Northern Michigan FruitNet 2018
Northwest Michigan Horticultural Research Center
Weekly Update

FruitNet Report – June 12, 2018

CALENDAR OF EVENTS

5/8 – 6/27	**IPM Updates**
6/22	**Farmer Field Day - SOIL, STEWARDSHIP & FARM LONGEVITY *Tickets are still available – RSVP here:** https://www.eventbrite.com/e/farmer-field-day-tickets-45485784205?aff=eac2

What's new?

- **Northwest Regional Report – June 12, 2018**
- **Farmer Field Day - SOIL, STEWARDSHIP & FARM LONGEVITY - Update**

New articles

Northwest Regional Report – June 12, 2018

Spotted wing drosophila was detected in our region last week, but most tree fruit pest and disease activity has slowed recently.

Emily Pochubay and Nikki Rothwell, MSU Extension

GROWING DEGREE DAY ACCUMULATIONS AS OF June 11, 2018 AT THE NWMHRC

Year	2018	2017	2016	2015	2014	2013	28 Yr. Avg.
GDD42	861	872	889	849	770	800	859.9
GDD50	505	457	487	460	424	460	462.4

2018 Growth Stages – NW Michigan Horticultural Research Center June 11, 2018

Bartlett Pear – 15 mm fruit
Potomac Pear – 18 mm fruit
Mac – 20 mm fruit
Gala – 13 mm fruit
Red Delicious – 15 mm fruit
HoneyCrisp – 15 mm fruit
Montmorency – 12 mm fruit
Balaton – 12 mm fruit
Hedelfingen – 11 mm fruit
Gold – 11 mm fruit
Napolean – 11 mm fruit
Riesling – 10”- 16” shoots

Weather Report

The weather over the past week has been much more typical than the heat wave we experienced at the end of May. Daytime temperatures have been in the 70s and nighttime temperatures dip down into the 40-50s. Most days have been sunny although the past few mornings have started out with cloud cover. Conditions continue to be windy, which has made spraying more difficult. We also have had no rain in the past week, and soils are dry. There is little rain in the forecast, and we expect soils to dry out more over the coming week. Thus far, we have accumulated 861GDD base 42 and 505GDD base 50. These accumulations are on average compared to past seasons.

Crop Report

Fruit is continuing to size, and some early varieties of sweet cherries are starting to lose green color. The sweet cherry crop looks good in most blocks around the region. The tart cherry crop size seems to be shrinking compared to last week’s estimate. Many growers

are estimating the tart crop to be about 60% of a crop. Last week, the following numbers were estimated for the other regions in Michigan and around the country (all numbers are in millions of pounds): SW MI: 25, WC MI: 60, UT: 40, WI: 10, WA: 27, and OR: 3.0. We have heard various estimates for NW Michigan, and some growers are estimating 130 million pounds but we have heard even higher amounts such as 180 million pounds. However, most growers are estimating a smaller crop than the numbers that were shared at meetings last week. We will keep growers posted on the crop sizes as the season progresses.

The apple crop is also sizing, and fruit at the station is 13-20mm depending on variety. For growers that are still thinning, the window may be closing in the next few days as the fruit will be too big to thin. The optimal fruit size for thinning is 10mm and many orchards are well beyond this size at this time. The carbohydrate model is also predicting thinning conditions to be more difficult, and it recommends increasing the chemical thinner rate by 30%. The model is predicting little to no stress, and the 4-day average balance for tree carbohydrate is 30-40g/day. Therefore, growers should consider an aggressive thinning program if they have yet to thin their apples. Fruit size and the lack of stress will make thinning more difficult. Aggressive thinning combinations include Sevin +NAA or Sevin + 6BA. Adjuvants will also increase the potential to thin the crop.

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
5/1	79	62	21.8	0.00	18.37	-18.37	-14.8	-
5/2	70	49	13.6	0.00	15.62	-15.62	-15.49	-
5/3	59	44	18.4	0.00	11.91	-11.91	-15.84	-
5/4	62	42	14.6	0.00	13.28	-13.28	-16.33	-
5/5	70	50	24.0	0.32	21.48	-21.16	-21.06	-
5/6	63	47	20.6	1.36	18.38	-17.02	-22.02	-
5/7	70	37	26.8	3.49	17.34	-13.85	-19.05	-
5/8	82	55	24.9	1.33	33.53	-32.20	-16.48	-
5/9	73	47	7.5	0.00	25.00	-25.00	-10.3	-
5/10	56	38	22.8	7.23	12.39	-5.16	-6.68	-
5/11	50	34	13.0	4.77	8.33	-3.56	-10.55	-
5/12	62	40	24.2	8.73	16.22	-7.49	-12.47	-
5/13	67	44	26.7	10.24	20.73	-10.49	-13.38	-
5/14	74	51	19.6	6.94	27.62	-20.68	-11.08	-
5/15	68	52	26.2	12.56	23.77	-11.21	-6.68	-
5/16	78	48	27.3	14.51	25.64	-11.13	-6.92	-

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
5/17	68	47	26.4	17.64	18.95	-1.31	-0.71	-
5/18	75	49	27.1	18.51	21.59	-3.08	-0.43	-
5/19	63	48	7.5	2.88	15.03	-12.15	2.13	-
5/20	62	39	26.1	24.60	10.93	13.68	5.28	-
5/21	67	43	14.2	13.34	13.52	-0.17	-0.87	-
5/22	67	51	25.7	24.42	17.27	7.15	-10.3	Apply standard chemical thinner rate
5/23	77	51	27.1	25.69	25.22	0.47	-21.39	Decrease chemical thinner rate by 15%
5/24	81	56	26.8	24.69	35.62	-10.94	-32.41	Decrease chemical thinner rate by 15%
5/25	87	66	25.1	17.90	55.78	-37.87	-42.59	Decrease chemical thinner rate by 30%
5/26	83	64	25.7	24.57	61.79	-37.22	-45.7	Decrease chemical thinner rate by 30%
5/27	85	63	27.1	28.90	72.52	-43.62	-55.67	Decrease chemical thinner rate by 30%
5/28	84	60	20.4	24.33	75.99	-51.65	-60.87	Decrease chemical thinner rate by 50%
5/29	89	58	26.0	34.28	84.60	-50.32	-46.08	Decrease chemical thinner rate by 30%
5/30	84	65	14.5	11.77	88.88	-77.11	-31.17	Decrease chemical thinner rate by 15%
5/31	75	67	14.3	15.14	79.54	-64.40	-21.09	Decrease chemical thinner rate by 15%
6/1	69	48	23.1	56.64	49.15	7.50	3.21	Increase chemical thinner rate by 15%

Apple Carbohydrate Thinning Model Results

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				Production	Demand	Balance	4-Day Ave Balance	
6/2	74	52	28.4	70.27	60.94	9.33	13.79	Increase chemical thinner rate by 15%
6/3	64	53	6.6	12.57	49.37	-36.80	20.93	Increase chemical thinner rate by 30%
6/4	70	51	28.5	85.24	52.44	32.80	41.54	Increase chemical thinner rate by 30%
6/5	59	44	22.6	81.10	31.28	49.82	42.65	Increase chemical thinner rate by 30%
6/6	67	45	19.8	77.90	40.02	37.88	29.64	Increase chemical thinner rate by 30%
6/7	69	54	26.3	95.19	49.52	45.67	26.68	Increase chemical thinner rate by 30%
6/8	75	49	20.4	85.52	48.28	37.23	24.65	Increase chemical thinner rate by 30%
6/9	73	60	12.7	53.61	55.85	-2.24	21.94	Increase chemical thinner rate by 30%
6/10	75	60	19.1	82.15	56.08	26.07	35.96	Increase chemical thinner rate by 30%
6/11	79	55	21.2	91.75	54.22	37.53	41.98	Increase chemical thinner rate by 30%
6/12	77	56	17.7	80.71	54.30	26.41	44.98	Increase chemical thinner rate by 30%
6/13	75	55	25.1	106.61	52.76	53.84	43.24	Increase chemical thinner rate by 30%
6/14	76	54	23.9	104.10	53.95	50.15	29.86	Increase chemical thinner rate by 30%

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
6/15	79	54	25.6	107.52	58.02	49.50		
6/16	84	59	22.3	89.39	69.91	19.47		
6/17	87	62	20.9	78.36	78.04	0.32		

Pest Report

Pest and disease activity seems to have slowed in the last week during more seasonal temperatures and drier conditions. This weather was welcomed, particularly for growers who took advantage of the warm and dry weather to apply plant growth regulators for apple thinning or bud conversion in cherries. The forecast for the coming week suggests that conditions will remain mostly dry with the highest probability of rain on Wednesday 13 June.

In apples, primary **apple scab** is ongoing in our region; this is also the case for the Ridge area. Most of the region has not received rainfall since early last week, and hence, spore discharge has not occurred in these areas. Some areas in Benzie and Manistee counties received a little rain late last week, and although spores likely discharged during this event, conditions dried quickly and an infection period was not recorded on Enviroweather. The RIMpro models (below) show little scab activity as a result of few substantial rain events. However, we suggest that growers continue to stay covered for primary scab if/when wet weather is a threat in the coming week. With the potential for a drier week ahead of us, growers should be mindful of **powdery mildew** as this disease requires very little moisture. Although early management is paramount for successful powdery mildew control, this disease could still get a foothold as apple terminals are actively growing.

Bear Lake (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=SBX4czs
Benzonia (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=W8AATqc
East Leland (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=bQVk0LY
Eastport (Biofix 2 May) - www.rimpro.eu/faces/venturia.xhtml?id=nK5Jcqr
Elk Rapids (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=hCoaC6M
Kewadin (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=Oa4COcX
Northport (Biofix 5 May) - www.rimpro.eu/faces/venturia.xhtml?id=Bsrm7WU
NWMHRC (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=HJzr7Kn
Old Mission (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=xPCzX8i
Williamsburg (Biofix 1 May) - www.rimpro.eu/faces/venturia.xhtml?id=wBe9zhP

Flagging terminals and ooze symptoms caused by **fire blight** infection have just started to show up in a few orchards. If an orchard has substantial fire blight symptoms and ooze, growers will need to slow the spread of this disease until trees reach terminal bud set and growth is inhibited. Copper sprays can kill the bacteria, but there is also the potential for fruit russeting and phytotoxicity on foliage, particularly if it is applied in high temperatures in the 80s and high humidity. If infected shoots are removed, pruning wounds will be vulnerable to infection from bacteria that are spread by rain. We encourage growers and scouts to contact us if they find fire blight or scab – we are working with Dr. George Sundin's lab to screen fire blight and apple scab sensitivity this season.

Disease pressure in cherries remains low at this time. We have received a few reports of **cherry leaf spot** lesions showing up on older leaves, but overall incidence is low thus far this season. We remind growers that previous data have shown that a season-long protectant Captan program has been an effective leaf spot management strategy. However, we caution growers that Captan alone will not provide **powdery mildew** control, if this disease is a concern. As mentioned in last week's report, previous research has shown that an efficacious mildew fungicide applied at first cover timing can provide effective seasonal mildew control in cherries. Lastly, like in apples, drier conditions will favor mildew development.

Most apple pests have been relatively quiet in the last week. Since 28 May, the NWMHRC **codling moth** biofix, we have accumulated ~222 GDD base 50; egg hatch is estimated to begin 250 GDD base 50 from biofix (i.e. roughly Wednesday 13 June or Thursday 14 June this week). The first flight of codling moth is likely ending but ongoing at the station – we found an average of one moth per trap this week (Table 1).

San Jose scale male flight activity also decreased in apples and sweet cherries at the station this week (<1 male per trap in apples and a total of 10 males in cherry); peak flight occurred last week (Table 1). We have not observed crawler activity at this time. Based on degree day accumulations, crawler activity should begin this week as we reached 500 GDD base 51 Monday 11 June .

Plum curculio activity has slowed and evening/dusk temperatures have been cooler lately. We have not observed new oviposition scars since last week. If evening temperatures warm into the 60s, there could be an uptick in plum curculio activity.

We received a report of **rose chafer** activity on Friday 8 June. These skeletonizing beetles have an aggregation pheromone and as a result, some orchards often have a hot spot area with high numbers of beetles. While several insecticides are available for rose chafer management, control can be difficult as this pest can quickly re-infest an area.

Drier weather has also been conducive for **two spotted spider mites**. We have observed two spotted spider mite adults, juveniles, and eggs stages in tart cherry at the station. Mite populations appear to be higher on leaves in the interior of the canopy. Many growers have been mowing and managing weeds recently and orchard floor

management often correlates with the movement of mites from ground cover into tree canopies. Additionally, some insecticides can also contribute to mite flaring.

The first detection of **spotted wing drosophila** in northwest Michigan was on Wednesday 6 June. This first fly was a male and it was detected in a trap on the orchard edge of a tart cherry block on Old Mission Peninsula. Spotted wing drosophila management programs should begin when fruit begin turning straw color, and most cherries are still green at this time.

Potato leafhoppers have not been reported at this time and we have not detected **obliquebanded leafroller** adults or **cherry fruit fly** in our traps at the station.

Table 1. Avg. number of cherry and apple pests in the NWMHRC trap line by date.

Cherry - NWMRHC	**7-May**	**14-May**	**21-May**	**28-May**	**4-June**	**11-June**
GFW	5	2	1	0	0	0
APB	0	0	5	6	7	7
LPTB			Set	4	11	11
GPTB				Set	1	0
SJS (sweet cherry)		Set	0	6	73	10
OBLR					Set	0
CFF					Set	0

Apple - NWMHRC	**7-May**	**14-May**	**21-May**	**28-May**	**4-June**	**11-June**
OFM	Set	0	0	0	0	0
STLM	Set	13	18	32	25	1
CM		Set	0	1	8	1
SJS (apple)		Set	0	6	24	1
OBLR					Set	0

APB = American Plum Borer

LPTB = Lesser Peachtree Borer

GPTB = Greater Peachtree Borer

SJS = San Jose Scale

CFF = Cherry Fruit Fly

OBLR = Obliquebanded Leafroller

OFM = Oriental Fruit Moth

STLM = Spotted Tentiform Leafminer

CM = Codling Moth

Farmer Field Day - SOIL, STEWARDSHIP & FARM LONGEVITY - Update

* GTCD is still accepting registrations and the sale has not ended! RSVP at the link below.

Learn About:
Soil Fertility, Nutrient Utilization, and Conservation Tools

Qualifies for a MAEAP phase 1 credit

Date: June 22, 2018

Time: 8:45AM - 4PM

Location: MAPLE BAY FARM **10875 US-31, Williamsburg MI**

Reception & bluegrass performance to follow featuring **CARTER CREEK**

FREE OF CHARGE

A locally-sourced lunch is included with pre-registration

TO REGISTER:
Contact the *Grand Traverse Conservation District* via phone or email: **231.941.0960 ext. 22 // lfreed@gtcd.org**

https://www.eventbrite.com/e/farmer-field-day-tickets-45485784205?aff=eac2

Articles featured in past FruitNet Reports

Spotted Wing Drosophila Report – June 8, 2017

Emily Pochubay and Nikki Rothwell, MSU Extension

The first spotted wing drosophila was detected on Wednesday 6 June in our northwest Michigan trapping line. The trap was at the orchard edge in a tart cherry block on Old Mission Peninsula. This initial detection was a single male fly which is unlike recent seasons when we typically caught a female fly initially. Additionally, this first detection is later (in terms of a calendar date) than we have observed lately; the trend for the last few seasons had been that SWD detected occurred earlier in each successive season.

Although SWD has been detected, we do not suggest that growers begin management programs at this time. Cherries are still green and previous research has shown that SWD can begin laying eggs into cherries when they begin turning straw color. A significant research focus for the research station this season is to hone in on this timing to gain a better understanding of when cherries are vulnerable to SWD, and ultimately, when management programs should begin. Our team will be working to calculate more exact color and penetration measurements in conjunction with fruit development stage susceptibility this season.

Our trap line covers Antrim, Benzie, Grand Traverse, Leelanau, and Manistee counties this season and we will continue to provide timely SWD trap reports in the FruitNet.

New 24 © for Mustang Max in Cherries

Label attached to this email or available here for download:
https://www.dropbox.com/s/073x6bb99f5qewe/2018-06-06%20Mustang%20Maxx%20SLN%20-%20MI%20-%20final%20label.pdf?dl=0

Rainfast characteristics of insecticides on fruit

Precipitation can impact the performance of insecticides on fruit crops, but some compounds resist wash-off.

Posted by **John Wise**, Michigan State University Extension, Department of Entomology, MSUE News

The rainfall events experienced in Michigan have prompted questions about the relative "rainfastness" of the insecticides used in fruit production. In 2006, AgBioResearch provided funds to purchase and install a state-of-the-art rainfall simulation chamber at the Trevor Nichols Research Center (TNRC), after which Michigan State University Extension has conducted trials on fruit crops for a range of insecticides.

There are several critical factors that influence impact of precipitation on a pesticide's performance. First is the plant-penetrative attributes of the various compounds. Some pesticide chemistries, like organophosphates, have limited penetrative potential in plant tissue, and thus are considered primarily as surface materials. Some compounds, such as carbamates, oxadiazines and pyrethroids, penetrate plant cuticles, providing some resistance to wash-off. Many newer compounds, such as spinosyns, diamides, avermectins and some Insect Growth Regulators (IGR), readily penetrate plant cuticles and have translaminar movement in leaf tissue. Others, like the neonicotinoid insecticides, are systemic and can have translaminar (moves from top surface to bottom of leaf) as well as acropetal movement in the plant's vascular system (moves from center to growing tips of leaves). Penetration into plant tissue is generally expected to enhance rainfastness of pesticides.

The second factor is the inherent toxicity of an insecticide to the target pest and the persistence of the compound in the environment. In some cases, a compound may be susceptible to wash-off, but its environmental persistence and inherent toxicity to the target pest compensates for the loss of residue, thus delaying the need for immediate re-application.

The third factor is the amount of precipitation. In general, organophosphate insecticides have the highest susceptibility to wash-off from precipitation, but following light rainfall their high field-rate toxicity to most target pests overcomes the necessity for immediate re-application. Neonicotinoid insecticides are moderately susceptible to wash-off with residues that have moved systemically into plant tissue being highly rainfast, and surface residues less so. Carbamate, IGR and oxadiazine insecticides are moderately susceptible to wash-off and vary widely in their toxicity to the range of relevant fruit pests. Diamide, spinosyn, avermectin and pyrethroid insecticides have proven to be moderate to highly rainfast on most fruit crops.

For most insecticides, a drying time of two to six hours is sufficient to "set" the compound in or on the plant. With neonicotinoids, for which plant penetration is important, drying time can significantly influence rainfastness. For neonicotinoids, up to 24 hours is needed for optimal plant penetration, thus the time proximity of precipitation after application should be considered carefully. Spray adjuvants, materials intended to aid the retention, penetration or spread on the plant, can also improve the performance of insecticides.

Based on results from current studies, the following charts have been developed to serve as a guide for general rainfastness characteristics and re-application recommendations for certain insect pests (also printed in the "2018 Michigan Fruit Management Guide,"

E0154). Note that these recommendations should not supersede insecticide label restrictions or farm-level knowledge based on site-specific pest scouting, but rather are meant to compliment a comprehensive pest management decision-making process.

Rainfastness rating chart: General characteristics for insecticide chemical classes						
Insecticide class	**Rainfastness ≤ 0.5 inch**		**Rainfastness ≤ 1.0 inch**		**Rainfastness ≤ 2.0 inches**	
	Fruit	**Leaves**	**Fruit**	**Leaves**	**Fruit**	**Leaves**
Organophosphates	Low	Moderate	Low	Moderate	Low	Low
Pyrethroids	Moderate/High	Moderate/High	Moderate	Moderate	Low	Low
Carbamates	Moderate	Moderate/High	Moderate	Moderate	Low	Low
IGRs	Moderate	Moderate/High	Moderate	Moderate	Low	Low
Oxadiazines	Moderate	Moderate/High	Moderate	Moderate	Low	Low
Neonicotinoids	Moderate, Systemic	High, Systemic	Low, Systemic	Low, Systemic	Low, Systemic	Low, Systemic
Spinosyns	High	High	High	Moderate	Moderate	Low
Diamides	High	High	High	Moderate	Moderate	Low
Avermectins	Moderate, Systemic	High, Systemic	Low,Systemic	Moderate, Systemic	Low	Low

Highly rainfast = ≤ 30% residue wash-off
Moderately rainfast = ≤ 50% residue wash-off
Low rainfast = ≤ 70% residue wash-off
Systemic = Systemic residues remain within plant tissue

Apple insecticide precipitation wash-off re-application decision chart. Expected codling moth control in apples, based on each compound's inherent toxicity to codling moth larvae, maximum residual and wash-off potential from rainfall.						
Insecticides	**Rainfall = 0.5 inch**		**Rainfall = 1 inch**		**Rainfall = 2 inches**	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Imidan	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Asana	Sufficient insecticide	Insufficient insecticide	Insufficient insecticide	Insufficient insecticide	Insufficient insecticide	Insufficient insecticide

	residue	residue	residue	residue	residue	residue
Assail	Sufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Proclaim	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Rimon	Sufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Delegate	Sufficient insecticide residue	Sufficient insecticide residue	Sufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Altacor	Sufficient insecticide residue	Sufficient insecticide residue	Sufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue

* Number of days after insecticide application that the precipitation event occurred.
Insufficient insecticide residue = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
Sufficient insecticide residue = Sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Grape insecticide precipitation wash-off re-application decision chart. Expected Japanese beetle control in juice grapes, based on each compound's inherent toxicity to Japanese beetle adults, maximum residual and wash-off potential from rainfall.

Insecticides	**Rainfall = 0.5 inch**		**Rainfall = 1.0 inch**		**Rainfall = 2.0 inches**	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Imidan	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Sevin	Sufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Brigade	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Actara	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Avaunt	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue

* Number of days after insecticide application that the precipitation event occurred. Insufficient insecticide residue = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended. Sufficient insecticide residue = Sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Blueberry insecticide precipitation wash-off re-application decision chart. Expected cranberry fruitworm control in blueberries, based on each compound's inherent toxicity to cranberry fruitworm larvae, maximum residual and wash-off potential from rainfall.						
Insecticides	**Rainfall = 0.5 inch**		**Rainfall = 1.0 inch**		**Rainfall = 2.0 inches**	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Asana	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Intrepid	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Assail	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Delegate	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue

* Number of days after insecticide application that the precipitation event occurred. Insufficient insecticide residue = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended. Sufficient insecticide residue = Sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Blueberry insecticide precipitation wash-off re-application decision chart. Expected Japanese beetle control in blueberries, based on each compound's inherent toxicity to Japanese beetle adults, maximum residual and wash-off potential from rainfall.						
Insecticides	**Rainfall = 0.5 inch**		**Rainfall = 1.0 inch**		**Rainfall = 2.0 inches**	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Imidan	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Mustang Max	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Sevin	Sufficient	Insufficient	Insufficient	Insufficient	Insufficient	Insufficient

	insecticide residue	insecticide residue	insecticide residue	insecticide residue	insecticide residue	insecticide residue
Provado	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue

* Number of days after insecticide application that the precipitation event occurred.
Insufficient insecticide residue = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus re-application is recommended.
Sufficient insecticide residue = Sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Blueberry insecticide precipitation wash-off re-application decision chart. Expected spotted wing Drosophila control in blueberries, based on each compound's inherent toxicity to SWD, maximum residual and wash-off potential from rainfall.						
Insecticides	**Rainfall = 0.5 inch**		**Rainfall = 1.0 inch**		**Rainfall = 2.0 inches**	
	***1 day**	***7 days**	***1 day**	***7 days**	***1 day**	***7 days**
Imidan	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Mustang Max	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Lannate	Sufficient insecticide residue	Insufficient insecticide residue	Sufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Malathion	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Delegate	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue
Assail	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue	Insufficient insecticide residue

* Number of days after insecticide application that the precipitation event occurred.
Insufficient insecticide residue = Insufficient insecticide residue remains to provide significant activity on the target pest, and thus an immediate re-application is recommended.
Sufficient insecticide residue = Sufficient insecticide residue remaining to provide significant activity on the target pest, although residual activity may be reduced.

Insecticide persistence, plant penetration and rainfastness rating			
Compound class	**Persistence (residual on plant)**	**Plant penetration characteristics**	**Rainfast rating**
Organophosphates	Medium - Long	Surface	Low
Carbamates	Short	Cuticle Penetration	Moderate
Pyrethroids	Short	Cuticle Penetration	Moderate - High
Neonicotinoids	Medium	Translaminar & Acropetal	Moderate
Oxadiazines	Medium	Cuticle Penetration	Moderate
Avermectins	Medium	Translaminar	Moderate
IGRs	Medium - Long	Translaminar	Moderate
Spinosyns	Short - Medium	Translaminar	Moderate - High
Diamides	Medium - Long	Translaminar	Moderate - High

Dr. Wise's work is funded in part by MSU's AgBioResearch.

Understanding Thinning and the Carbohydrate Model

Fruitlets need energy to grow, survive, and set. The carbohydrate model predicts the grams of carbon/tree unit that are available to the tree for fruitlets and vegetative growth. A deficit of energy (carbohydrates) causes stress in the tree. When apple trees are under stress they are more sensitive to naturally drop fruitlets. In the same sense, stressed trees also respond more to chemical thinning applications. We have been using the carbohydrate model as a thinning guide for many years in Michigan with good success. The model is now on Enviroweather. Growers should click on the Apple Section of Enviroweather and go to the Apple Carbohydrate Thinning tab. The user will be directed to the Cornell site that houses the model (http://newa.cornell.edu/index.php?page=apple-thin). Growers should select Michigan and the Enviroweather station closest to them, then click continue. Next, enter the green tip and bloom dates and click on 'calculate.' The results will be presented in chart and

graph form and will provide thinning recommendations. We have also included Phil Schwallier's 2018 thinning recommendations in this FruitNet.

At the time of thinning, which with precision thinning can begin as soon as bloom, we like to see 2-3 days in a row that have stress to optimize thinner applications. A single day of deficit is not important as the trees can probably buffer that deficit. We need 2 or 3 days of deficits of carbohydrates to obtain the stress effects, and thinners will work when we have a deficit of carbohydrates, which is -10 to -40g carbon/day. The more of a deficit in carbohydrates, the more thinning activity growers will obtain from their thinning applications. A surplus of energy (carbohydrates) will strengthen fruitlets, and they will resist thinning. Traditionally, our region has hard-to-thin situations in most years because we have cold, sunny conditions, which creates a surplus of energy, and the trees resist thinning.

The Honeycrisp is at full bloom at the NWMHRC today, 25 May. If we were to apply thinner now, we have a -30 level of stress, and we would have moderate thinning. However, bloom time is not the optimum time for thinning apples. If we were at a more sensitive thinning window, 8-10mm fruit, thinners should work well during this time but because the trees are in a deficit, the thinners will probably work too well and we would recommend reducing the rates of the thinners by 15% according to the model. Since we are at bloom, the thinners will have a mild affect on thinning fruit (see bottom chart for a guide to thinning at different times in apple tree phenology), but many growers are starting to take advantage of the 'nibble' approach to thinning and are starting their thinning programs earlier than in the past. Starting to thin at bloom or petal fall increases both fruit size and return bloom.

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
5/1	79	62	21.8	0.00	18.37	-18.37	-14.8	-
5/2	70	49	13.6	0.00	15.62	-15.62	-15.49	-
5/3	59	44	18.4	0.00	11.91	-11.91	-15.84	-
5/4	62	42	14.6	0.00	13.28	-13.28	-16.33	-
5/5	70	50	24.0	0.32	21.48	-21.16	-21.06	-
5/6	63	47	20.6	1.36	18.38	-17.02	-22.02	-
5/7	70	37	26.8	3.49	17.34	-13.85	-19.05	-
5/8	82	55	24.9	1.33	33.53	-32.20	-16.48	-
5/9	73	47	7.5	0.00	25.00	-25.00	-10.3	-
5/10	56	38	22.8	7.23	12.39	-5.16	-6.68	-
5/11	50	34	13.0	4.77	8.33	-3.56	-10.55	-
5/12	62	40	24.2	8.73	16.22	-7.49	-12.47	-
5/13	67	44	26.7	10.24	20.73	-10.49	-13.38	-
5/14	74	51	19.6	6.94	27.62	-20.68	-11.08	-
5/15	68	52	26.2	12.56	23.77	-11.21	-6.68	-
5/16	78	48	27.3	14.51	25.64	-11.13	-6.92	-
5/17	68	47	26.4	17.64	18.95	-1.31	-0.71	-
5/18	75	49	27.1	18.51	21.59	-3.08	-0.43	-
5/19	63	48	7.5	2.88	15.03	-12.15	2.13	-
5/20	62	39	26.1	24.60	10.93	13.68	5.28	-
5/21	67	43	14.2	13.34	13.52	-0.17	-0.87	-
5/22	67	51	25.7	24.42	17.27	7.15	-10.73	Apply standard chemical thinner rate
5/23	77	51	27.1	25.69	25.22	0.47	-20.63	Decrease chemical thinner rate by 15%
5/24	81	56	26.8	24.69	35.62	-10.94	-27.43	Decrease chemical thinner rate by 15%
5/25	82	66	18.3	12.18	51.79	-39.60	-30.75	Decrease chemical thinner rate by 15%
5/26	77	61	19.5	20.28	52.75	-32.47	-26.45	Decrease chemical thinner rate by 15%
5/27	75	57	21.1	27.64	54.37	-26.73	-25.99	Decrease chemical thinner rate by 15%
5/28	75	55	23.3	34.70	58.92	-24.22	-	-
5/29	75	54	24.3	39.65	62.05	-22.40		
5/30	79	56	24.3	39.94	70.55	-30.61		
5/31	-	-	-	-	-	-		

This model can help us understand what will happen if we have 2-3 day deficit and the different timings when thinners are applied. We need to be careful at 10 to 15mm when a deficit of -60 or lower occurs. Our choices are to back off rates or delay thinning. However, if a -80 g carbon/day occurs at petal fall and you thin, you may get the job done perfectly.

Here is a rule of thumb guide based on Phil Schwallier's work with the carbohydrate model:

If we have 3 days of stress, then the following natural drop may happen at the 10-15 mm stage:

Stress Level	Amt. of Thinning
-20	2%
-40	15%
-60	25%
-80	40%
-100	80%

Guide for time of thinning application of aggressive combinations (i.e. Sevin+NAA or Sevin+MaxCel): Thinning Percent at Different Time During Season and Stress Levels:

	0	-20	-40	-60	-80	-100
Petal Fall	0%	10%	15%	25%	35%	50%
6 mm	5%	20%	30%	40%	50%	60%
10mm	15%	30%	40%	50%	60%	80%
15 mm	15%	30%	40%	50%	60%	80%
20 mm	10%	20%	30%	40%	45%	50%
25 mm	3%	10%	15%	20%	30%	35%
30 mm	0%	0%	2%	5%	10%	15%

MaluSim Carb Model Thinning Decision Guide.

Stress Level	4 Day Ave Carb Balance	Thinning Rate Recommendation	Example for Gala
No	> 0	Increase Rate by 30%	S+M 150 ppm
Slight	-20 to 0	Use Standard Rate	S+M 100 ppm
Mild	-40 to -20	Reduce Rate by 15%	S+M 100 ppm
Moderate	-60 to -40	Reduce Rate by 30%	S+M 50 ppm
Severe	-80 to -60	Reduce Rate by 50%	S or M 150 ppm
Extreme	<-80	Do not thin, many fruits will fall off	

To conclude, this model is a tool that can help guide thinning strategies and thinner applications. Based on the upcoming forecasts, the weather looks like it will be excellent for thinning with the warm temperatures. We encourage growers to be diligent about thinning this season as the Michigan apple crop looks sizable and there is an abundance of bloom on apple trees this year.

PGR's and Thinning Strategies 2018

Phil Schwallier and Amy Irish-Brown, MSU Extension

Here is a link to the article:

https://www.dropbox.com/s/b6piqdomcj36glr/PGR%27s%20and%20Thinning%20Strategies%202018.pdf?dl=0

WEB SITES OF INTEREST:

Farmer to Farmer – Connecting farmers, cultivating community
http://www.f2fmi.com

Insect and disease predictive information is available at:
http://enviroweather.msu.edu/homeMap.php

This issue and past issues of the weekly FruitNet report are posted on our website:
http://www.canr.msu.edu/nwmihort/nwmihort_northern_michigan_fruit_net

60-Hour Forecast:
http://www.agweather.geo.msu.edu/agwx/forecasts/fcst.asp?fileid=fous46ktvc

Information on cherries:
http://www.cherries.msu.edu/

Information on apples:
http://apples.msu.edu/

Information on grapes:
http://grapes.msu.edu