Northern Michigan FruitNet 2002
Weekly Update

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April 10, 2002

Snow patches are rapidly receding, buds are swelling, robins are singing mightily in the morning to make their territorial claims, and we recognize that the new growing season is fast upon us. This first FruitNet report provides timely information for managing apple scab and bacterial canker and news about our PestNet and Weather reporting services. Our next FruitNet report is planned for April 23rd. and should include growth stages if the warming trend continues. Let us know if you prefer to change from fax to e-mail version (or vice-versa, see below).

GROWING DEGREE DAY ACCUMULATIONS as April 10, 2002 at the NWMHRS:

Year	2002	2001	2000	1999	1998	1997
GDD42	20	40.5	160.7	132	126.4	70.4
GDD50	0	11	56	49.7	50.5	26.5

MSU PESTNET FORECAST
By Gary Thornton

Project GREEEN has provided funding once again for a joint weather-monitoring grant between the NWMHRS and SimpleSoft. This year's grant will allow us to run an innovative program throughout the state to deliver real-time disease and insect prediction information to all fruit growers. This year's program allows us to utilize the newly developed Michigan Agricultural Weather Network (MAWN) of electronic weather stations throughout the fruit growing regions of Michigan. This season's PestNet forecast will include information from a total of nine weather stations throughout NW Michigan.

This network will provide growers with predictions based on real time information for wetting events (apple scab, cherry leaf spot and fireblight). The reports will be sent for every wetting event in the NW region, up to twice a day, depending on the length of the wetting event. Fax and e-mail reports will go out between 7:00-8:00 am and 6:30-7:30 pm when it rains. **Disease prediction reports via the PestNet Code-A-Phone will only be updated at that time as well.** Information can be received via three methods:

Via email – This method of delivery is ***free*** to those who subscribe and strongly encouraged. In order to read the reports via email, you will need to have Adobe Acrobat. If you do not have this software, you can download the Adobe Acrobat Reader for free at the following WEB address:
http://www.adobe.com/products/acrobat/readstep2.html *Fill out steps one and two and click on download. You may consider "unchecking" the boxes in step two that will prevent them from contacting you with new product info.*

Via Fax – *Reports will be sent via fax to those subscribing. The cost for the season is **$25.** Subscribe by contacting the NWMHRS (946-1510). If you subscribed last year, you will be sent two free reports before payment will be required. Please let us know if you would like to subscribe again. Make checks payable to **Michigan State University** and mail them to: NWMHRS, 6686 S. Center Hwy., Traverse City, MI 49684.*

Via Phone – *Discussed in the Code-A-Phone article and available for **free** to anyone who has access to a touch-tone phone. The phone numbers for those wishing to access the PestNet are 947-3063 (Local) 1-877-763-3300 (Toll free)*

To subscribe to the PestNet Forecast (email or fax) contact Jackie Baase or Alison Heins at the NWMHRS via phone at 946-1510 or 888/749-3019, via fax at 946-1404, or via e-mail at thornton@msue.msu.edu

60 HOUR WEATHER FORECAST
By Jim Nugent and Gary Thornton

A few years ago a program was initiated to deliver **weather forecasts daily** for the Grand Traverse area **during the growing season**. The forecast is given in 3 hr. increments for a 60 hr. period. It is now available by e-mail, which is strongly encouraged, and also via fax. There is a **$30** subscription fee for the fax version and a **$20** subscription fee for the e-mail version per season. The Traverse City 60 hr. forecast is also available free on the web at:
http://www.agweather.geo.msu.edu/agwx/forecasts/fcst.asp?fileid=fous14ktvc The predictions are based on the Traverse City airport, so you will need to adjust temperature forecasts as appropriate to your site.

The computer program that generates these reports is run twice per day - based on 8:00 a.m. data that is available to us at about 2:45 p.m., and again based on 8:00 p.m. data and available to us about 2:45 a.m. Fax subscribers will receive the afternoon report only. E-mail subscribers will receive both reports; i.e. updated reports every 12 hours. We will begin the fax cycle by about 3:00 p.m. Reports will be sent daily from ***mid April*** through ***mid October***.

This predictive information should complement the real-time (current) weather and pest scouting information that you are collecting to further improve your IPM implementation decisions!

To subscribe to the 60 Hour Weather Forecast (email or fax) contact Jackie Baase or Alison Heins at the NWMHRS via phone

To subscribe to the 60 Hour Weather Forecast (email or fax) contact Jackie Baase or Allison Heins at the NWMHRS via phone at 946-1510 or 888/749-3019, via fax 946-1404, via e-mail at nwmihort@msue.msu.edu Make checks payable to ***Michigan State University*** and mail to: NWMHRS, 6686 S. Center Highway, Traverse City, MI 49684.

FRUITNET

This weekly newsletter, written by area Extension agents, is sent out of the NWMHRS. **It is available via e-mail (strongly encouraged) or via fax**. Please let us know if you would like to switch from fax to e-mail. FruitNet will be published on Tuesdays throughout the growing season. Funding for this is provided by the area horticultural organizations. Subscription is ***free*** in NW Michigan. Past subscribers will automatically remain on the list, unless you ask to be removed. New subscribers should contact the NWMHRS (946-1510).

PHONE SYSTEM FOR LOCAL CODE-A-PHONE MESSAGE
By Gary Thornton

Last year the Code-A-Phone system was updated to provide fruit growers from throughout the state with quicker access, improved information and a broader range of options. This system is known as a telephony system and works similarly to how you access bank information. You will need a touch-tone phone to access this system.

To access, call:

947-3063 (Local to Traverse City)
1-877-763-3300 (Toll free statewide)

Options this year include the following by pressing the corresponding number:

1. Stone Fruit Information
2. Pome Fruit Information
3. Weather conditions and Disease Forecasts (including wetting events from 23 weather stations throughout Michigan with 9 of those in NW Michigan)
4. Listing of Weather Station Numbers (required for access to your local weather station info).

For example: A grower could call up and hear, "Welcome to the Northwest Michigan Horticultural Research Station Information Network. Please press 1 for stone fruit information, 2 for pome fruit, 3 for weather conditions and disease forecasts, including wetting events, or 4 for a list a weather station numbers. You may return to this main menu at any time by pressing the star key." Then you might press 1 to listen to the stone fruit information. At that time it would say, "Press 1 for the stone fruit message, press 2 for a refresher on the 'postponed insecticide treatment strategy for plum curculio' or press 3 for recommendations on the use of pheromone disruption for controlling lesser and greater peach tree borers." For starters, it will only say "Press 1 for the stone fruit message." By pressing the star key you can back out of the menus to get to additional menu options.

The highlight of the system is the access to the latest information on current wetting events. This is being made available through a GREEEN grant with MSU and SimpleSoft, Inc. cooperating. This information will be updated twice daily during a wetting event and thus can be accessed from wherever you have access to a touch-tone phone. The system will ask for the weather station that you want the information from, so you will need to know the code of that station and punch it in when asked. Listed below are the stations that will be available as of the week of **April 15th** and their respective codes. Write these down!! If you happen to loose them, they will be available via menu selection 4.

Eastport – #100
Yuba – #110
Northport West – #120
East Leland – #140
NWMHRS – #160
Benzonia – #180
Old Mission – #190
Elk Rapids South – #200
Kewadin – #210

This year the phone system will have statewide codes listed as well, so you may hear of places that you are not familiar with.

MANAGING FUNGICIDE RESISTANCE IN APPLE ORCHARDS
(Dave Rosenberger, Wolfram Koeller, and Bill Turechek, Plant Pathology, Highland & Geneva, NY) from Scaffolds Fruit Journal Vol. 11, No.4, April 8, 2002

Over the past 30 years, the apple scab fungus has developed resistance to dodine (Syllit), the benzimidazoles (Benlate, Topsin M), and the SI fungicides (Nova, Rubigan, Procure). The first indications from orchard tests clearly indicate that the new strobilurin fungicides (Sovran and Flint) will not be exempt from resistance. This article outlines recommendations for minimizing further selection for resistance and suggests strategies for controlling scab in orchards wheremany of the fungicides mentioned above are no longer fully effective.

Apple scab has never developed resistance to any of the "contact" fungicides, a broad grouping that includes copper, the EBDC fungicides (mancozeb, Polyram), captan, the other carbamates (ferbam, thiram, ziram), or sulfur. The contact fungicides are multi-site inhibitors. That means that they disrupt several metabolic pathways in fungi, thereby making it difficult for the fungus to circumvent the action of the fungicide. Contact fungicides prevent spores from germinating on the surface of susceptible tissue, be it leaves or fruits. Once spores are allowed to germinate and to infect tissue beneath the surface, contact fungicides can no longer control the infections.

By comparison, dodine, the benzimidazoles, the SI's and the new strobilurins can stop the scab fungus after apple tissue has already been infected. Therefore, these fungicides are effective when applied on a post-infection schedule (in the absence of resistance, of course). These fungicides arrest fungal development by interfering with a single critical metabolic pathway in the fungus, but resistance develops when the target fungus develops mechanisms for bypassing the blocked pathway. The mechanisms used to bypass the fungicide activity are different for the different fungicide groups. Initially, the number of resistant strains will be very low and will not compromise good control of scab. Because they survive treatment, however, they will multiply more rapidly than sensitive strains and will increase in proportion over time. At some point, they will cause scab even though the fungicide has been applied at the same rates and timings that provided good control in previous years. The goals of

though the fungicide has been applied at the same rates and timings that provided good control in previous years. The goals of anti-resistance measures are to slow the build-up of resistant strains and to control existing resistant strains by using other fungicides that are still effective.

For the SI fungicides, Wolfram Koeller and Wayne Wilcox have demonstrated methods for slowing the expansion of SI-resistant populations and for controlling resistant strains that escape. SI-resistant strains are not immune, and many of them can still be controlled by using a high rate of SI fungicides. However, the level of control will still be less than for the sensitive strains and a contact fungicide must therefore be included in tank mixes to control SI-resistant strains. This strategy has worked well for more than a decade in many orchards. We have tested orchards where SI+contact fungicide tank mixes have been used in a regular program for 12 years, and scab in several of these orchards remains fully SI-sensitive. However, we have also identified orchards in which scab is fully resistant to the SI's. In the latter group of orchards, the SI's were routinely used in post-infection applications and not always in mixtures with contact fungicides. The current situation in most New York orchards is somewhere in between these two extremes, with scab populations that are neither fully SI-sensitive nor fully SI-resistant.

The new group of strobilurin fungicides (Sovran, Flint) provides an alternative for reducing selection pressure for SI resistance. Of course, two questions are important: How fast will the strobilurins develop resistance by themselves, and do they control SI-resistant strains as effectively as SI-sensitive strains? Proactive research conducted in Wolfram Koeller's lab and in cooperation with Wayne Wilcox has shown that development of resistance to strobilurin fungicides is more complex than it has been with previous classes of fungicide chemistry. Following are their essential findings and predictions:

1. There is no doubt that scab will develop resistance to the strobilurin fungicides. Lab experiments, orchard trials, and experiences from Europe suggest that development of resistance will proceed in two phases. First, scab strains that are not entirely immune to the strobilurins will emerge. As with the SI's, these strains will still be controllable by using higher strobilurin rates. In the second phase of resistance development, strains that are totally immune to the strobilurins will slowly emerge. How long will the first phase last? The first phase lasted for five years in Europe, and it still persists in a large majority of European orchards. Preliminary laboratory tests suggest that dependence on post-infection applications (especially applications >48 hr post-infection) might speed the development of strains immune to strobilurins.

2. Do the strobilurins control SI-resistant strains as effectively as SI-sensitive strains? Not necessarily. Scab isolates that are resistant to SI fungicides are somewhat less sensitive to post-infection activity of strobilurin fungicides. Where minimum label rates of strobilurin fungicides were applied in fully SI-resistant orchards, SI-resistant strains were not controlled as well as the SI-sensitive strains. At maximum label rates, the strobilurins controlled both SI-resistant and SI-sensitive strains equally well. This means that using low rates of strobilurins at post-infection timings will maintain selection pressure for SI resistance and that post-infection sprays of strobilurins may not perform well in orchards with SI resistance.

3. The strobilurin fungicides remain fully effective against SI-resistant scab when the strobilurins are used as protectants. This means that the strobilurins are not cross-resistant to the SI's because only the post-infection activity of strobilurins is compromised when they are applied to SI-resistant populations of apple scab.

The discovery that there is some linkage between strobilurin activity and SI resistance impacts the usefulness of strobilurins as tools for managing SI resistance. To conserve their usefulness, strobilurins should be applied at rates in the upper half of the rate ranges indicated on the product labels whenever they are used in post-infection timings.

Increased emphasis on resistance management for apple scab is warranted because, in orchards where dodine, benzimidazoles, and SI's are no longer effective, the strobilurins represent the last currently known chemistry that can provide any post-infection control of scab. Strobilurin resistance that resulted in total loss of post-infection activity would leave some growers with nothing but contact fungicides to control scab. Contact fungicides used alone are very unforgiving precisely because they lack post-infection activity. Thus, growers have a great incentive for preserving strobilurins (and SI's where they are not already compromised). These chemistries represent the only remaining tools that have the post-infection activity necessary for emergencies and for suppressing "escapes" (i.e., those few infections that escape control by protectant fungicides or by strobilurins and SI's used in preventive programs).

Key strategies for avoiding problems with fungicide resistance include the following:
1. *Emphasize preventive fungicide timing*. Over the past decade, various "IPM strategies" have been developed to reduce fungicide use by omitting early sprays in low-inoculum orchards, by using a 4-spray SI program that often stretched the interval between pink and petal fall sprays, or by using electronic scab predictors to time post-infection SI sprays. In retrospect, we believe that these programs often contributed to rapid selection for SI resistance, especially when they were used in high-inoculum orchards. **The party is over: We now need to revert to more conservative scab-management programs to preserve fungicide activity**.

Spraying preventively means the first scab spray should be applied early enough to ensure that no infections become established on young foliage. Sprays should be applied ahead of predicted infection periods rather than regularly depending on post-infection activity of the fungicides. Spraying preventively utilizes the strength of the strobilurin fungicides as spore germination inhibitors and the strength of the contact fungicides in SI+contact tank mixes. It also ensures that pathogen populations will remain low and that resistant strains will be controlled rather than left to "run wild". When used in post-infection spray timing, however, contact fungicides in tank mixes will not reduce selection pressure for resistance, nor will they control resistant strains.

The most rigorous preventive timing would involve spraying on a regular 5-7-day interval to ensure that new leaves are always protected ahead of any infections. In orchards with SI resistance, this level of preventive spraying may be needed unless growers believe that higher label rates of the strobilurin fungicides are more cost-effective than reducing the spray intervals. In orchards where the SI fungicides are still working, we believe that a 10-day spray interval is still OK when using strobilurin and SI+contact fungicides in rotations or alternations. However, remember that protection from these fungicides only lasts about 6-7 days. (The last 3-4 days in a 10-day schedule are dependent on the post-infection activity of the strobilurin or SI.) Therefore, if scab is still active when switching from a 10-day program to a contact fungicide, the contact fungicide should be applied within 6-7 days of the last strobilurin or SI+contact application.

2. *Plan to use strobilurin or SI+contact fungicides beginning at tight cluster or pink*. This is another aspect of preventive spraying that will help to ensure complete control of primary scab and mildew. Beginning mildew control at petal fall worked well in the early years of SI use, but it is no longer recommended.

3. *When post-infection activity is needed, use higher rates*. This is true for both strobilurin and SI fungicides. Using the low label rates on a post-infection basis is a recipe for disaster. ("High rates" mean at least the middle of the rate range given on the SI and strobilurin product labels.)

4. *High rates of strobilurins may reduce selection for resistance more effectively than low strobilurin rates mixed with contact fungicides*. Koeller points out that the high rates of strobilurins provide the best post-infection and protection activity. Low rates plus a contact fungicide may provide equal or better protectant activity, but the contact fungicide cannot compensate for the selection pressure exerted by the low rate of the strobilurin. However, Rosenberger suspects that a contact fungicide such as mancozeb or captan may redistribute to new foliage more effectively than strobilurin fungicides. If that suspicion is correct, then the redistribution of the contact fungicide applied as part of a tank mix would prevent infections on newly-emerged (and therefore unsprayed) foliage that would otherwise be controlled only via post-infection activity of the next SI or strobilurin spray. The jury is still out on whether growers should spend the extra dollars to buy a higher rate of a strobilurin used alone or whether they should buy a contact fungicide to use with the strobilurin.

5. *Alternating strobilurin and SI+contact sprays is better than using blocks of two or three sprays* before switching to the alternative chemistry. We are not certain why that is true, but we seem to get more effective disease control. More effective disease control means less selection pressure because there is less chance of generating secondary inoculum in trees.

In orchards where SI's are no longer effective, the key to effective scab control will be preventive timing, a tighter spray interval, and higher rates of strobilurin fungicides any time that post-infection activity is needed. Using a delayed-start program followed by low rates of strobilurins on a 10-day schedule will likely result in control failures where SI-resistant scab strains are present at high numbers. It will also speed the development of resistance to the strobilurins.

Resistance management strategies for apple powdery mildew are based on the same principles as those used for apple scab. The only problem with mildew is that none of the contact fungicides have mildew activity. Therefore, there is even more reason to start early and use higher rates of SI and strobilurin fungicides where mildew is a problem. "Starting early" with mildew means including a mildewcide beginning at about tight cluster and certainly no later than at pink.

For apple growers, managing resistance and selecting appropriate fungicides is difficult because there is no way to predict existing levels of resistance to the various fungicides within individual orchards. The proportion of fungicide-resistant scab strains varies from region to region and from orchard to orchard within regions. Even where resistant strains are present, the fungicides may still appear effective if the size of the resistant population is still low. Diagnosis of resistance problems is largely based on field experience. However, fungicide resistance can be implicated in control failures only in those cases where growers can verify that sprays were well timed, that spray coverage was excellent, and that appropriate rates of the fungicide were used.

BACTERIAL CANKER SUPPRESSION
By Gary Thornton and Jim Nugent

Bacterial canker is a serious disease of sweet cherry in the Eastern United States caused by the bacteria *Pseudomonas syringae* pv. *syringae* and *Pseudomonas syringae* pv. *morsprunorum*. Research has shown that copper offers some control of this disease, however, results are inconsistent. This likely occurs because the pathogen can infect trees over a fairly long period of time in spring, and again in fall. It can invade wood, leaves or fruit. Consequently, some growers swear that it helps and others don't bother applying it, as they see that it has little value.

The bacteria overwinter at the margins of cankers, systemically in the vascular system of the tree or in buds. The bacteria multiply rapidly when weather conditions are cool and wet and are spread mostly by rain. They then invade wounds or natural tissue openings such as nectaries of flowers or stomata. Since infections are so weather dependent, the severity of this disease varies greatly from year to year.

When using copper to help control bacterial canker, full rate applications of copper should be applied during the dormant to early bud swell periods only. Some growers claim success with applications made in the fall at 75% leaf drop. Most applications in Michigan are applied in the spring prior to the bud burst stage. Rates are typically cut in half if the applications are made beyond the mid to late swollen bud stage. Once bud burst occurs and the tender, green tissue inside begins to be exposed, then copper may cause serious phytotoxicity, particularly if warmer temperatures prevail. However, if copper is applied between bud burst and bloom, follow labeled rates for blossom blight (generally 25-35% of the dormant rate). Again, it should be stressed that significant phytotoxicity may occur when copper is applied to green tissue on sweet cherries. Copper applications later in the growing season are not recommended, as the bacteria do not thrive in the warmer weather.

The MSU Fruit Spray Calendar indicates a multiple application program using Tri-Basic Copper Sulfate for Bacterial Canker control on tart cherries. This is not registered in the same way on sweets due to increased phytotoxicity problems on sweets. Note also that the program indicated will cause leaf defoliation even on tart cherries if applied during warm conditions.

Keep in mind that the weather does play an important role in the level of infections that take place and some of those infections can be avoided through the use of sound cultural practices. When training young sweet cherries, use clothes pins to spread the main scaffolds. Steep crotch angles are more susceptible to winter injury and often lead to damaged tissue that can provide the bacteria a means to enter the tree. Pruning is best done prior to the cool, wet periods of the spring, when the trees are still fully dormant and temperatures are still generally below freezing. If you have to prune later, avoid pruning sweet cherry trees when cool, wet weather is in the near forecast. A few days of warm, dry weather can allow those pruning cuts to dry off and reduce their susceptibility to canker, although it won't prevent all infections from occurring.

Sweet cherries on Gisela rootstocks have demonstrated an increased susceptibility to bacterial canker, so are good candidate orchards to receive copper treatment. Also, consider treating orchards with a past history of canker problems.

In the long term, reducing bacterial canker problems should be addressed by doing all of the horticultural practices that keep trees healthy. This pathogen is an opportunist that causes increased problems when trees are stressed. Factors that increase the predisposition of trees to canker infection include such things as low soil pH, exposure to wind, and low (cold) pockets, but any stress factor may lead to increased problems.

Please send any comments or suggestions regarding this site to:

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Northern Michigan FruitNet 2002
Weekly Update

James E. Nugent Gary E. Thornton William M. Klein
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Michigan State University
April 23, 2002

GROWING DEGREE DAY ACCUMULATIONS as April 22, 2002 at the NWMHRS:

Year	2002	2001	2000	1999	1998	1997
GDD42	176	121	196	182	224	93
GDD50	95	47	68	63	97	32

WEATHER
By Jim Nugent

Record high temperatures last week were followed by a return to winter temperatures. Sunday night, during the snow event, temperatures were in the 27 to 28 degree F range for several hours, with wind. On Monday afternoon I was surprised at the extent of bud damage that resulted in tart cherries at the higher elevations at the NWMHRS. Buds in lower areas looked better. A more conventional inversion frost occurred Monday night/Tuesday morning, with warmer temperatures on the higher sites than the previous night, but colder in lower areas.

GROWTH STAGES

Apple: Red Delicious--1/2" green
Pear: Bartlett – bud burst
Sweet Cherry: Napoleon – tight cluster
Tart Cherry: Montmorency – swollen bud
Plum: European type – green cluster
Grapes: Chardonnay – early bud swell

COMMODITY REPORTS
By Gary Thornton

Last week a light infection period for apple scab was reported in some areas of NW Michigan. The temperatures were on the cool side, but significant spore release could have taken place based on the plant phenology at that time. Some growers ignored the infection period. Those who did should keep a close watch for lesions, and if they show up, modify their spray program.

Overwintering egg numbers of European red mites appear to be down all over the state. The few orchards checked here in NW Michigan have had low numbers.

A REVIEW OF STRATEGIES FOR CONTROLLING APPLE SCAB AND MILDEW IN 2002
Dave Rosenberger,
Scaffolds Fruit Journal, April 1, 2002

Fungicide strategies for controlling apple scab and powdery mildew remain mostly unchanged from those recommended for the 2001 season and published in *Scaffolds* last year (see citations at the end of this article). This article provides a brief summary and update of the recommendations published last year. A follow-up article next week will cover the latest information on fungicide resistance problems and strategies for minimizing selection pressures that contribute to fungicide resistance.

Key recommendations for early-season disease control on apples in 2002 include the following:

1. Start early! Plan to use contact fungicides (mancozeb, Polyram, captan) beginning at the green tip bud stage and again 7-10 days later. Appropriate spray intervals will vary depending on temperature (i.e., tree growth rate), rainfall, and predicted infection periods. Copper applied at green tip to suppress fire blight inoculum provides scab control equivalent to that of a mancozeb spray. None of the protectant fungicides (including copper) have postinfection activity. Therefore, scab infections that occur at green tip will not be controlled if the first spray is not applied until half-inch green.

Delaying the first spray beyond green tip is risky except when apple scab ascospore maturity is considerably delayed compared with "average" years or where orchards had virtually no scab the previous season. The latter can be determined only by carefully observing terminal leaves for scab symptoms during October. Growers should not assume that they have "clean" orchards just because they failed to notice scab from the tractor seat.

Sprays between green tip and tight cluster can prevent early scab infections that would otherwise generate secondary inoculum for infecting leaves and fruit between bloom and first cover. In most cases where significant fruit scab is present at harvest, the origins of the problem can be traced to poor scab control during the prebloom period.

Even the best fungicides will often fail when the following three conditions occur simultaneously:

1. Trees are growing rapidly, thereby generating large quantities of susceptible tissue.

2. Extended rains favor scab and interfere with spraying during the period between late bloom and second cover.

3. Primary scab lesions are visible at petal fall, thereby providing huge quantities of inoculum.

The first condition occurs every year during the spring growth flush that begins near petal fall. The second condition is both unpredictable and uncontrollable. Therefore, the only fool-proof way to avoid a scab disaster is to prevent condition #3. Careful prebloom scab control is the key to ensuring that no secondary inoculum is available during the interval between petal fall and second cover.

For powdery mildew, starting "early" means including a mildewcide in the spray program starting at the tight cluster bud stage, or at the very latest, by the pink bud stage. When the SI fungicides were first introduced, they sometimes provided adequate mildew control when applied only in the petal fall and first cover sprays. In most orchards, the SI fungicides are less effective against mildew now than they were 10-12 years ago, so mildew control must be initiated earlier before inoculum from primary mildew infections can spread to new foliage. Remember that powdery mildew can spread in the absence of rainfall or leaf wetting. Therefore, new foliage should be protected with fungicides even when no scab infection periods are predicted.

We can expect high levels of overwintering mildew in 2002 because the mild winter will have allowed most mildew-infected buds to survive. For 2002, delaying mildewcide applications until petal fall will be somewhat like closing the barn doors after the horses have run away.

2. Strobilurin or SI+contact fungicide sprays should be introduced at tight cluster or pink. Sovran and Flint are strobilurin fungicides; Nova, Rubigan, and Procure are SI fungicides. A strobilurin or SI fungicide should be used at tight cluster and/or pink to ensure adequate mildew control and to ensure complete control of apple scab during this critical period. The strobilurin and SI fungicides have postinfection and anti-sporulant capabilities that are lacking in contact fungicides. The time between tight cluster and petal fall usually encompasses the peak of scab ascospore discharge, the period of most rapid leaf expansion, and the period when any primary infections that became established shortly after bud-break will begin to produce conidia. Dollars paid out for fungicides between tight cluster and petal fall often pay dividends by reducing the need for fungicides to control secondary scab and mildew during summer.

Apple growers with low-inoculum orchards and good management skills may be able to save on fungicide costs by using only contact fungicides until petal fall. However, scab programs built exclusively on contact fungicides are likely to fail in orchards with high inoculum levels and in years when weather conditions favor severe scab and limit preventive spray timing. Furthermore, none of the contact fungicides control powdery mildew. If no mildewcide is applied before petal fall, mildew control may be compromised and selection pressure for fungicide resistance will be increased.

3. Consider an alternating program of strobilurin and SI+contact fungicide sprays. There is no single "correct" scheme for configuring strobilurin and SI+contact fungicide sprays during the period between tight cluster and second cover. However, an alternating program (e.g., stroby, then SI+contact, then stroby, then SI+contact) may be slightly more effective than blocking programs wherein two or three applications of one chemistry are followed by several sprays of the alternative chemistry. This is especially true where the strobilurins are applied alone and rust diseases are prevalent. As suggested last year, a "fill-in" spray of mancozeb or captan alone may be needed to bridge the period between strobilurin or SI+contact sprays applied at pink and petal fall.

4. Should the strobilurin fungicides be applied in combination with contact fungicides? No one has a definitive answer for this question. An obvious reason for using strobilurin+contact combinations is to gain better control of rust diseases than that provided by strobilurin fungicides used alone. If one assumes that contact fungicides will redistribute better than strobilurin fungicides, then tank mixes might perform better than a strobilurin fungicide applied alone in situations where spray coverage was incomplete or rapid terminal growth might leave new leaves unprotected. However, we currently have no data to prove that contact fungicides have better redistribution capabilities than strobilurin fungicides. Tank-mix combinations of strobilurin+contact fungicides have been proposed as a resistance management strategy for apple scab, but that assumption is now questionable based on recent work by Dr. Wolfram Koeller. (The details of fungicide resistance management will be discussed in next week's article.)

If growers opt to use strobilurin fungicides in combination with a contact fungicide, it is imperative that the rate of strobilurin in the mixture be maintained at the same level as for sprays where the strobilurin is applied alone. Tank-mix combinations involving a contact fungicide plus a full rate (minimum label rate) of a strobilurin fungicide can be expensive, but they may provide enough risk-reduction to warrant consideration during the critical period between pink and first cover.

5. Regardless of tree-row volume calculations, never apply Flint at less than 1 oz/A or Sovran at less than 2 oz/A. These minimum rates for small trees have been adjusted upward since last year due to changes on product labels and concerns about fungicide resistance. The only exception is that if trees are sprayed to drip with a hand-held wand, then rates of 0.67 oz of Flint/100 gallons or 1.33 oz of Sovran/100 gallons are sufficient. When directed sprays are applied with a hand wand, then the actual rate per acre might drop below the minimum rates recommended for airblast applications.

6. On mildew-sensitive cultivars, mildewcides will be needed until shoot growth slows or terminates. After four or five applications of strobilurin and SI fungicides, sulfur may useful for suppressing mildew infections during June and early July.

The bottom line:

Focus on preventing early infections of scab and mildew. Over the past 20 years, many of us have proposed IPM strategies for controlling scab and mildew that involved omitting early fungicide applications or stretching spray intervals during bloom. Based upon what we are learning about fungicide resistance, many of those strategies now appear unwise and unsustainable. We are increasingly aware that fungicides with post-infection activity are valuable tools that will be quickly compromised if they are overused or misused. Next week's article on fungicide resistance will help to explain the basis for our renewed emphasis on controlling primary infections of scab and mildew and will include more information on effects of strobilurin rates and spray timing.

Citations:

Rosenberger, D.A. 2001. Fungicide strategies for control of apple scab and mildew in 2001. Scaffolds Fruit Journal 10(2):1-3. On-line at www.nysaes.cornell.edu/ent/scaffolds/2001/3.26_disease.html.

Rosenberger, D.A. 2001. Fungicide strategies for control of apple scab and mildew in 2001 - Part II. Scaffolds Fruit Journal

Rosenberger, D.A. 2001. Fungicide strategies for control of apple scab and mildew in 2001 - Part II. Scaffolds Fruit Journal 10(3):1-3. On-line at www.nysaes.cornell.edu/ent/scaffolds/2001/4.2_disease.html.

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Northern Michigan FruitNet 2002
Weekly Update

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April 30, 2002

GROWING DEGREE DAY ACCUMULATIONS as of April 29 at the NWMHRS:

Year	2002	2001	2000	1999	1998	1997
GDD42	193	189	256	243	277	145
GDD50	103	81	94	91	118	53

WEATHER
By Jim Nugent

The major weather events that have affected the potential fruit crops in NW MI are: 1) Record high temperatures in the 80's during the week of April 14 advanced cherry buds to a vulnerable stage for cold injury ahead of normal. 2) Freezing northeasterly wind at temperatures of 26-28 degrees F occurred for 10 to 11 hours during the night of April 21 and early morning of April 22, causing extensive bud damage in cherries, particularly at higher elevations (temperatures were lower at higher elevations and potential exposure to wind was greater). 3) More typical inversion types of freeze further damaged fruit buds, particularly in low areas, on the mornings of April 23, 25, 26 and 27. 4) The extent of the damage in cherries was very likely accentuated because last year's severe drought and large crops caused trees to go into this spring in a weakened state. This reduces the hardiness of buds, resulting in higher bud losses at given temperatures than normal.

GROWTH STAGES
Apple: Red Delicious--1/2" green
Pear: Bartlett – late bud burst
Sweet Cherry: Napoleon – early white bud
Tart Cherry: Montmorency – early bud burst
Plum: European type – early white bud
Grapes: Chardonnay – early bud swell

COMMODITY REPORTS

Tart Cherries experienced extensive freeze damage in NW MI. Fertilizer rates may be reduced somewhat in blocks with bud damage. In **Sweet Cherries** severe bud damage occurred in some varieties (Emperor Francis, Napoleon, and many black varieties), but was not so bad in others (particularly Gold). **Blossom brown rot** is a concern on any **stone fruits** in bloom or at petal fall, but the low temperatures have kept the brown rot pressure low.

Apples came through the wind freeze in good condition. We expect to see some damage in low areas from inversion freezes, but have not yet assessed conditions in these areas. The apple growers' main concern so far is **apple scab**. A long and cool wetting period just ended, resulting in an infection period only for Northport. It was humidity that carried this infection through, so growers in other areas that have relatively higher humidity – particularly low areas or spots near bodies of water, should treat this as a light infection. The next spray for apples should include either a sterol inhibitor or a strobilurin fungicide for mildew control. These products also have up to four days of back action. Dr. Alan Jones' research has shown that the strobilurins perform better when used on a protectant basis. **Spotted tentiform leaf miner** is flying and laying eggs on the few warm days we've had. **European red mite** egg numbers are low in most blocks. Oil can be applied to kill eggs, but the timing should be frost free for 48 hours both sides of the application. Oil may prove difficult to fit in this year due to cold temperatures and wind.

In **Pears**, **pear psylla** egg numbers are low as well, likely due to low overwintering adult populations and unpleasant flying conditions for the adults. Eggs are darkening as they approach hatch time. Oil sprays can be applied to deter egg laying. Surround can also be applied to deter egg laying on both organic and standard orchards.

Grapes in NW MI show little to no damage at this time.

REDUCING FERTILIZER COSTS FOLLOWING FROST DAMAGE
From *Fruit CAT Alert, April 30, 2002*
Eric Hanson, Horticulture Dept, MSU
Jim Nugent, District Horticulturist, MSUE

Fruit trees, grapevines and blueberry bushes require a certain amount of nitrogen (N) and potassium (K) to support vegetative growth and fruit production. If the fruit are lost to frost damage, the nutrient requirements are also reduced. Here are some thoughts on fertilizing following frost damage.

The amount of nutrients that accumulate in the fruit of these crops is one estimate of how much fertilizer can be reduced if the crop is frosted out (Table 1). The N content of the fruit ranges from 8 lb per acre (blueberries) to as high

as 50 lb per acre (15 ton per acre peach crop). The K contents range from 8 to 80 lb per acre. In the event of a crop failure, fertilizer rates can be reduced by at least these amounts. Since these plants obtain only part of their nutrients from added fertilizer (the rest from soils supplies), fertilizer rates can be reduced even more in some cases.

Table 1. Nitrogen and potassium removed from fruit plantings in harvested fruit (lb per acre).

Crop	N	K	References
Apples	18-20	30-80	1,5,8
Blueberries	8	8	4,6
Cherries	18	16	9
Grapes	28	40	2,3
Peaches	50	80	7

If the fruit of apples or grapes is lost to frost, N rates can be reduced by 50 % (on lighter, sandier soils) to 100% (heavier, fertile soils) of typical applications. In cherries, peaches and blueberries where the entire crop has been lost, N rates can safely be reduced be a third on sandier soils, to as much as a half on heavier soils. Reduce rates proportionately in the case of partial crop failures.

The effect of crop loss on K requirements is difficult to estimate. Fruit are strong sinks for K, so the K demand is clearly reduced when the crop is lost to frost. Frost-damaged plantings on heavier soils likely will not benefit from K additions this year. Plantings on sandy soils with a low K reserve or where tissue analysis has indicated a need for K, may benefit from K, but will require lower rates, perhaps half of the typical application. Application of K could be discontinued this year in situations where K levels in the soil are moderate to high and an annual maintenance of K is typical.

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ACTUAL AND PREDICTED DEGREE-DAY
ACCUMULATIONS SINCE MARCH 1, 2002 (*)

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