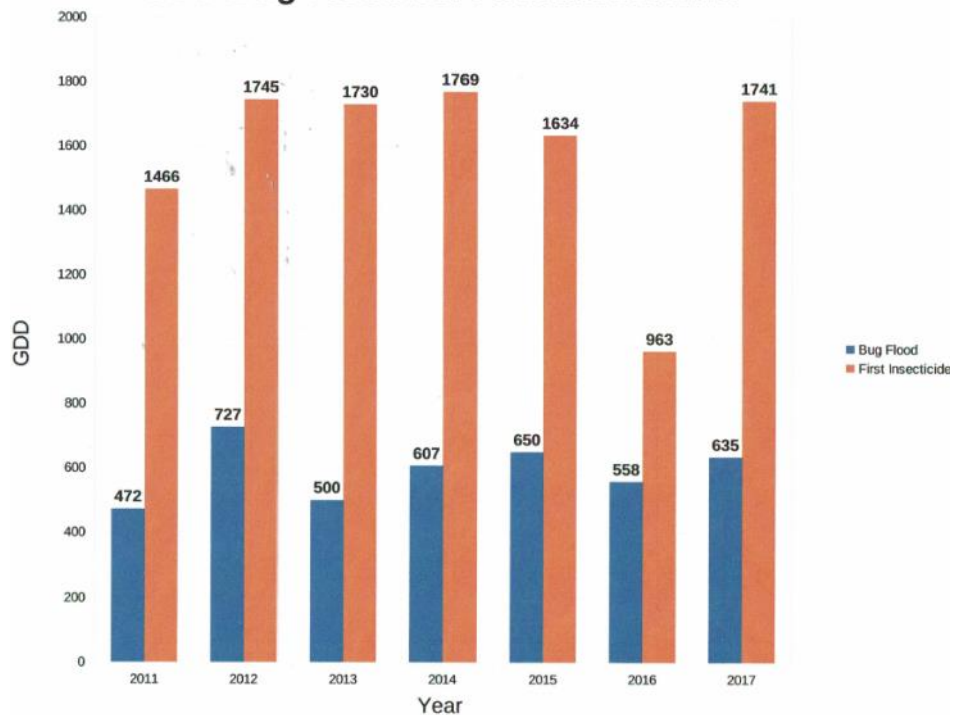
Every year we start collecting growing degree days on March 1st. This keeps us consistent on a yearly basis. Our weather station stays in the same location every year and all year long. The calculator in our weather program allows us to calculate growing degree days in three different methods. We choose to use the integration method as we feel it is more accurate to temperature fluctuations throughout the day versus the high/low method or the growing degree day cut off method. We use many tools to determine the timing of spring insect control. GDDs, observations, sweep net catches, plant stage and past history is all taken into consideration.

With 10 years of data collected, we started looking at specific correlations. One the next page is our chart of GDDs and flooding. In the chart, you will find that we have had great control almost every year with the exception of 2016. On average, we have had between 40 to 50 calendar days of control after the bug flood. In 2016, we only had 17 calendar days of control. In 2016, did we have a late hatch of insects or did something else happen with our insect flood? In any event, we felt the populations were uncomfortable so we used an insecticide on the marsh.

We plan to continue flooding for insect control in the spring because it works so well for us. In the flood waters, we have seen larva of all species floating with the trash on the bed edge, with insects such as June beetles and nocturnal cutworm, which we didn't even know we had in our beds. We are also amazed to see the flight of birds having a feeding frenzy on the floating insects. All the early pests are controlled and I'm pleased with how low the 2nd generation Sparganothis Fruitworm populations are. When cleaning the trash from an insect flood, we are also increasing our fruit quality potential, by removing pathogens that overwinter on old leaves or potential mummy berries.

One important fact for our markets is that with flooding, there is no chemical residue – no MRI to be concerned with! In selling our crop, we take a great deal of pride in sharing with our customers that we use cultural practices like flooding instead of using chemicals for the early pest problems. Our fruit is a better quality product because of this practice. When looking at the chart below, please understand that the first Insecticide is actually for the 2nd generation pest populations which are typically timed based on environmental factors, flights and percentages out of bloom and other tools. This insecticide is addressing Cranberry Fruitworm as well as 2nd generation Sparganothis Fruitworm. 2016 was the only exception as we were still addressing what was 1st generation pests.

GDD Bug Flood vs. First Insecticide



CRANBERRY TIPWORM

by Janet van Zoeren and Christelle Guédot

UW-Madison, Department of Entomology

Common Name: Cranberry tipworm, blueberry gall midge

Order: Diptera

Family: Cecidomyiidae

Scientific Name: *Dasineura oxycoccana* (Johnson)

Cranberry tipworm is a sporadic pest in Wisconsin cranberry production, in that few growers seem to have problems with it, but it can be quite concerning for those that do. The larva of this fly causes damage to the terminal bud. This is a complicated pest to manage, due to its rapid life cycle, conflicting information about the ability of the plant to tolerate damage, the potential impact of this pest on yield, and a lack of choices for



Cranberry tipworm larva in a blueberry bud.

Photo by Brian Little, the University of Georgia, Bugwood.org.

rotating insecticide classes to prevent insecticide resistance.

Identification and Life Cycle:

The cranberry tipworm overwinters as a late-instar larva or pupa (there are conflicting reports in the literature) in the trash layer of the cranberry bed. The adults begin to fly at around bud-break. Adult cranberry tipworm flies are similar in appearance to a mosquito, with long legs and antennae, but they are about ½ the size of a mosquito. The males are dark grey or black, but the females are a characteristic orange-color, which is unique to flies of this size, and provides an easy identification characteristic. The female lays her eggs near the tips of cranberry upright shoots.

The larvae of the cranberry tipworm are what causes crop damage, by feeding on the growing tips of cranberry or blueberry plants. Newly-hatched larvae are clear, turning white and then peach-colored as they age. Summer generations pupate near the plants' growing tips, and the final fall generation returns to the trash layer to overwinter. The life cycle of cranberry tipworm can take as little as 14 days to complete in ideal conditions, and there are four to five overlapping generations of cranberry tipworm per year in Wisconsin.

Damage Symptoms:

Cranberry tipworm damage happens due to their larvae feeding on the growing tips of cranberry uprights and runners. Initial symptoms include curling, cupping and whitening of the terminal leaves, followed by death of the terminal bud. Frequently, the plant can compensate for the loss of the terminal bud by rebranching, forming vegetative shoots on lateral buds. This may be more common in southern Wisconsin, due to the slightly longer growing season, and is infrequent in northern Wisconsin, where the season is shorter and the plant often does not have enough time to re-bud following damage.

The effects of cranberry tipworm on yield are variable and remain poorly understood. The year of damage, there appears to be minimal immediate impact on yield; because cranberry tipworm is an indirect pest, feeding on buds above the current year's flowers, the plant seems to be able to continue to produce fruit that fall despite damage. There does seem to be a decrease in flowering the year following tipworm damage (Terwari and Averill 2012). Even when able to produce lateral shoots following terminal bud damage, those tend to be vegetative rather than fruiting, decreasing the overall flower-set. However, this reduction in flowers has not been shown to correspond to a decrease in berry production (Terwari and Averill 2012), suggesting that the plant may be able to compensate for tipworm damage to one part of the vine with increase fruit-set elsewhere. However, this hasn't been thoroughly researched, and no research has focused on effects on vine vigor in the long term.

As a perennial vine, fully understanding the effect of cranberry tipworm damage on yield should take into account both immediate and long-term effects of bud damage. Currently, growers need to rely on their own intuition to determine how much damage their beds can tolerate, and when to implement control.

Monitoring and Control:

Monitoring for cranberry tipworm requires at least a hand lens, or ideally a microscope, due to their small size. Because tipworm populations can be patchy, it is best to monitor at multiple beds by walking transects across the beds, in order to ensure a representative sample.

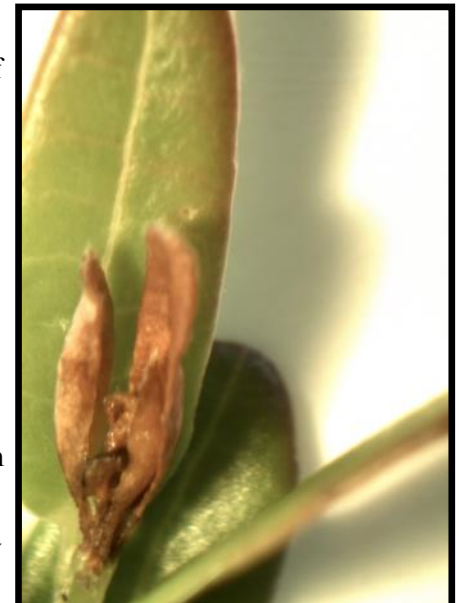
You can monitor for larvae by collecting approximately 50 randomly selected uprights per bed. Using magnification, carefully inspect each upright, looking for eggs, larvae, nymphs and damage symptoms. Since tipworm larvae develop very quickly, care should be used when basing a decision to spray on damage symptoms, since by the time damage symptoms appear the larvae are likely to have pupated and to have moved to a different section of the marsh. Alternatively, monitor for adults with sweep netting – it is recommended to mist the net to dampen it so the adult flies will stick better. Then, under magnification, look for the bright orange female adult flies. There is no known action threshold for cranberry tipworm.

Cultural control

Heavy winter sanding (i.e. 1.5"-2") can slow down emergence of the first generation of cranberry tipworm adults (Mahr and Perry 2006). This works because many of the overwintering generation, in the trash layer, are then unable to unbury themselves when they emerge as adults in the spring. This can keep populations low in the spring of the year following sanding, but



Cranberry tipworm adult female. Photo courtesy of University of Maine Cooperative Extension.



Cranberry tipworm damage. Photo courtesy of Benjamin Tilberg, Ocean Spray, Inc.



Cranberry tipworm eggs. Photo courtesy of UMaine Extension.

will not provide season-long control, and should only be used every few years to avoid over-sanding the beds. It is best, when using sanding as a cultural control method for tipworm, to sand in large contiguous blocks of beds, to avoid adults flying in and re-populating from neighboring beds.

Avoiding late-season fertilizer applications constitutes another form of cultural control for cranberry tipworm. Late fall or early spring nitrogen applications encourage excessive vegetative growth, which is exactly what tipworms feed on. By cutting back those late fall and early spring nitrogen fertilization events, you can make your cranberry vines less appealing to tipworm. Additionally, fertilization following tipworm damage can promote vine health and encourage those lateral shoots, which can help the vine compensate for the damage (DeMoranville, Sandler and Bicki 1996).

Biological control

Biological control is not currently commercially available for cranberry tipworm. However, larvae of the native hoverfly species, *Toxomerus marginatus*, feed on tipworm and are likely to offer some protection when prevalent. In addition, many species of native parasitoid wasps and generalist predators have been observed feeding on cranberry tipworm (Fitzpatrick et al). Hoverflies and other biocontrol agents often rely on flower nectar resources, so pollinator gardens may also serve to encourage natural enemies. Shane Foye and Shawn Steffan have found a nematode that feeds on at least some fly species. In coming years they hope to test whether this nematode species will feed on cranberry tipworm. Stay tuned!



Adult nematode and immatures.
Photo courtesy of Shane Foye.

Chemical control

A list of available insecticides to control cranberry tipworm in cranberry is provided in the following table. Efficacy data is based on recent field trial data (Perry et al 2018, Guédot and Perry 2016). Movento, the only currently registered insecticide that provides excellent control, is taken up by the plant and provides systemic control. This product will be covered in more detail in a future article, so will not be discussed in depth here. However, it is important to remember to rely on other control options or to rotate chemistries, in order to avoid development of resistance, and to maintain the effectiveness of current products. All product recommendations can be found in the [2018 Cranberry Pest Management in Wisconsin guide](#). Additionally, you should always fully read and follow the label before spraying any pesticide and check with your handler for pesticide use and Pre-Harvest intervals.

Class (IRAC code)	Tradename	Active ingredient	Label PHI** (days)	Efficacy
Diamides (28):	Altacor	Chlorantraniliprole	1	Poor
Acetyl CoA Inhibitors (23):	Movento	Spirotetramat	7	Excellent
Spinosyns (5):	Delegate	Spinetoram	21	Poor
Benzoylureas (15):	RimOn	Novaluron	1	Good
Neonicotinoids (4A):	Assail	Acetamiprid	1	Poor
Organophosphates (1B):	Diazinon	Diazinon	7	Good
Biologicals:	Grandevo	<i>Chromobacterium subtsugae</i>	0	Poor
	Venerate XC	<i>Burkholderia spp.</i>	0	Poor

****Note** – although the official preharvest interval for Movento is 7 days, Ocean Spray requires a 40 day PHI, and in 2017 handlers in Canada required a 50 day PHI. Again, make sure to check with your handler on their approved PHI for each product you plan to use.

References and further reading

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PRELIMINARY EVIDENCE OF PHEROMONE LOADING DIFFERENCES

by Shawn A. Steffan, Elissa M Chasen, and Christelle Guédot
USDA-ARS and UW-Madison Entomology

In recent years, there has been repeated questioning of whether certain lures provide valid, reliable trap-counts. To provide some answers for the key moth pests being tracked by Wisconsin growers and consultants, we examined the pheromone loads within lures purchased from the four primary suppliers.

We examined the lures for the cranberry fruitworm (CFW), the sparganothis fruitworm (SFW), and the blackheaded fireworm (BHFV). These lures were purchased from ISCA Technologies, Great Lakes IPM, Scentry, and Trécé. Based on our first analyses of lure compositions at the University of Wisconsin BioTech Center, we are seeing some significant differences.

In the ISCA Tech lure for CFW, we found that the two primary components were present, and both were loaded in an appropriate ratio. ISCA was the only producer to make this lure this spring. Fortunately, it appears that the important compounds were present and the loading ratio was satisfactory. We were told by Great Lakes IPM that when they are done selling all their current CFW lures (from ISCA), they will begin making their own CFW lures. We will again assess lure loading at that time.

For SFW and BHFV, these lures were manufactured by ISCA, Scentry, and Trécé. Interestingly, Scentry and Trécé didn't offer these directly to consumers—instead, Great Lakes IPM represented the 'storefront' and provided the SFW and BHFV lures for Scentry and Trécé. Looking at the SFW loading, it appears the right pheromone compound was present in the ISCA, Scentry, and Trécé lures. However, the ratios were strikingly different. The Trécé SFW lures had 11 times higher loads than the ISCA SFW lure, and 2.3 times that of the Scentry SFW lure. Looking at the BHFV lures, Trécé again had the highest loading, with 9 times that of the ISCA lure, and 17 times that of the Scentry lure. Do these differences matter for monitoring our cranberry pests? While we do not have a direct comparison of their effectiveness in the field, it is very possible that the loading may affect attractiveness. More moths might be attracted to the Trécé lures, and the lures will likely last longer. If there are issues with SFW or BHFV lure longevity, the loading amount should explain the differences.

Trécé also loaded a second compound in its BHFV lure that, according to McDonough et al. (1987), is a key synergist (greatly enhances the effectiveness of the primary compound). Neither ISCA nor Scentry loaded this synergist, although these two manufacturers did load a third pheromone that may or may not enhance moth capture. In the older literature, this third compound was thought to enhance moth capture, but more recently was shown to be neutral/redundant with the primary pheromone. It will be interesting to see if Trécé BHFV lures are providing higher moth counts.

At this point, we recommend purchasing lures for SFW and BHFV from Trécé and CFW lures (only ones available right now) from ISCA. Lures can be purchased directly from Great Lakes IPM and ISCA Tech.

TRAINING REQUIREMENTS UNDER WPS 170.409

by Ben Tilberg
Ocean Spray Cranberries, Inc.

As the season begins, most growers use some sort of pesticide to control emergence of weeds or insects. The use of pesticides requires notification to ensure workers and persons entering the application areas are protected from exposure. Proper training and PPE (Personal Protective Equipment) will protect workers from exposure while working near or in restricted-entry areas. The updated quick reference Overview of Worker Protection Standard for Cranberry Pesticides, found on the bottom of the page will help to remind personnel of the requirements for PPE and notification. Movento (highlighted) is a new pesticide registered in WI this year.

How soon must workers and handlers be trained?

Handlers must be trained before doing any handling task. Early-entry workers who will contact anything that has been treated with the pesticide while the restricted-entry interval (REI) is in effect must be trained before they do any early-entry task. Other agricultural workers, including early-entry workers who will not contact anything that has been treated with the pesticide while the REI is in effect, must be trained before they accumulate more than five separate days of entry into pesticide-treated areas after the REI expires. These five days of entry need not be consecutive and are not limited to a growing season or calendar year. Untrained workers must be provided with basic pesticide safety information before they enter pesticide-treated areas on the establishment. To view the complete list of training requirements please visit this website: <https://www.epa.gov/pesticide-worker-safety/safety-training-pesticide-workers-and-handlers>

Here is a link to the EPA approved WPS training video: https://youtu.be/8zE9_vmPdwQ

Record keeping: Have workers and handlers “sign in” when the training has been completed to keep a record of training. This may be requested upon inspection, so keep it handy!

OVERVIEW OF WORKER PROTECTION STANDARD FOR CRANBERRY PESTICIDES						
Product	Restricted Use	REI	Signal Word	Notification		Personal Protective Equipment
Insecticides		Hours		Oral	Post	
Actara		12	Caution	x	x	Basic PPE in accordance with WPS
Altacor		4	Caution	x	x	Basic PPE in accordance with WPS
Assail 30 SG & 70 WP		12	Caution	x	x	Basic PPE & Chemical resistant gloves and headgear
Confirm 2F		4	Caution	x	x	Basic PPE in accordance with WPS
Diazinon AG600 & 50W & AG500		5 days	Caution	x	x	Basic PPE & respirator, face shield, safety glasses, Coveralls, CR footwear
Delegate WG		4	Caution	x	x	Basic PPE in accordance with WPS
Imidan 70W		3 days	Warning	x	x	Basic PPE & respirator, face shield, safety glasses, CR apron
Intrepid 2F		4	Caution	x	x	Basic PPE in accordance with WPS
Lorsban 4E & Advanced (Chlorpyrifos)		24	Warning	x	x	Basic PPE & respirator, face shield, safety glasses, CR apron, CR footwear
Movento		24	Caution	x	x	Basic PPE in accordance with WPS
Orthene 97		24	Caution	x	x	Basic PPE & respirator, face shield, safety glasses, CR apron
Sevin XLR		12	Caution	x	x	Basic PPE & respirator, face shield, safety glasses, Coveralls, CR footwear
Fungicides						
Abound		4	Caution	x	x	Basic PPE in accordance with WPS
Bravo Ultrex		12	Danger	x	x	Basic PPE & respirator, face shield, safety glasses, Coveralls, CR footwear
Bravo Weather Stik		12	Caution	x	x	Basic PPE in accordance with WPS
Indar 2F		12	Caution	x	x	Basic PPE & headgear
Tilt & Orbit		12	Warning	x	x	Basic PPE in accordance with WPS
Proline 480 SC		12	Caution	x	x	Basic PPE in accordance with WPS
Herbicides						
2, 4-D Granules		12	Caution	x	x	Basic PPE in accordance with WPS
Callisto		12	Caution	x	x	Basic PPE in accordance with WPS
Casoron 4G		12	Caution	x	x	Basic PPE in accordance with WPS
Devrinol 2-XT & DF-XT		24	Caution	x	x	Basic PPE in accordance with WPS
Evital 5G		12	Caution	x	x	Basic PPE in accordance with WPS
Round-up Weathermax		see label	Caution	x	x	Basic PPE in accordance with WPS
Poast		12	Warning	x	x	Basic PPE & face shield, safety glasses, Coveralls, CR Apron, CR footwear
Select & Max		24	Caution	x	x	Basic PPE in accordance with WPS
Stinger		12	Caution	x	x	Basic PPE in accordance with WPS
Weedar 64		48	Danger	x	x	Basic PPE in accordance with WPS, CR Apron
This is advisory information only. Always read and follow current label directions. The label is the law.				NEW	Basic PPE	**Handlers and loaders should always use long Sleeved Shirt, long pants, eyewear, shoes with socks and chemical resistant gloves



FARM TECHNOLOGY DAYS- How you can help!

Cranberry Exhibit at Innovation Square will be hosted July 10-12 at D&B Sternweis Farms and Weber's Farm Store-Heiman Holsteins. Our cranberry exhibit will be located in the heart of Farm Technology Days-Innovation Square.

We are excited to teach people about our #1 state fruit. To help us do this we are asking fellow growers to come talk about what they know best-CRANBERRIES! We are encouraging families to volunteer together since we would like this to be a kid-friendly Exhibit. If you would like to help represent as a Grower Volunteer, we have two shifts available daily during the farm show: 8:30AM-12:30PM and 12:30PM-4:30PM. Volunteers will help answer questions and share cranberry information. Volunteers will receive complimentary admission and children 12 years and younger are free! BONUS-If you volunteer for one shift you will still have time to enjoy the Farm Technology Days without having to pay. Our exhibit volunteers will also receive a t-shirt so people will be able to easily spot Growers if they have any questions about cranberries.

If you are unable to volunteer for the show, but are still interested in helping out, we will need people to help us set up our exhibit prior to the show and to take it down after the show.

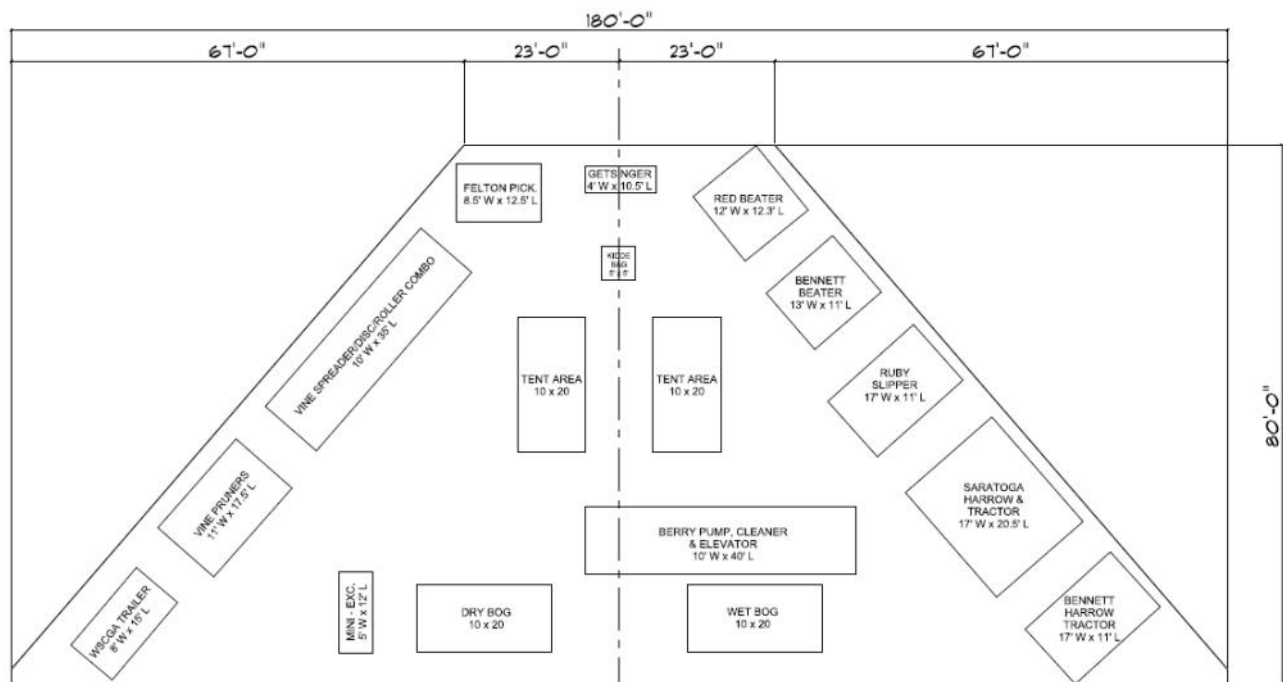
We want to show people the advances of technology over the years. We plan on doing so by having old and new harvest equipment on display. It will be similar to Larry Rezin's wonderful CranFest display! In order to accomplish this we are still in need of Cranberry Equipment. Please contact us if you are willing to loan your equipment for display.

We're also looking for a volunteer(s) to help plan and organize the Ag. Education Tent components such as: Mini Bog Display, Cross Section Soil/Vine Displays, Sand Box play area and Take a Bog Home project.

Lastly, we are looking for a Cranberry Welcome booth to be created out of barn board/drying crates, surplus wood supplies that mimic a 'lemonade stand'. We have the design; we are looking for the labor to see this vision through. The Cranberry Exhibit Committee has a budget to help with expenses for our wish list of requests.

Please reach out to Heidi Slinkman (gaynorcranberry@gmail.com) or (715-213-4828), Mary Smedbron (715-213-2821), or Stephanie Bennett (715-323-0199) to let us know how you can help out.

Thank you to everyone that is helping us create this unique exhibit. We can't wait for you to join us in Marshfield July 10-12!! The Cranberry Exhibit Committee: Heidi Slinkman, Mary Smedbron, Stephanie Bennett, Nicki Ryner, Ben Rezin, & Ben Tilberg



Cranberry Exhibit Layout at Farm Tech Days

GROWER UPDATES

GAYNOR CRANBERRY COMPANY

Things are coming to life and it's great to see warmer temperatures in the forecast! We will be applying our casoron this week. Growers in our area have had a few frost nights. We have started our IPM scouting this week and will be planning ahead for the insects and weeds that come along with the warm weather. We love seeing all the wildlife come back and anxiously await all the new babies! I had the opportunity to rescue and help an injured bald eagle and visited The Raptor Education group in Antigo. What an amazing facility they have in Antigo! As cranberry growers we love the opportunity to be stewards of the land!

Jenna Dempze

JAMES POTTER CRANBERRY MARSH

Our growing season is officially under way! With all the rain and sunshine we have received the last couple of weeks, our vines are really greening up. It is such a refreshing feeling to see growth and so much green again. We spent the later part of April and early May getting our irrigation in and running smoothly. We were also able to do our yearly trash flood. We are renovating about 4.5 acres this year, so we are beginning to work at getting that bed dried out and level to work on. A lot of work needs to be done before planting, but we'll get there.

Sandy Nemitz

OBSERVATIONS FROM THE FIELD

by Pam Verhulst
Lady Bug IPM, LLC

Bronzed Uprights

Our first week out scouting we were surprised to see the amount of vine stress.

Each situation is unique and growers that have bronzed uprights need to ask themselves when they think their vines became vulnerable. Were they dry in November? Were they exposed after the February thaw? Or maybe they were susceptible in April.



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