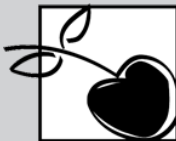


## Crop Advisory Team

# Alert



MICHIGAN STATE  
UNIVERSITY  
EXTENSION

Published by MSU IPM Program

March 30, 2010 -- Vol. 25, No. 1



## Fruit Crop Advisory Team Alert

### In this issue

#### Tree fruit news

- 2010 fruit insecticide registration update
- Southwest Michigan 2010 Monday Fruit IPM meetings

#### Small fruit news

- Generic fungicide options
- New fungicides for small fruit crops in Michigan
- Remember to scout for mummy berry in blueberries
- Southwest Michigan grape pre-season IPM update April 14
- Winegrape integrated pest management kick-off

#### Other news

- IPM Cover Cropping Think Tank
- Michigan Nut Growers Association meeting April 10
- Using honey bees for fruit pollination
- Regional reports

Next issue April 13

### Starting up the season

Spring is here and it's time to start planning for the upcoming growing season. Our first issue offers information on new labels and corrections for insecticides, meeting information for tree and small fruit growers and much more. We appreciate suggestions from you, our readers. Please feel free to contact Andrea Gooch at (517)

353-4703 or email [catalert@msu.edu](mailto:catalert@msu.edu).

Internet readers can also sign up to receive a brief email when we post new issues on the Internet or use our RSS feed. Details are at: <http://ipmnews.msu.edu/fruit/>

We look forward to joining with MSU's faculty and Extension educators to provide you information this season.  
– Joy Landis, editor, and Andrea Gooch, assistant editor.

### 2010 fruit insecticide registration update

John Wise, Rufus Isaacs and Larry Gut, Entomology

This is a summary of insecticide/miticide label new additions, restrictions and corrections to the [2010 MSU Fruit Management Guide](#) (E-0154). Agri-chemical labels and regulations can change quickly so use this information within the context of each compound's actual label.

#### New insecticide label information for compounds listed in the 2010 Michigan

#### Fruit Management Guide

**Movento (91)** (spirotetramat) belongs to a new class of insecticides called the tetramic acid derivatives, and was registered in pome fruits, stone fruits and grapes for control of aphids, scale insects, mealy bugs, phylloxera and pear psylla. **EPA issued an Interim Cancellation Order** for Movento and Ultor. The order states that

#### Insecticide 2010 additions, label changes, restrictions

Compound	Label Changes/Restrictions	Crop	Target pests
Avaunt 30WG	New Labeled Use	blueberries	fruitworms, plum curculio
Centaur 70WDG	New Labeled Use	cherries, plums	scale insects, leafhoppers
Tourismo 3.5SC	New Labeled Use	grapes	grape berry moth, leafhoppers
Lorsban/Chlorpyrifos	Label Restriction	apples – one spray per season	
Guthion 50 WP	Label Restriction	blueberries – no aerial application, 1.5 lb max	
Movento 2F	Interim Cancellation Order	pome and stone fruits, grapes	
Kelthane MF	Discontinued	pome fruit, grapes, strawberries	
Ecozin	Discontinued	fruit crops	

“use of product in the possession of the applicators is permitted provided such use is consistent with the previously approved labeling for the products.” Growers can continue to use material they have purchased and is in their possession. EPA also stated “as of March 12, 2010, it is unlawful to sell or distribute these products except for the limited purpose of return to the manufacturer, or for proper disposal.”

**Lorsban (32)** (chlorpyrifos) is an

organophosphate insecticide that has great affinity for organic matter such as bark or soil. Chlorpyrifos is registered for use as a trunk spray on apples, cherries, peaches, and nectarines to control American plum borer, dogwood borer, and lesser and greater peachtree borers (See Table 2.). Foliar applications may be used dormant/delayed-dormant (pre-bloom) in pome and stone fruits for scale, leafroller, psylla, and aphid control, either alone or in combination with oil. **In**

**apples, chlorpyrifos can be used only once per season**, either pre-bloom or post-bloom as a trunk spray. Chlorpyrifos is registered for post-bloom foliar use on sour cherries only. Lorsban also has a Special Local Needs 24(c) label in grapes for pre-bloom control of climbing cutworms (effective 2004), targeted at the trunks of the vines. Lorsban also has limited label use in cranberries and strawberries. **IPM**

**Table 2.**

Lorsban uses by formulation	Apples	Pears	Cherries		Plums	Peaches	Nectarines
			Tart	Sweet			
<b>Pre-bloom foliar</b>	4E, Adv, 50W,75W	4E, Adv, 75W	4E, Adv, 50W,75W	4E, Adv, 75W	4E, Adv, 75W	4E, Adv, 75W	4E, Adv, 75W
<b>Post-bloom foliar</b>	none	none	50W,75W	none	none	none	none
<b>Trunk spray</b>	4E, Adv, 75W	none	4E, Adv, 75W	4E, Adv, 75W	none	4E, Adv, 75W	4E, Adv, 75W

\* Adv refers to Lorsban® Advanced

## Southwest Michigan 2010 Monday Fruit IPM meetings

Mark Longstroth and, Bill Shane, MSUE educators

The [Monday Fruit IPM update meetings](#) will be at Annette and Randy Bjorge’s Fruit Acres in Berrien County again this year. The weekly meetings will begin on April 12 and run until June 29. There will be no Monday meetings on Memorial Day, May 31. The meeting will run from 5:00 PM to 6:30 PM. Each meeting will be a review

of the current fruit pest situation in Berrien County with displays of insects and fruit collected that day from area fruit plantings. Bill Shane and Mark Longstroth will share the results of their scouting and discuss current and upcoming pest events and emergences. (Each week will change with the changing pest complex). We try to cover

all fruit grown in Southwest Michigan. Meeting dates will be Mondays; April 12, 19, 26, May 3, 10, 17, 24, June 7, 14, 21, 28. Two RUP credit are available for private pesticide applicators and commercial applicators with a fruit certification (1C). **IPM**

## Small fruit news

### Generic fungicide options

Annemiek Schilder, Plant Pathology

Following the trend in human medicines, “generic” versions are now available for some common fungicides used to treat plant diseases. This is due to the expiration of patents on various proprietary fungicide products. Generic products by law have to have the same amount of active ingredient as the original fungicides. However, there may be differences in inert ingredients or formulations.

Generic products tend to be more economical than brand name products, but most have not have been separately

evaluated for disease control efficacy in Michigan and may not be mentioned in the crop sections of E-154 (*Michigan Fruit Management Guide*). However, most of them are briefly described in the “Fungicides and Bactericides for Fruit Crops” section of the guide. For more information on individual products, check out their labels or material safety data sheets on the following website: [www.cdms.net](http://www.cdms.net). Generic products are presumed to be similar in disease control efficacy to their brand name counterparts. However,

minor variations in efficacy, behavior or even phytotoxicity may occur due to formulation differences.

Do **not** assume that the labels of generic products are exactly the same as the brand name fungicides that you are used to. Sometimes there are differences in the crops that the product is labeled for or in the label instructions or restrictions. An example is Iprodione (iprodione), which is labeled for blueberries, whereas the brand name product Rovral (iprodione) is not. Also, Tebuzol (tebuconazole) is labeled for apples and

pears, but other tebuconazole products such as Elite, Tebustar, and Orius are not.

The table below lists generic versions of common fungicides. Read the fungicide

label carefully before use as you would for any new product. **IPM**

Brand name	Active ingredient	Generic versions
Aliette	fosetyl-AI	Legion
Aliette	phosphites (same breakdown product as fosetyl-AI)	ProPhyt, Phostrol, Agri-Fos, Rampart, Fosphite, Fungi-Phite, Topaz
Elite	tebuconazole	Orius, Tebuzol, TebuStar, AmTide Tebuconazole
Rally/Nova	myclobutanil	AgriStar Sonoma
Orbit	propiconazole	Bumper, PropiMax, Propiconazole E-AG, AmTide Propiconazole,
Ridomil	metalaxyl	MetaStar, Metalaxyl
Bravo	chlorothalonil	Chlorothalonil, Echo, Equus
Rovral	iprodione	Iprodione, Nevado
Topsin M	thiophanate methyl	Thiophanate Methyl, T-Methyl
Agri-Mycin	streptomycin	Ag Streptomycin, FireWall
MycoShield	tetracycline	FlameOut

## New fungicides for small fruit crops in Michigan

Annemiek Schilder, Plant Pathology

Various new(er) fungicides are available for use on fruit crops in Michigan. Some of these you may already know and others you may be less familiar with. The fungicides are listed in alphabetical order with relevant information on the crops they are labeled for and guidelines/restrictions. As with all fungicides, read the label carefully before use. Labels and material data safety sheets (MSDS) can be found on the following website: [www.cdms.net](http://www.cdms.net). Descriptions of all fruit fungicides and efficacy ratings of recommended fungicides can be found in E-154 (Michigan Fruit Management Guide).

**AgriStar Sonoma** (myclobutanil) is a generic version of Rally, which used to be called Nova. It is labeled for broad-spectrum disease control in grapes, apples, and stone fruit. Note that AgriStar Sonoma is not labeled for other berry crops, whereas Rally is. The REI is 24 hours and the PHI is 1 day for stone fruit is and 14 days for apples and grapes. The efficacy of this product has not been specifically evaluated in Michigan.

**Forum** (dimethomorph) is a new, systemic fungicide for control of downy mildew in grapes. Use Forum as a preventive application before infection occurs. The minimum application

interval is 7 days. Performance may be improved by using Forum as a tank mix with another fungicide. The addition of a spreading/penetrating adjuvant is prohibited. Do not make more than 5 applications per year, and no more than one application before switching to a fungicide with a different mode of action. Forum may be applied through irrigation systems with restrictions (see the label). Forum is not for use in greenhouse and transplant production. The REI is 12 hours and the PHI is 28 days. Forum has not been evaluated for disease control in Michigan.

**Iprodione** (iprodione) has the same active ingredient as Rovral. It is a contact fungicide with locally systemic properties. It is labeled on grapes, cherries, peaches, nectarines, plums, apricots, blueberries, strawberries, raspberries, blackberries, gooseberries, and currants. Note that Iprodione is labeled for blueberries but Rovral is not. Thorough coverage is essential for effective control. Alternating Iprodione with fungicides with a different mode of action may delay the buildup of resistant pathogen strains. Do not exceed a 4-spray maximum for wine grapes and berries-, a 2-spray maximum for stone fruit, and a 1-spray maximum for table grapes and strawberries. Do

not apply after first fruiting flower in strawberries or after petal fall in stone fruit. Iprodione may be applied through irrigation systems with restrictions (see the label). The spray suspension should be applied within 24 hours of preparation and the pH of the spray solution should be buffered to 5.0-7.0 if necessary to prevent potential active ingredient degradation. The efficacy of this product has not been specifically evaluated in Michigan.

**Legion** (fosetyl-AI) has the same active ingredient as Aliette. It is available as an 80 WDG formulation. This product is labeled for control of Phytophthora collar and root rot and fire blight in apples and pears (bearing and non-bearing) and apple blister spot in bearing trees; Phytophthora collar and root rot in stone fruit (non-bearing); Phytophthora and anthracnose (and suppression of Phomopsis and Alternaria fruit rot) in blueberries; Phytophthora root rot in raspberries, blackberries, and cranberries; downy mildew in grapes; and red stele and leather rot in strawberry. Do not tank mix Legion 80 WDG with copper compounds or apply to foliage that bears copper residues from previous sprays as this could result in phytotoxicity to crops. Stickers, spreaders and wetting agents are not

recommended with this product. Legion is acidic in nature and must not be tankmixed with acid-type compatibility spray adjuvants, such as Buffit Spray Aide, Triton AG-44M, or with adjuvants that aid foliar penetration, such as Herbex or Induce. The REI is 12 hours. The PHI is 12 hours for blueberries and strawberries, 14 days for apples and pears (365 days in non-bearing pome and stone fruit trees), 15 days in grapes, 30 days in cranberries, and 60 days in raspberries and blackberries. This product has not been specifically evaluated in Michigan.

**MetaStar** (metalaxyl) has the same active ingredient as Ridomil. MetaStar is for soil application only and is not to be used for foliar applications, except in solutions used to dip plants. MetaStar is labeled for control of *Phytophthora* diseases in apples, stone fruit, blueberries, cranberries, raspberries, strawberries. This label is for field use only and is not intended for use on transplant trays, greenhouses, lath houses, float houses, hydroponic production, or in bedding plant structures. MetaStar may be applied through irrigation systems with restrictions (for instructions see the label). Applications are usually made in the spring and the fall. The REI is 48 hours and the PHI is 45 days for raspberries and cranberries. In strawberries, an application at fruit set is allowed for control of leather rot. No PHI is indicated for the other crops if application instructions are followed.

**Mettle** (tetraconazole) is a new sterol inhibitor fungicide. It is a systemic fungicide labeled for control of powdery mildew and black rot in grapes. When a post-infection application is used for black rot, it is recommended within 72 hours of an infection period. Mettle is absorbed quickly into the plant tissue and is rainfast within 2 hours of application. Do not make more than two applications of Mettle to grapes per year. The maximum amount of Mettle allowed per season is 10 fluid ounces and there must be at least 14 days between applications. Do not apply Mettle through any kind of irrigation system. The REI of Mettle is 12 hours and the PHI is 14 days. Mettle has not been tested for disease control in Michigan vineyards.

**Nutrol** (monopotassium phosphate;

50% P<sub>2</sub>O<sub>5</sub> and 32% K<sub>2</sub>O) is a water-soluble fertilizer (0-52-32) as well as a fungicide against powdery mildew. This product is labeled for control of powdery mildew in apples, stone fruits, and grapes. It acts primarily as a contact fungicide. Nutrol will not cause phytotoxicity, even at high concentrations. Nutrol is a non-toxic, environmentally friendly product that is exempt from residue tolerances. It can also be used as a pH buffer to prevent alkaline hydrolysis of pesticides. A 1 percent solution will have a pH between 4.5 and 6.0. Nutrol is compatible with most commonly used agricultural chemicals. The PHI is 0-days. This product has not been evaluated in Michigan.

**Rampart** (mono- and dipotassium salts of phosphorous acid; equivalent to 3.9 lb phosphorous acid per gallon) is a systemic phosphite fungicide labeled for apples, cherries, peaches, nectarines, plums, apricots, blueberries, strawberries, raspberries, blackberries, cranberries, gooseberries, and currants. The target diseases listed are root rots (*Phytophthora*, *Pythium*, *Fusarium*, *Rhizoctonia*), downy and powdery mildew, anthracnose, and bacterial diseases. Application is foliar, aerially, as a root dip or through the irrigation system (with restrictions). In fruit trees, the product may also be applied via trunk injection. Do not apply at less than 3-day intervals. Do not apply to plants that are dormant, or heat or moisture stressed. To avoid copper phytotoxicity, do not apply to plants that have been treated with copper-based compounds at less than 20-day intervals. Allow foliage to dry completely after application. Do not apply when conditions favor wet tissue for prolonged periods greater than four hours. The REI is four hours and the PHI is 0 days. This product has not been evaluated for disease control in Michigan.

**Ranman** (cyazofamid) is a new fungicide for control of downy mildew in grapes. Ranman has limited systemic activity, so should be applied in a preventive mode. Make fungicide applications on a 10-14 day schedule when disease warning systems forecast disease infection periods or when conditions are favorable for disease development. Do not apply more than 6 sprays of Ranman per season and no more than 3 consecutive sprays

before switching to fungicides with different modes of action for the next three applications. Do not use any surfactant with Ranman. Application water volumes for ground application should at least be 100 gal per acre. Ranman may be applied through irrigation systems with restrictions (for instructions see the label). The REI is 12 hours and the PHI is 30 days. This product has not been evaluated for disease control in Michigan.

**Regalia** (extract of *Reynoutria sachalinensis* = giant knotweed) is a plant extract-based biofungicide that can be used in organic production. The proposed mode of action is by increasing the plant's natural defenses. This induced resistance is not systemic but is there is some translaminar protection. The resistance reaction takes 1 to 2 days to develop. Light is required for best results. Regalia should therefore be used as a preventative treatment. Applications have to be repeated every 7-14 days to protect new growth. Regalia is labeled for control of various diseases of apples, pears, cherries, peaches, nectarines, plums, apricots, grapes, blueberries, raspberries, blackberries, gooseberries, and other berry crops. Regalia has a 0-day PHI and a 4-hour REI. In a blueberry trial in Michigan, Regalia provided good control of mummy berry and moderate control of anthracnose. In grapes, Regalia showed good control of powdery mildew and moderate control of downy mildew and Botrytis bunch rot. More trials are needed to assess this product in Michigan fruit crops.

**TebuStar** (tebuconazole) has the same active ingredient as Elite. Tebustar is labeled for cherries, peaches, nectarines, and grapes. The PHI is 0 days for stone fruit and 14 days for grapes. The efficacy of this product has not been specifically evaluated in Michigan.

**Topaz** (mono- and dipotassium salts of phosphorous acid; 3.9 lb phosphorous acid per gallon) is a systemic phosphite fungicide labeled for apples, cherries, peaches, nectarines, plums, apricots, blueberries, strawberries, raspberries, blackberries, cranberries, gooseberries, and currants. The target diseases listed are root rots (*Phytophthora*, *Pythium*, *Fusarium*, *Rhizoctonia*), downy and powdery mildew and fire blight. Application is foliar, aerially, as a root dip or through the irrigation

system (with restrictions). Do not apply at less than 3-day intervals. Do not apply to plants that are dormant, or heat or moisture stressed. To avoid copper phytotoxicity, do not apply

to plants that have been treated with copper-based compounds at less than 20-day intervals. Allow foliage to dry completely after application. Do not apply when conditions favor wet tissue

for prolonged periods greater than four hours. The REI is four hours and the PHI is 0 days. This product has not been evaluated for disease control in Michigan. **IPM**

## Remember to scout for mummy berry in blueberries

Annemiek Schilder, Plant Pathology

This is the time of year to start looking for overwintered mummy berry mummies on the ground underneath blueberry bushes. It may require some crawling around on your hands and knees to get close to the target. Mummy berry mummies look like tiny black pumpkins (about 3/8 inch in diameter) and may be partially embedded in the soil or located underneath leaf litter. Germinated mummies have small, brown, finger-like projections (stipes) that eventually develop into apothecia which look like small brown trumpets. There can be anywhere from one to seven stipes on a mummy. Depending on

how wet the site is, only 10-20 percent of mummies actually germinate in any one year. It is therefore advisable to scout in "hot spots" first, especially wet areas and in rows close to the woods.

The number of apothecia is the best predictor of the number of shoot strikes. Even if there are lots of mummies, but none has germinated, the risk of infection will be low. Apothecia start shooting ascospores into the air when the cups are about 1/8 inch in diameter. The spores are released when the mushrooms are disturbed or the air pressure changes, and are dispersed by wind. If any green leaf tissue is visible

at that time, there is a risk of infection. Most spores are released when the cups are between 1/4 and 1/2 inch wide. During cool wet conditions, the apothecia can release small amounts of spores for up to two to three weeks. Under warm dry conditions, they may last only 1 week. However, they are likely to release lots of spores during that week, as many as 1 million spores per day. Prolonged cool, wet weather is conducive to infection. At the optimum temperature (57°F), only 6 hours of leaf wetness are required for infection. Frost (28-30°F) can also predispose shoots to infection. **IPM**

## Southwest Michigan grape preseason IPM update April 14

Mark Longstroth and Diane Brown-Rytlewski, MSUE educators

Grape IPM integrated pest and crop management meetings begin on April 14. The first meeting will be held at the [Southwest Michigan Research & Extension Center](#) (SWMREC), west of Benton Harbor at 1791 Hillandale Rd. The meeting will be from 10:00 AM to noon. Several topics will be covered at

the meeting. Dr. Annemiek Schilder will discuss early season disease control; Dr. Rufus Isaacs will discuss insect control in grapes and demonstrate using a predictive model for grape berry moth development and control. Mark Longstroth will discuss early season weed control. Suzanne Forraht, Berrien

County Groundwater Technician, will be available to help grape growers working with Grape\*A\*Syst. National Grape is sponsoring a pizza lunch following the meeting. Admission for the meeting and lunch is free. The MDA has granted two RUP Credits for this meeting. **IPM**

## Winegrape integrated pest management kick-off

Erin Lizotte, Nikki Rothwell and Duke Elsner, MSUE educators

A day-long program to kick off the growing season for winegrape growers and vineyard managers will be held at the Northwest Michigan Horticultural Research Station from 10:00 AM to 4:00 PM on April 16. We are fortunate to be able to bring in Dr. John Reganold from Washington State University where

he is a professor in the Department of Crop and Soil Science. Dr. Reganold's farming systems research measures the effects of alternative and conventional farming on sustainability indicators: soil health, crop quality, financial performance, environmental quality, and energy efficiency. In addition to Dr.

Reganold, we will be joined by MSU winegrape faculty and extension staff to help us all prepare for the 2010 season.

There is a \$25 fee for this program and registration is required by April 12. Please call Jackie Baase at 231-946-1510 to register. We hope to see you there! **IPM**

## Other news

### IPM Cover Cropping Think Tank

Erin Lizotte, IPM/IFP District Educator

Since our last IPM Think Tank in 2008, there has been a great deal of interest in orchard floor management and

so in 2010 it seems fitting that we revisit the ever evolving science behind cover cropping and orchard floor management.

For the 2010 IPM Think Tank, we are fortunate to host Dr. David Granatstein, the statewide coordinator

for the Center for Sustaining Agriculture and Natural Resources at the Tree Fruit Research and Extension Center in Wenatchee, Washington. Dr. Granatstein has studied the use of compost as a soil amendment, mulches, cover crops for nutrient improvement and for beneficial insect habitat, the Swiss sandwich

technique, and rodent repellent plants and will address how growers can improve upon the standard of sod alleys and weed spray strips. We will also hear from Dr. George Bird, Michigan State University specialists and growers utilizing cover crops. The meeting will

be held at the [Northwest Michigan Horticultural Research Station](#) on April 7, registration begins at 8:45 AM and the program will run until 4:00 PM. There is a \$25 registration fee that includes lunch. Please call Jackie Baase at (231)946-1510 to register. **IPM**

## Michigan Nut Growers Association meeting April 10

The spring meeting of the Michigan Nut Growers Association is scheduled for Saturday, April 10 beginning at 9:00 AM. This will be followed by the annual meeting of the Midwest Nut Producers

Council (a chestnut industry group) starting at 2:30 PM. Both meetings will be held in the main lecture hall of Farrall Hall (Ag Engineering building)

on campus. For more information go to <http://www.michigannutgrowers.org> or call Professor Dennis Fulbright at 517-353-4506. **IPM**

## Using honey bees for fruit pollination

Zachary Huang and Walt Pett, Entomology

### Importance of honey bees to Michigan agriculture

The Western honey bee *Apis mellifera* plays a crucial role for United States agriculture because it provides pollination for a large number of crops. The value of agricultural crops dependent on honey bee pollination was estimated to be \$14.6 billion per year in the U.S. (Morse and Calderone, 2000). According to the most recent production data published in October 9, 2009 (Kleveno, 2009), Michigan's fruit and vegetable industry produces over two billion dollars per year and nearly 50 percent of that value is due entirely to honey bee pollination (Table 1). This is more than 100 times the value of honey alone, which was \$7.4 million in 2008.

### The decline of honey bees, a national trend

Despite the importance of honey bees, the beekeeping industry has been in decline since two parasitic mites, varroa (*Varroa destructor*) and tracheal mites (*Acarapis woodi*), invaded the United States in the 1980s. Varroa mites have nearly wiped out the feral (unmanaged) honey bee population in the United States (Kraus and Page, 1995) and managed honey bee colonies have been declining mainly due to more complicated management because of the mites. For example, in Michigan alone, the total number of honey producing colonies has decreased from the 95,000 in 1988 to 65,000 in 2006.

**Table 1. About 50 percent of the Michigan fruit and vegetable industry depend on honey bees (2008 data).**

Crop	BD*	Value (\$1,000)	Adjusted Value (\$1,000)%
Apple	0.9	380,815	342,734
Asparagus	0.9	18,516	16,664
Blueberry	1	130,555	130,555
Cabbage*	0.3	443,520	133,056
Carrots	1	17,668	17,668
Celery	1	14,705	14,705
Cherries (Sweet + Tart)	0.9	78,189	70,370
Cucumbers (Fresh + Pickled)	0.9	55,719	50,147
Dry bean	0.1	129,060	12,906
Onions	1	14,117	14,117
Peach	0.6	26,794	16,076
Peppers	0.8^	41,602	33,282
Pumpkin	0.9	15,283	13,755
Soybean	0.1	714,784	71,478
Squash	0.9	12,144	10,930
Strawberry	0.4	5,846	2,338
Tomatoes <sup>s</sup> (Fresh + Processed)	0.8^	34,668	27,734
Total		2,133,985	978,516

\*BD: Honey bee dependence factor: the percentage of seed/fruit production that is due to honey bee pollination (based on Gordon and Davis, 2003).

^Adjusted value was calculated as a product of total production value and the honey bee dependence factor BD.

\*Cabbage value was not given and calculated based on a production of 672 ton @ 30 cents per lb.

^BD for peppers and tomatoes were not available in literature and assumed to be 0.8.

<sup>s</sup>Data for processed tomato was missing for 2008, so value for 2007 (\$10,098,000) was used.

This is almost a third reduction of managed bee colonies during the last 16 years. About 30,000 of these colonies are “migratory”, whereby beekeepers move their bees to southern states (e.g. Florida, Georgia) to overwinter their colonies, and come back in April for fruit tree pollination. Varroa mites continue to be the major threat to our honey bees. The MSU apiary lost 36 out of 40 colonies, when bees were checked recently (March, 2010). Many beekeepers reported losing 80-90 percent of their bees last winter. These high mortalities were most likely due to high mite populations late last year.

**Colony collapse disorder (CCD)**

The most recent crisis to honey bee colonies is called CCD (colony collapse disorder), which has been reported in the national news since 2007. Colonies affected with CCD show three symptoms. First, bees “disappear” from their colonies with no dead bees found inside or near the hive. A colony, seemingly healthy in September will have no bees, or a handful of bees, with a queen, around October/November. The colony will have brood (eggs, larvae and pupae). This suggests adult bees left or died outside the colony quite rapidly. Usually, the colonies are not invaded right away by opportunistic pests: small hive beetles, wax moths, and other honey bees (bees will take honey from a nearby hive, a behavior called robbing) for two to three weeks. This disorder was large in scale -- it has been reported in 33 different states (CCD Working Group, 2007a). The disorder is also severe, with large beekeepers (5,000 to 9,000 colonies) losing up to 90 percent of their colonies (CCD Working Group, 2007b). In Michigan only about 6,000 colonies (out of a total of 65,000 colonies) were reported to be affected in 2006. But another Michigan beekeeper recently (February, 2008) reported another loss of 2,300 colonies while pollinating almonds in California. The cause of this disorder is still unknown and honey bee scientists all over the country are studying the problem. There was one paper (October 2007, Science) reporting that Israeli Acute Paralysis Virus (IAPV) was highly correlated with CCD occurrence and the virus probably came to US through package bees imported from Australia (which began in 2005). A more recent

study (December 2007, American Bee Journal) determined that IAPV was in this country as early as 2002, therefore it did not play a major role in causing CCD. Mainly because of this paper, the embargo against Australian package bee importation never went into effect, to the relief of the almond growers. Currently most scientists think it might be a combination of several stresses: bees are stressed by pesticides applied inside (for controlling mites and other pests) or outside (for controlling pests on crops and brought back by bees), by migratory transportations across several time zones, by novel pathogens (a new nosema disease, *Nosema ceranae* was found to be present in this country for over 10 years, yet we only learned that it was here because of the CCD crisis), by the varroa mite (which suppresses the immune system of bees), and the many types of viruses the mite transmits (IAPV is just one of the 20 also viruses bees can be infected with, other common viruses include acute bee paralysis virus [ABPV], black queen cell virus [BQCV], chronic bee paralysis virus [CBPV], Kashmir bee virus [KBV], and sacbrood bee virus [SBV]). **Today, the causes for CCD has not yet been identified.**

In light of these problems of honey bees, the growers are urged to work even more closely with beekeepers to ensure good pollination result. We feel that the following steps can help growers to optimize their fruit and vegetable pollination.

**Understand basic honey bee biology and behavior.**

Understanding some basic bee biology and beekeeping will facilitate your inspection of the hives, gauging of quality/strength of the hives, and help maximize the use of bees for your pollination.

**Social structure.** Honey bees are social insects and only the sterile female workers do all the in-hive work (cleaning, drying nectar into honey, feeding young) and outside work (foraging for water, pollen, nectar and propolis, and colony defense). The queen’s only job is to lay about 2,000 eggs per day and releases queen mandibular pheromone to let the workers know that she is present and healthy. The males’ (drones) only job is to mate with queens and are

produced only during May to August. A typical colony of bees have about 30,000 workers, one queen and a few to hundreds of drones. About 1/3 of these workers are foragers. Foragers show flower constancy so that they tend to focus on flowers of a single species, resulting more efficient pollination.

**Internal factors affecting foraging behavior.** To provide adequate pollination, honey bee colonies must be of sufficient strength, free of diseases, have a laying queen with enough brood. A newly installed package bee colony, with two pounds of bees, would have about 9,000-11,000 workers and is considered on the weaker side. Such a colony would concentrate heavily on brood rearing and only have about 1,000-2,000 foragers, only stronger colonies would send out about 30 percent of bees as foragers. A typical median strength overwintered colony would have about 30,000 workers and can send out 10,000 foragers. If you are comfortable checking bees, and you have the beekeepers permission, check for the presence of chalkbrood, American foulbrood and varroa mites. In general, three to five frames of solid brood suggest a fertile queen and a healthy colony.

**External factors affecting foraging behavior.** Environmental factors also affect honey bee foraging. Bees do not work in the rain and work less on cloudy days. Foraging activity is positively related to temperature, with a linear relationship from 60-90°F. Bees also slow down when it gets too hot (over 90°F). High winds (above 20 mph) will inhibit flying activity. Bees tend to fly lower, near the orchard floor when winds are high. Bumble bees can forage at lower temperature and lower light conditions.

**Finding a beekeeper nearest to you.**

Zachary Huang has established a database of beekeepers that are willing to provide pollination services, with over 420 beekeepers registered. The majority of them are from Michigan. Go to <http://cyberbee.net>, click beebase on the left, then click #2 “For beekeepers providing pollination services” and you have a choice to search beekeepers by area code, county, zip code, or a last name. Once you have a working relationship with a beekeeper, it is best to keep working with the same one year after year.

**Pest Management During Pollination.**

Do not apply broad-spectrum insecticides when flowers are open. Bee hives should be removed immediately after pollination if post-bloom pesticide applications are planned. By monitoring for pest problems carefully during bloom, growers can help minimize the need for pest control. If an insecticide application is necessary during bloom, the compounds that are least toxic to bees should be used, with careful observation of the pollinator-restrictions on the label. In general dust form is more harmful to honey bees, and morning or day applications are not as safe for bees as evening applications. Inform the beekeeper before a spray so that colonies can be shut down for one to two days with wetted burlap blocking entrances, if highly toxic insecticides have to be sprayed. This database lists the toxicity of various pesticides to honey bees: <http://apiculture.com/databases/pesticides.htm>.

**Different strategies for different crops**

**Use the “early” strategy for tree fruits.** For tree fruit crops, it is advantageous to have bees working the flowers as soon as they open. This provides multiple benefits. It improves the odds that fertilization will occur before the ovules start to lose vigor (this can happen in only three days on some crops), flowers are more likely to receive the multiple visits needed to deposit enough pollen. In many crops, it is important to pollinate the first flowers (cherry) or “king blossoms” (apple) because they set the best fruits.

**Use the “late” strategy for small fruit crops.** Generally, flowers of small fruit crops are less attractive to honeybees than other flowers due to flower shape and less nectar, so the opposite strategy is used. Let the crop starting to bloom before bringing bees in so that bees tend to forage more on your crop. If brought in too early, bees will learn to forage elsewhere and when crops bloom, they are not attractive enough to get the

**Table 2. Recommended density of honey bee colonies (per acre) for Michigan crops.**

Crop	Colonies	Notes
Apple	1-3	Dwarf varieties need more hives
Sweet cherry	1	Balaton may need more
Pear, Plum, Peach	1	
Blueberry	3	Cultivars vary in their dependence on pollination
Cranberry	3	
Raspberry, strawberry	1	

bees “back” to where you want them. Blueberry flowers have about three days to be pollinated after the flowers open, but you want the bees to stay in the field, so move bees into blueberry fields after 5 percent bloom but before 25 percent of full bloom. The “late” strategy is especially important for cranberries, which is not very attractive to bees. Luckily, cranberry flowers will stay open for a while if not pollinated, and the petals will turn to a rosy color if not pollinated in time. In cranberries, it is better to wait until 10 percent bloom in order to maximize the yield. If you see too many flowers turning rosy, this means you did not have enough pollinators, so make sure you increase the number of bee hives next year.

**Hive density recommendations.**

Because Varroa mites had wiped most of our feral (unmanaged) honey bee populations, recommended rates for pollination prior to 1987 have to be increased to compensate the lack of “free” honey bees. The table below lists recommended rates for hive density. From an economic point of view, it is best to start with the highest number of hives you can afford, then cautiously reducing it the following year to see if your yield is affected. An alternative method is to place different densities of honey bee colonies in separate orchards and determine if there is a difference in yield.

**Internet resources**

Honey bees as pollinators: <http://cyberbee.net/column/pollinator/beepoll.pdf>  
 Bumble bees as pollinators: <http://cyberbee.net/column/pollinator/bumblepoll.pdf>  
 Pollination and pesticides <http://cyberbee.net/column/pollinator/pesticides.pdf>

**Cited references**

CCD Working Group. 2007a. Map of CCD distribution. <http://www.ento.psu.edu/MAAREC/pressReleases/CCDMap07FebRev1-.jpg>  
 CCD Working Group. 2007b. Map of CCD distribution. CCD Frequently Asked Questions (FAQ). <http://www.ento.psu.edu/MAAREC/FAQ/FAQCCD.pdf>  
 McGregor, S. E. 1976. Insect pollination of cultivated crop plants. USDA-ARS, Washington, D.C. available on line: <http://gears.tucson.ars.ag.gov/book/>  
 Morse, R. A., and N. W. Calderone. 2000. The value of honey bees as pollinators of U.S. crops in 2000. Bee Culture: 2-15. online: <http://www.masterbeekeeper.org/pdf/pollination.pdf>  
 Kraus, B. & R.E. Page, Jr. 1995. Effect of *Varroa jacobsoni* (Mesostigmata: Varroidae) on feral *Apis mellifera* (Hymenoptera: Apidae) in California. Environmental Entomology 24: 1473-1480 **IPM**



**I – Southwest**

Mark Longstroth, Bill Shane,  
 Diane Brown-Rytlewski

**Weather**

The winter of 2009-10 was a mild

Michigan winter. December was cold and snowy. January seemed milder than normal because of a warm spell when temperatures were generally above freezing and most of the snow melted. The coldest days of winter were at the beginning and end of January when low

temperatures briefly fell close to zero. The snow and cold returned in February. Several snowstorms deposited several feet of snow and the highs seldom rose above freezing for the entire month. Under these conditions we do not expect any winter damage to fruit.

Spring and the month of March began on the same day in Southwest Michigan. The weather seemed warm with highs in the 50s and lows above freezing. Bud swell was underway by mid-March and we would have needed temperatures around 20°F to cause significant [freeze injury](#). The passage of a cold front followed by clear conditions caused morning lows between 19°F and 21°F across the region on March 26. Fruit buds were noticeably swollen and getting ready to open. We anticipate there was widespread light damage from this freeze. While the skies were clear, there was a light breeze all night so that colder air was mixed above the ground and did not collect near the ground. In fact, the hilltop locations had the coldest temperatures. Light rain fell Sunday, March 28. Warmer temperatures are forecast for the upcoming week with highs in the 70s by the weekend. With these warm temperatures, we can expect rapid bud development. Very little rain has fallen in March and soils are dry.

The [Enviro-weather website](#) continues to improve. Click on the site closest to you and then choose fruit from the banner across the top of the page.

**Tree fruit**

Fruit tree buds swollen and beginning to open. With the warm forecast for the week we can expect that all fruit buds will burst.

**Apricot** buds are at red tip. With the warm forecast, we should see redbud by next week.

**Peach** buds are swelling. No green

tissue is exposed. Many growers have applied copper to reduce [peach leaf curl](#). It is probably too late to apply copper sprays, but chlorothalonil sprays would still be worthwhile before the next rain.

Both **sweet cherries** and **tart cherries** are at swollen bud. Early sweet cherry varieties should open this week. Copper can still be applied to sweet cherries that will not open soon. Copper will injure sweet cherries and is only used as a [dormant spray](#) to reduce bacterial canker. We should soon know if the freeze on March 25 with lows near 19°F caused any damage to swollen fruit buds.

In **plums**, Oriental plum buds are at white side. European plums buds are still in swell.

**Apples** are at silver tip and the early varieties are starting to open. Growers need to be ready for apple scab. Because of mild conditions in March, we expect scab spores from the leaf litter will be ready as soon as green tissue is available for infection. The dry conditions we have experienced will delay spore discharge a little, but growers should be ready to apply scab sprays as green tissue appears. Copper can be used for the first spray at green tip. We expect rapid bud development this week so growers should be prepared to protect unfolding leaves or even exposed flower buds if the weekend's rain becomes an apple scab infection.

**Pear** buds are swelling. [Pear psylla](#) adults are out. Growers should prepare to protect against pear scab.

**Small fruit**

**Blueberry** fruit buds are swollen and leaf buds are beginning to break exposing green tissue to mummyberry. Our next significant rain event is forecast for the weekend. Growers

**Southwest Michigan GDD totals.  
March 1 through March 28**

Location	GDD 42	GDD 45	GDD 50
<a href="#">SWMREC:</a>	44	28	11
<a href="#">Fennville:</a>	38	23	7

should scout for mummyberry mushrooms – the best place to look is where the soils are moist. Dry conditions suppress mushroom development, so some areas may not see large numbers of mushrooms until after we get more moisture.

**Grape** buds are beginning to move. Growers are tying canes. There is still time to apply dormant [lime sulfur applications](#) to suppress diseases that overwinter on the vine such as powdery mildew, black rot and phomopsis.

**Strawberry** growth is just beginning with new leaves emerging from the crown. Growers are applying herbicides and putting down straw mulch.

**Raspberry** buds are breaking dormancy. Early varieties are showing green, but late varieties still appear dormant. Now is the window for [lime sulfur applications](#) to suppress anthracnose.

**Cranberries** are dormant.

**Miscellaneous**

Growers have used the good March weather to get ahead of spring tasks. Many have finished pruning and are clearing brush and applying preemergent herbicides.

The Fruit Code-A-Phones in Van Buren County (269) 657-8217 and Berrien (269) 944-4126 ext 1, will be working and updated by April 1. The first Monday Fruit IPM Update meeting will be Monday, April 12 at the Fruit Acres Farm in Berrien County. **IPM**

**2 – Southeast**

Bob Tritten

**Weather**

Our winter of 2009-10 in southeast Michigan was mild in terms of temperatures with a fair amount of snow cover for much of the winter. Most of our [Enviro-weather](#) stations in the region have reported low temperatures over the season of -8 to -10°F, however there

was a great deal of variability in these temperatures. These low temperatures were recorded only for one or two nights.

In looking at our crop of flower buds for our tree fruits this spring, it appears that we have a bit of a shy crop of buds. Commercial fruit growers understand that just because we don't possibly have as many flower buds at this time of year that it does not relate to the size of the crop that we will potentially harvest at the end of the season. This lighter than

typical bud set is primarily due to the fact that most of our tree fruit crops had a very heavy crop load last season. I have been forcing some peach blossoms over the last three to four weeks, and am a bit concerned in that I see a fair amount of flower buds that are not developing as they normally do. Here again, these are simply preliminary signs that might have bearing at the end of the season, but time will tell.

We are having an earlier spring than

normal; however our degree day totals are about normal. I saw my first green tissue on apples when I was on grower visits last Friday, March 26, in the Romeo area. However most flower buds in other parts of the region are still fairly tight. With warm weather predicted later this week, I would expect to see development of our flower and leaf buds to occur very rapidly.

Our spring has also been much drier than most. I have already been at farms that are preparing ground for both tree and small fruit planting, and I expect that mid- to late this week a number of farms will be planting fruit crops.

**Tree fruit**

**Apple** buds are at early silver tip at most farms, and as mentioned earlier I saw a very small bit of green tissue on early flowering varieties last Friday in Romeo. During our last warm spell, I saw a few spotted tentiform leafminer adults flying. Apple pruning is complete at most farms across the region and most brush has been chopped or pushed out of the orchard. This is in anticipation of the first possible application of fungicide later this week when we will most likely begin to see green tissue and weather conditions favor apple scab development. I am a bit concerned about early apple scab development this year as in winters with a heavy amount of snow cover we tend to have less than the normal amount of leaf deterioration over

**Southeast Michigan growing degree day totals for March 1 to March 30**

Location	GDD 42	GDD 45	GDD 50
Commerce (Oakland)	75	50	25
Emmett (St Clair)	66	44	21
Flint (Genesee)	74	49	25
Lapeer (Lapeer)	73	50	26
Petersburg (Monroe)	72	47	23
Romeo (Macomb)	73	49	24

the winter time. There was also a fair amount of fruit left unharvested in some blocks which could also lead to larger than normal amounts of overwintering structures for apple scab development.

**Pear** buds are slightly swelling.

I've seen a few pear psylla adults flying during the last warm spell.

**Peaches** are at bud swell. Many growers applied a fall application of a fungicide to control peach leaf curl, and many have applied a second application this spring as peach leaf curl was common across the region last season.

**Sweet cherry** flower buds are quite swollen with the warm temperatures expected later this week I would predict very rapid development.

**Tart cherry** flower buds are swelling slightly, but they are still fairly tight.

**Plums** have a small amount of bud swell for Japanese plums, but European plum buds are still very tight.

**Small fruit**

**Strawberry** growth is just starting to occur underneath the straw. A few farms uncovered a portion of their strawberries a few weeks ago during the recent warm spell to promote early flowering and therefore fruiting. I don't think that the cold weather that we have had since then has damaged the flower buds. However, strawberries have not been uncovered across the region.

**Raspberries** are dormant to a slight amount of bud swell for summer fruiting raspberries. Just a few canes are emerging from the soil for fall bearing raspberries.

**Blueberry** bud scales are cracked open with no green tissue visible. Pruning is mostly done on blueberries across the region.

**Grapes** are dormant. **IPM**

**4 – West Central**

Mira Danilovich

**Weather**

What a difference a year makes? Last year at this time the weather was cold and the trees were still quite dormant. This time around we are having warmer than normal temperatures, plenty of sunshine and no excessive rainfall. Degree-day accumulation is ahead of last year and ahead of the five-year average. According to the historical degree day summary, Ludington is three days ahead of 2009 for GDD base 50 and about a day behind the five-year average for the same period January through March 30. Similarly, the Hart station shows two GDDs base 50 ahead of 2009 and about one GDDs base 50 behind the five-year average.

One could argue that it has been

rather dry. This whole month we had only three rain events from March 10-13 with total accumulation slightly over 1.25 inch. For the whole month of March, high temperatures were into the 40's and 50's. On the other hand, low temperatures were quite variable and with readings from the low teens to mid-40's. Warmer daily temperatures have started to move things quickly.

Though we had no precipitation in the last two weeks, soil moisture is adequate.

**Tree fruit**

**Apples** are generally in silver tip, as of yesterday, Idareds are showing very early green tip. With the temperatures predicted to be well into the 70's in the next few days, all varieties are expected to be in green tip and past that stage.

**Pears** are in swollen bud; **tart cherries** are just starting to show bud-scale

separation and initial swelling; and **sweet cherries** are in swollen bud with early blooming varieties starting to show a hint of a side green. **Apricots** will be in bloom this weekend in the Hart area; European **plums** are about the same stage as tart cherries; and **peaches** are in advanced swollen bud to calyx green and in several blocks on very sandy soil first green is emerging. It appears that the bud swell in peaches happened earlier than the suggested model based on degree-day base 42 accumulation forecasted.

Given the stage of bud development the low temperatures we experienced from March 25-27 with the lowest registered on March 26 were most damaging to sweet cherries. Our [Enviro-weather](#) stations in Hart and Ludington registered 16.3°F and 15°F respectively. Low-lying areas had even lower temperatures inflicting even greater

damage. Cutting sweet cherry buds revealed various degrees of frost damage – anywhere from 20-30 percent above five inches to more than 80 percent on lower limbs and in low, frost-prone areas. None of the other crops are showing frost damage from that cold spell.

This early frost damage to the sweet cherry buds may favor bacterial canker development. Copper sprays will help in disease management by lowering the inoculum surviving on the trees. We are moving out of the best control window for the peach leaf curl applications. Though, being so dry might buy us a

little time. Fungicide applications (Bravo) are encouraged up to bloom. Research has shown the application will be beneficial though somewhat less effective.

For detailed information regarding weather conditions, degree-day accumulations, weather forecast, historical degree day and other weather summary go to the Enviro-weather site: <http://www.enviroweather.msu.edu> equipped with various models to be used as tools in disease and insect management. **IPM**

**West Central Michigan growing degree day totals from March 1 as of March 29**

Location	GDD42	GDD45	GDD50
Hart	68	39	13
Ludington	63	36	12

# 12 ----- Fruit Crop Advisory Team Alert - March 30, 2010

## ACTUAL AND PREDICTED DEGREE-DAY ACCUMULATIONS SINCE MARCH 1 2010 (\*)

STATION OR DISTRICT	BASE 42 BE DEGREE-DAYS				BASE 50 BE DEGREE-DAYS			
	AS OF 2009	03/29 2010	BY 04/03	BY 04/08	AS OF 2009	03/29 2010	BY 04/03	BY 04/08
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
WEST UP NORMS**		11	17	24		0	1	3
MARQUETTE	0	46	55	56	0	6	8	8
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
EAST UP NORMS		1	5	9		0	0	0
CORNELL	0	51	61	61	0	10	14	14
SSMARIE	0	76	91	91	0	20	26	26
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
N.W. LP NORMS		20	30	40		2	6	8
BEULAH	0	98	114	120	0	27	33	33
BINGHAM	0	71	83	87	0	14	17	17
NORTHPORT	0	51	60	62	0	9	11	11
OLDMISSION	0	73	85	89	0	15	19	19
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
N.E. LP NORMS		16	23	31		2	4	5
ALPENA	0	64	74	77	0	16	20	20
ROGERCITY	0	41	47	50	0	6	8	8
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
W. CENT. LP NORMS		31	47	60		8	14	19
FREMONT	0	102	123	132	0	30	40	40
HART	0	93	112	121	0	22	29	29
LUDINGTON	0	81	98	105	0	19	25	25
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
CENT. LP NORMS		33	50	66		6	14	19
ENTRICAN	0	83	103	116	0	24	31	31
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
E. CENT. LP NORMS		35	52	70		7	14	20
BADAXE	0	67	85	96	0	22	30	30
SAGINAW	0	78	99	112	0	26	36	36
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
S.W. LP NORMS		57	82	105		21	31	39
BHARBOR	0	96	116	133	0	26	33	35
FENNVILLE	0	93	112	129	0	22	28	30
GLENDORA	0	101	122	140	0	26	33	35
GRANDJUNC	0	119	144	165	0	41	52	55
HOLLAND	0	129	156	179	0	36	46	48
KENTCITY	0	95	115	132	0	27	34	36
SPARTA	0	90	109	125	0	23	29	31
WATERVLIET	0	101	122	140	0	26	33	35
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
S. CENT. LP NORMS		53	76	98		20	29	37
BELDING	0	94	114	131	0	25	32	33
COLDWATER	0	105	128	146	0	31	40	41
ELANSING	0	90	109	125	0	25	32	33
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
S.E. LP NORMS		48	69	90		16	25	33
DETROIT	0	118	144	165	0	41	52	52
FLINT	0	91	111	127	0	29	36	36
MILFORD	0	88	107	123	0	29	36	36
ROMEO	0	89	109	125	0	29	36	36
SALINE	0	100	122	140	0	36	45	45
TOLEDO	0	107	131	150	0	37	47	47

\* Since weather data for some agricultural stations are not available prior to April 1st, GDD values for those stations during February and March are estimated with closest available station data.

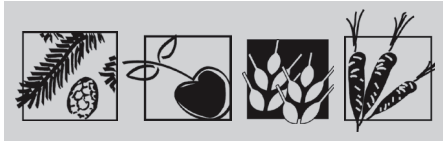
\*\* District normals were calculated as the mean of daily GDD totals at several stations within each district for the period 1951-1980.  
Report generated at 09:04, 03/30/10

Michigan State University Cooperative Agricultural Weather Service  
 Cumulative Precipitation Summary For 03/29/2010

PRECIPITATION TOTALS SINCE

STATION	DIST	03/23/2010	03/16/2010		03/02/2010		04/01/10	
		(last week)	(last 2 weeks)	Dev. Norm.	(last 4 weeks)	Dev. Norm.	(since Apr.1)	Dev. Norm.
+-----+-----+-----+-----+-----+-----+-----+-----+-----+								
MARQUETTE	WU	0.01	0.01	-0.84	0.51	-1.26	0.00	0.00
CORNELL	EU	0.03	0.04	-0.83	0.19	-1.56	0.00	0.00
SSMARIE	EU	0.08	0.12	-0.75	0.14	-1.61	0.00	0.00
BENZONIA	NWL	0.00	0.00	-0.72	0.80	-0.80	0.00	0.00
BEULAH	NWL	0.00	0.00	-0.72	0.84	-0.76	0.00	0.00
BINGHAM	NWL	0.00	0.00	-0.72	0.38	-1.22	0.00	0.00
NORTHPORT	NWL	0.00	0.00	-0.72	0.38	-1.22	0.00	0.00
OLDMISSION	NWL	0.00	0.00	-0.72	0.34	-1.26	0.00	0.00
ALPENA	NEL	0.00	0.00	-0.77	0.43	-1.25	0.00	0.00
ROGERCITY	NEL	0.00	0.00	-0.77	0.20	-1.48	0.00	0.00
FREMONT	WCL	0.00	0.04	-0.89	1.09	-0.91	0.00	0.00
HART	WCL	0.00	0.00	-0.93	0.97	-1.03	0.00	0.00
LUDINGTON	WCL	0.00	0.00	-0.93	1.17	-0.83	0.00	0.00
LUDINGTON	WCL	0.00	0.00	-0.93	1.17	-0.83	0.00	0.00
ENTRICAN	CL	0.00	0.06	-0.79	0.85	-1.10	0.00	0.00
BADAXE	ECL	0.12	0.14	-0.74	0.61	-1.29	0.00	0.00
SAGINAW	ECL	0.00	0.01	-0.87	0.58	-1.32	0.00	0.00
BHARBOR	SWL	0.00	0.00	-1.10	0.12	-2.14	0.00	0.00
FENNVILLE	SWL	0.00	0.20	-0.90	1.18	-1.08	0.00	0.00
GLENDORA	SWL	0.03	0.11	-0.99	1.05	-1.21	0.00	0.00
GRANDJUNC	SWL	0.10	0.24	-0.86	1.14	-1.12	0.00	0.00
HOLLAND	SWL	0.00	0.00	-1.10	1.01	-1.25	0.00	0.00
KENTCITY	SWL	0.01	0.08	-1.02	1.26	-1.00	0.00	0.00
SPARTA	SWL	0.00	0.29	-0.81	1.69	-0.57	0.00	0.00
WATERVLIET	SWL	0.03	0.11	-0.99	1.05	-1.21	0.00	0.00
BELDING	SCL	0.00	0.13	-0.93	1.16	-0.98	0.00	0.00
COLDWATER	SCL	0.01	0.23	-0.83	0.75	-1.39	0.00	0.00
ELANSING	SCL	0.17	0.22	-0.84	0.61	-1.53	0.00	0.00
DETROIT	SEL	0.43	0.50	-0.58	1.07	-1.08	0.00	0.00
FLINT	SEL	0.20	0.34	-0.74	0.65	-1.50	0.00	0.00
MILFORD	SEL	0.09	0.27	-0.81	0.86	-1.29	0.00	0.00
ROMEO	SEL	0.69	0.76	-0.32	1.50	-0.65	0.00	0.00
SALINE	SEL	0.56	0.66	-0.42	1.32	-0.83	0.00	0.00
TOLEDO	SEL	1.13	1.22	0.14	2.14	-0.01	0.00	0.00

Report generated at 09:04, 03/30/10



## **Crop Advisory Team Alerts**

Integrated Pest Management Program  
Michigan State University  
B 18 Food Safety & Toxicology Building  
East Lansing, Michigan 48824 -1302

## **The Fruit Crop Advisory Team (CAT) Alert is brought to you by:**

### **MSU Extension and Agricultural Experiment Station Field Staff**

Robert Tritten, District Educator - SE Michigan  
Mark Longstroth, District Educator - SW Michigan  
Dr. Bill Shane, District Educator - SW Michigan and Horticulture Specialist  
Dr. John Wise, Research/Extension Coordinator - Trevor Nichols Research Complex  
Dr. Carlos Garcia-Salazar, Small Fruit Educator - Central Region  
Amy Irish-Brown, ICM Fruit Educator - West Central Michigan  
Phillip Schwallier, District Educator - Clarksville Horticulture Experiment Station  
Dr. Mira Danilovich, District Educator - West Central Michigan  
Dr. Duke Elsner, ANR Educator - Grand Traverse & Kalkaska Counties  
Dr. Nikki Rothwell, Station Coordinator - NW Michigan Horticultural Research Station  
Erin Lizzotte, District Educator - NW Michigan Horticultural Research Station  
Dr. Rob Serrine, Extension Director, Leelanau County  
Diane Brown-Rytlewski, Berrien County Horticulture Extension Educator

### **MSU Extension Campus Specialists**

Dr. Annemiek Schilder, Plant Pathology (small fruit)  
Dr. George Sundin, Plant Pathology (tree fruit)  
Dr. Larry Gut, Entomology (tree fruit)  
Dr. Rufus Isaacs, Entomology (small fruit)  
Dr. Jeff Andresen, Geography/Agric. Meteorology  
Dr. Ron Perry, Horticulture  
Dr. Eric Hanson, Horticulture  
David Epstein, Integrated Pest Management Program  
Paul Jenkins, Small Fruit Education Coordinator

MSU is an affirmative-action, equal-opportunity employer. Michigan State University Extension programs and materials are open to all without regard to race, color, national origin, gender, gender identity, religion, age, height, weight, disability, political beliefs, sexual orientation, marital status, family status or veteran status.



### **The Crop Advisory Team Alerts are published by the Michigan State University IPM Program**

Joy Neumann Landis, editor  
Andrea Gooch, assistant editor

*Crop Advisory Team Alert* subscriptions are \$38 or free on the Internet at:

[www.ipmnews.msu.edu/fruit](http://www.ipmnews.msu.edu/fruit)

To subscribe or for information:  
*Crop Advisory Team Alerts*  
243 Natural Science Bldg.  
Michigan State University  
East Lansing, MI 48824  
(517) 353-4703  
E-mail: [catalert@msu.edu](mailto:catalert@msu.edu)

Additional support provided by the MSU Fruit Team.