**BORED MEETING**

A GNAWING PROBLEM
(Art Agnello, Entomology, Geneva; ama4@cornell.edu)

[Following is an updated version of our annual pre-season article on trunk boring insects.]

**Dogwood Borer**

In recent years, there has been increased concern around the Northeast about damage being caused to apple trees by borers. The species of primary concern is dogwood borer, but American plum borer can also be prevalent in western New York apple orchards, particularly those that are close to tart cherry and peach orchards. From our observations, DWB is very widespread throughout many of the Eastern as well as Western NY orchards with young plantings. While we do not have a complete picture of the effects of these borers on dwarf trees, we do know that they reduce vigor and can, in time, completely girdle and kill trees.

We have tested a number of insecticides against these borers over a number of growing seasons. Lorsban is very effective for this use and we have urged growers to take advantage of it where needed (and while it is still available). In the past, we have compared some other materials, including white latex paint and a series of alternative insecticides against Lorsban, with varying results. To make a long story short, white paint has no value as a preventive, and none of the other insecticides have really provided control comparable to one application of Lorsban. Assail is labeled for this use, but should be considered a fall-back option in the event that using Lorsban is not an acceptable option, and would probably require two applications – one between pink and mid-June, and the second before early August.

Our tests have shown that borers can be controlled season-long by applying Lorsban at one of a variety of times in the spring and summer. While a postbloom application (to the trunk only) of Lorsban is still allowed, enabling growers to spray at the peak of the dogwood borer flight, applying this material prebloom (as early as half-inch green) works well, too, and may be more convenient. Fall also may be a good time to control dogwood borer. Results from 2002 indicated that Lorsban applied postharvest the previous year (sprays went on in October 2001) controlled both the overwintering and the summer generations of dogwood borer. An October application of Lorsban similarly provided season-long control of dog...
wood borer the next season. Lorsban works when applied in the spring or fall because it infiltrates burrknot tissue and kills larvae concealed within. It is also very persistent in wood, so it continues to work for a considerable time after it is applied (apparently 9-12 months in our trials). Fall application could offer growers a more convenient alternative for applying borer control sprays. Recall that Lorsban label restrictions allow only ONE application of any chlorpyrifos product in apples, whether as a foliar or trunk spray, so these recommendations pertain only if no earlier applications have been made during the season. Bear in mind that we additionally have a mating disruption option available, Isomate-DWB, which we have found to be very effective in interfering with these insects’ pheromone communication process. Use of this product would be recommended as a tactic at mid-May to early June, before the first adult catch of the season, and in plantings with annual DWB pressure, should be considered as a valuable complement to a trunk spray program.

In a survey we conducted in the mid-1990s, we observed some relationships between borer infestation and various orchard parameters such as the proportion of trees with burrknots, proximity to stone fruit orchards and presence of mouseguards. Conventional wisdom has held that borer problems are worse where mouseguards are in place. Mouseguards can contribute to increased expression of the burrknots that borers invade, and may shield borers from predators and insecticide sprays. This has led some growers to contemplate removing mouseguards under the premise that mice are easier to control than the borers. However, results of our survey indicate that dogwood borer larvae may be found as readily in trees without mouseguards as in those with them. (American plum borer may be a different story in orchards near tart cherry or peach trees.) A number of orchards in which we have conducted borer control trials have never had mouseguards and there is no shortage of dogwood borers in them. If mouseguards are deteriorated and can no longer protect the tree, there may be some small advantage, in terms of borer control, to removing them. But, in orchards where mouseguards still provide protection against rodents, removing them for the sake of borer control is probably not worth the risk. Instead, we would recommend the use of trunk sprays to control borers. Even with mouseguards on, insecticides will give adequate control if they are applied carefully (i.e., a coarse, low-pressure, soaking spray with a handgun).

**Black Stem Borer**

The emergence in 2013 of the black stem borer (BSB, *Xylosandrus germanus*) ambrosia beetle as a cryptic but devastating pest of apple trees in our region has focused more attention on early spring insect activity that could have serious consequences for tree health as the season progresses.

In 2018, we again assessed BSB adult occurrence and distribution in several New York apple growing regions, using ethanol-baited bottle traps hung on metal garden hangers at a 1-m height, placed along the edges of orchards bordered by hedgerows and woods likely to be a source of immigrating beetles. Additional traps were located inside the orchards, adjacent to previously...
attacked trees, to verify their attractiveness. Traps were checked weekly starting at the end of April, before maximum temperatures of 68°F began to occur, and continuing until the first week of September. Traps were placed on 8 farms in Wayne Co., 5 farms in Orleans Co., 2 farms in the Hudson Valley, and 8 farms in the Champlain Valley/ Capital District.

Beetle activity began in most locations on 3-8 May in WNY and during the week of 14 May in ENY (corresponding to 63–87 and 91–157 DD (base 50°F) among trap sites in the Lake Ontario and ENY regions, respectively). The first peak flight was 24 May in Orleans Co. and 29 May in Wayne Co., and 23–28 May in the ENY locations, which had significantly lower trap numbers. An uncharacteristically similar size second flight was seen in both Orleans (19 Jul) and Wayne (2 Aug) counties last year, with peak numbers higher than those of the first flight in both locations. All the eastern NY sites recorded relatively low captures throughout the season. The first adult flight ended on 13–14 Jun statewide. The second summer flight proceeded through August, as has been observed previously, with very few beetles captured after 1 Sep. Higher numbers of beetles were routinely captured at the orchard edges than in the interiors, although appreciable numbers were taken inside the blocks at some of the most heavily populated sites.

We continued to evaluate the efficacy of trunk sprays against infestations of ambrosia beetles by setting out trials of insecticide and repellents, located on three commercial farms having documented infestations (Sodus, Huron, and Lyons). All treatments were replicated in randomized complete plots at each of the individual test sites. Potted 2-yr old trees from the nursery were placed in turn into larger pots, which were then flooded to induce stress and promote ethanol production. These potted trees were placed inside wooded areas directly adjacent to the orchard plantings, and the trunks of the potted trees were sprayed using a handgun sprayer on May 9, before the start of major BSB flight. The treatments included different topical formulations and rates of methyl salicylate (a host defense and signalling compound), alone and combined with verbenone; these were in SPLAT formulations, and applied using a caulking gun. Verbenone, a natural terpene compound found in many plants such as pine trees, is used in the control of bark beetles such as mountain pine beetle and Southern pine bark beetle. It is produced, probably as a defensive mechanism, when the number of insects in an infested tree approaches the maximum that the tree can support, and acts as repellent to other beetles. Because it has demonstrated efficacy in related groups of bark boring beetles, as well as this species, we proposed that it might offer a higher degree of prevention than using insecticide sprays alone.

Additional treatments were the Systemic Acquired Resistance (SAR) activator Actigard (acibenzolar-S-methyl) and the grower standard insecticide Lorsban (chlorpyrifos). Trunk and tree damage was assessed among the different treatments on 10 Jul, after the end of the first adult flight, and on 23 August, as the second flight was subsiding, to determine what effect these treatments had in preventing attacks by this beetle.

- Infestation holes: On the 23 Aug evaluation date, all the repellent treatments had fewer infestation sites (holes) than the Untreated checks. There was a similar trend on the earlier evaluation date, but not at statistically significant levels. On 10 Jul, Actigard had fewer holes than the Lorsban treatment.
- Gallery contents, adults: The fewest number of galleries containing adults was seen in the Actigard and all repellent treatments, especially on the 23 Aug evaluation date.
- Gallery contents, brood: No brood was present in galleries on 10 Jul. On 23 Aug, lower numbers were seen in all treatments than in the continued...
Check except Lorsban, with zero in all treatments containing methyl salicylate.

- Empty or aborted galleries: The fewest numbers were found in the combination verbenone + methyl salicylate treatments, particularly at the higher rates.

In general, all the repellent treatments had fewer infestation sites (holes) than the Untreated Checks. The combined verbenone-methyl salicylate treatments had the lowest incidences of galleries containing adults or brood; effects were more pronounced according to rate. The combination formulation was more effective than either verbenone or methyl salicylate alone. SAR inducers like Actigard prime the host for stress events by inducing the expression of host defense genes; in apples, these have been used primarily for fire blight control. Only a single application of Actigard was used in these trials, but some trends were still apparent, which suggests the possibility of increased efficacy with multiple applications. We intend to conduct further trials of this type in 2019, with a focus on more host signalling and defense compounds, as these appear to be capable of helping the trees ward off infestations by this beetle.

In the interim, although recommendations for controlling this pest are still provisional, it appears that tree health – avoiding stress to the trees – is an important factor in BSB management. Our current advice is for growers to remove and destroy any infested trees detected in a planting, to prevent new infestations in surrounding trees. Trapping and monitoring adults using ethanol lures is a useful and informative tactic, but the fact remains that ambrosia beetles are difficult to control with insecticides. Sprays must be closely timed with beetle attacks, and multiple applications may be necessary. We would advise that growers consider multiple applications against this insect - Lorsban prebloom, and following up in June with one (or two) applications of one of the labeled pyrethroid products, Warrior or Dani-tol.

We anticipate that growers considering the use of Lorsban trunk sprays against San Jose scale and/or dogwood borer at this time may also see some benefit against ambrosia beetles, particularly in trees that might be under stress from flooding or cold injury. ❖❖

STORM WARNING FUJI & ZESTAR COLLAPSE: THE "PERFECT STORM" FOR TREE STRESS AT HARVEST
(Peter Jentsch, Entomology, Highland; pjj5@cornell.edu)

In the world of fruit growing, there are few sights more disheartening for a grower than the loss of fruit just days before harvest. Whether it's hurricane winds and flooding, hail storms, tall spindle trees upended in a failed support structure from a heavy crop load, herbicide injury during drought years leading to tree decline, fireblight or borer injury, late season tree decline and fruit damage is costly.

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it may be a "perfect storm" of cause and effect, interacting together within specific varieties and rootstocks to cause severe decline over time.

During the past few seasons we've seen early and late season environmental stress affecting newly planted or young, yet well-established trees. Stress can be caused by severe rain (Hurricanes Irene and Sandy in 2011-12), seasonal droughts (2016, 2018), established virus or bacteria such as *Erwinia amylovora* (fire blight) present from the nursery, root and tree boring insects such as dogwood borer and black stem borer.

In eastern and western NY, growers are increasingly seeing the presence of BSB-infested trees with trap captures of BSB from Essex to Orange Counties.

![Fig. 2. Tree decline; leaf browning and leaf drop.](image)

In 2017, we observed two Hudson Valley orchards with severe tree decline leading to tree loss. The first was a block of Fuji on M.9 rootstock in Ulster Co. with varying degrees of rootstock, union and scion injury just above ground level up to the graft union and well into the scion wood. The second was a block of Zestar, also on M.9 rootstock in Columbia Co., that had near identical injury. Both blocks showed yellowing foliage of weakened trees with near perfect crop load, standing in contrast to the dark green of neighboring trees. Both blocks had the same herbicide active ingredient in weed management programs over the past two years.

In Fuji on M.9 we assessed 121 trees, inspecting three rows in the block and finding over 58% of the trees with varying degrees of yellowing. As we dug into the rootstock and base of the scion we found 30% of the trees had lost 100% of their bark just below and above the rootstock graft union. Only 9% of the trees in the block had complete or undamaged bark, the majority without burrknots. Evidence of dogwood borer feeding, frass and or live larva were found in 52% of the trees, while 1-mm holes, galleries and sawdust frass indicated BSB in 26% of Fuji trees. Bark loss was closely associated with the presence of both dogwood

![Fig. 3. Black stem borer (BSB), *Xylosandrus germanus*.](image)

...continued...
borer (DWB), *Synanthedon scitula* (Harris), or black stem borer (BSB), *Xylosandrus germanus*.

Aspects of this sampling showed many of these severely damaged trees had little to no live bark around the perimeter of the trunk, yet they were still completely green, and with a full crop. Over the weeks, many of these trees had transitioned from a "completely healthy appearance" to yellow, then brown, in just a matter of a few days. During mid-season, the grower had removed 73 trees across the Fuji rows in the block with increasing numbers of trees showing severe symptoms of decline as we neared harvest.

Adjacent rows with Cameo, Golden Delicious and HoneyCrisp, also on M.9, and on the same herbicide schedule, showed no signs of yellowing or decline. However, in Cameo we observed flaking bark and cracking, but no signs of cambium decline or bark separation from the wood. The Golden Delicious and Honeycrisp were without any signs of damage to the trunk, save the "normal" growth cracking and healing that comes with age.

In the Columbia Co. Zestar block, we observed pockets of decline, initially thought to be only from black stem borer. Similar herbicide schedules and active ingredients were used over the past two years, identical to the Ulster Co. Fuji block. Dogwood borer has also been a perennial problem, with live larvae present and significant DWB feeding injury found throughout the block. Bark separation from the trunk near the base of the tree of both rootstock and scion was also present.

We know that rootstocks, which produce a high number of rooting initials that appear above ground when the graft union is up, such as the M.9 rootstock, are very prone to dogwood borer infestations in the Northeast. The loss of vascular cambium tissue from DWB feeding restricts the flow of nutrients and water to the tree, causing tree stress as nutrient flow slows within the tree.

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**Fig. 4.** Cracking and peeling bark, often associated with direct trunk inflicted blow and herbicide injury.

**Fig. 5.** Cracking and peeling bark provides DWB larvae with ideal habitat for infestation.
On dwarfing rootstock orchard planting systems with considerably smaller trunk diameter and shallow rooting systems, trees are at greater risk to the impact of disease and insect pests and environmental stresses.

These symptoms all add to the larger concerns defined as Sudden Apple Decline (SAD), or Rapid Apple Decline (RAD), to which underlying causes are considered to be attributed to a complex of factors.

Our observations point to the following:

* presence of dogwood borer, predominately along the southern side of the rootstock in rooting initials or burrknots below the graft union. The rootstock above ground peeled off, revealing dead wood, fresh frass from DWB feeding, and a high percentage of regions of dying trees with live larvae present.

* the appearance of 1-mm holes into the dead wood, assessed to be that of black stem borer with fresh frass, tunneling and galleries within the heartwood.

* a defined region of canker radiating upward from the graft union on the north side of the tree. Beneath the bark of the canker was dead wood walled off by live tissue (see images below). We noted the Northwest band of bark to still be wet from the morning dew at noon. The canker on a number of the stressed and dead trees had split open. It may be that this area of moisture from dew in very dry years would have slower drying time post-herbicide application AND act to "re-wet" the region for additional uptake of herbicide having a long residual.

* herbicide strips on the two farms were impeccably clean, free of weed plants. There may be the possibility of residual herbicide injury causing cankers where overlap of high rates of spray and slow dry time causes re-wetting and re-absorption of the active ingredient. The presence of
dogwood borer wounding of the tree, exacerbated and amplified by aggressive girdling by DWB larvae seeking moisture during drought years, may provide the access of cambium absorption and uptake of herbicide into these freshly wounded sites. In years of drought, super spindle trees without adequate irrigation will undergo increasing stress that may lend conditions to increased risk of herbicide injury. This appeared to be the case in the use of Rely (glufosinate) in studies conducted by Brad Majek at Rutgers University.

His short article appeared in the Rutgers Cooperative Extension Plant and Pest Advisory. One of the photos in Brad's article looks very similar to the damage seen in many Hudson Valley apple orchards. Desiccation from herbicide exposure combined with normal water stress during hot dry periods may predispose the trunks to invasion by Botryosphaeria dothidea, a canker pathogen that is incapable of killing the cambium in healthy functioning trees, but which becomes very pathogenic in drought-stressed trees. Gramoxone can also contribute to similar trunk damage, especially on young trees (observations from Dr. David Rosenberger).
In the trial conducted by Brad Majek and Win Cowgill on June 26, 1991 using 4 herbicides using a OC-16 nozzle to one side of M-7 and M-26 trees. Herbicides were directed only to one side of the row and Glufosinate was applied at 0.84 and 1.12 kg ai/ha. They found only Glufosinate had injured the trunks, appearing as a dark sunken area where the spray contacted the bark. The cambium beneath the injured area appeared to be severely injured or killed. The injury was more severe when suckers or weeds were not present to intercept the spray and shield the trunk.

Minimizing the use of herbicides that might injure the bark and cambium layer is yet another important factor in reducing tree stress. If injury from herbicide causes restriction in the cambium layer, reducing movement in phloem and xylem cells, the tree will be unable to transport nutrients and water. This in and of itself may lead to BSB infestations.

The importance Dogwood borer management played in the collapse of these trees cannot be overstated, as wounding by boring insects may provide access to the cambium layer during herbicide applications.

Irrigation to reduce stress in newly planted trees, especially in soils that drain quickly, such as sandy loam, shale or alluvial till, is essential as the trees go into the ground. New plantings of high density fruit on well-drained soils should be under regimented irrigation shortly after planting as root systems are developing. Establishing the rooting zone, pushing the extension leader and developing fruiting wood is critical to the productivity and longevity of a high-density block.

A topic for future research will need to include the influence of DWB on the stress of young trees to produce EtOH, leading to BSB attraction and infestation. Subsequently, the fungal pathogens introduced to the tree by the adult to feed its young may contribute to cambium decline. Secondarily, does the influence of herbicide on the trunk of trees play a role in cambium decline, leading to bark death and separation where wounding by BSB and DWB occur? We hope to begin the process of answering these questions in small plots studies beginning in 2019.

The farming of apple has always been and will continue to be an immensely challenging endeavor. With the advent of highly dwarfing rootstocks, recent demands on the nursery to produce hundreds of thousands of trees for land that can support thousands of trees to the acre, has compromised tree quality. High levels of stacked or multiple strains of virus have been detected in many new plantings across the US. Root structure has been compromised and insufficient to support newly planted trees in well-drained soil during low moisture levels unless irrigation systems are employed at planting. The first eight to ten years in the life of a tall spindle system is one that requires unending attention to detail. Highly dwarfing rootstocks, especially M.9, will hound even the stoutest of growers with a ruthless and unending barrage of tree stresses that are unforgiving in rehabilitation, leading to failure if left unattended. A single weak link in these systems can lead to rapid decline of entire blocks. As we commit to growing more fruit per acre, one's tenacity and commitment to effective diligence and detail in all areas of production also needs to flourish.

### Reference

#### PEST FOCUS
Highland:
**Redbanded Leafroller, Spotted Tentiform Leafminer, and Oriental Fruit Moth**
1st catch today, 4/15
Streptomycin is a clear asset in the fire blight arsenal — it is inexpensive, effective, and reliable. But antibiotics are not always an option, and more and more, biological materials are holding their own in the fight. Over the past few years, we have seen many companies advertising an increasing number of products with claims of high levels of blossom and shoot blight control. However, biological materials are still relatively new to the apple scene, an industry with a long history of effective, high-stakes management decisions, and making changes to the management paradigm is unnerving.

There are a multitude of reasons for the growth of antibiotic alternatives. Organic production eliminated antibiotic use in 2014 in the US; in European markets, they are prohibited or severely limited, and pressure from regulatory organizations and markets to use more sustainable management techniques will not be slowing any time soon. The prevailing evidence supports that responsible streptomycin applications do not seem to select for resistance in the pathogen, yet resistance continues to appear in commercial settings.

So just what are the biological materials and how do they work? Here I'll review what biological materials are, different modes of action, and specific materials available for fire blight management. This is not an endorsement of any of the specific trade products, but rather a neutral perspective and overview of the current market.

Biologicals can disrupt these events by:

1 - Outcompeting the bacteria during colonization of the plant.

Biologicals are defined slightly differently, depending on the field. In the strictest form, a "Biological Control Agent" (BCA) is a living organism applied to suppress the pest or disease. On the other hand, "Biopesticides" are related products, defined by the EPA as "certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals" (Pal and Gardener 2011; EPA 2016).

Biopesticides come in three classes:

- Biochemical: These materials are derived from natural sources such as plant extracts or minerals. They act in a non-toxic way (i.e., mating disruption).
- Microbial: These materials have microorganisms or their products as the active ingredient.
- Plant Incorporated Protectants (PIPs): These are products produced from the host plant, as a result of genetic material that has been added to the plant. A common example is Bt toxin that has been incorporated into corn and soy plants.

To understand how biologicals can be used in fire blight management, it's first important to review the important features of the disease. Fire blight is caused by Erwinia amylovora, a bacterial pathogen that preferentially colonizes the floral surface — specifically, the stigma or the sticky part of the tip of the female organ. First, enough heat must be accumulated for this to occur, defined precisely by disease forecasting models such as MaryBlyt (Turechek and Biggs 2015). Then there must be a wetting event to wash the bacteria into the natural openings in the flower, the nectary at the base of the floral cup (unlike fungi, bacteria cannot penetrate plant cells directly).
2 - Producing antibiotic metabolites, killing the pathogen prior to infection, or
3 - Priming natural host defenses, making the plant more resistant to the bacteria. This is called 'Induced Resistance'
A simplified view of these events is depicted in Fig. 1.

Much like antibiotics, these materials require precise applications, to ensure they are in the right place at the right time to provide effective control (Fig. 2). Materials with competitive action or antimicrobial metabolites must be applied when the bacteria is present or just before. This enables sufficient, timely colonization or interaction with the pathogen. Induced resistance materials, also called Systemic Acquired Resistance or Induced Systemic Resistance materials (SARs or ISRs), must obviously be applied prior to infection events, with enough time to activate the host.

What products are currently available and where do they fit in? Competitive products include both bacteria and fungi. The most well-known examples include: Pantoea agglomerans, a bacterium closely related to the fire blight bacterium and an excellent colonizer of apple flowers, marketed as Bloomtime Biological (Northwest Agricultural Products), and the yeast Aureobasidium pullulans, marketed as Blossom Protect (Westbridge Agricultural Products). The bacterium Pseudomonas fluorescens is also an effective competitor, marketed as BlightBan (NuFarm). Materials with

Figure 1. Depiction of fire blight blossom infection and how biological materials interfere. (A) In order for a blossom infection to occur, flowers must be open and receptive, heat accumulation must be sufficient for E. amylovora to colonize the stigma (red circle), and there must be a wetting event (blue arrow) to wash the bacteria into the floral nectary. (B) Biological materials protect against infections by outcompeting the pathogen or producing antibiotic metabolites (green ‘x’) or priming host defenses (red block).

Figure 2. Approximate timing of biological materials corresponding to phenological stages of apple for blossom and shoot blight protection.
antimicrobial activity are most often Bacillus species, most commonly strains of B. amylo-
liquefaciens and B. subtilis. Currently on the market are Serenade Optimum (Bayer), Double
Nickel (Certis), and Seriel (BASF).

Products that stimulate Induced Resistance response in the host plant work by stimulating two possible pathways – ISR and SAR, as mentioned earlier. These pathways are related and overlapping in the plant, and science is still detangling the complex molecular mechanisms involved in plant protection. The products include Regalia, an extract of the plant Reynoutria sachaliensis or giant knotweed (Marrone Bio Innovations) and Bacillus mycoides strain marketed as LifeGard (Certis). Another common product used in induced defense is acibenzolar-S-methyl, a synthetically derived product marketed as Actigard (Syngenta). Many of these products have been recommended as part of an integrative management strategy outlined in an extensive report from the The Organic Center, based on results from both research trials and anecdotal experience (Ostenson and Granatstein 2013).

To learn more about biological controls for plant pathogens, there are excellent articles on the EPA website (EPA 2016) and at the American Pathological Society of America website (Pal and Gardener 2011).

Sources
Pal, K., and Gardener, B. 2011. Biological Control of Plant Pathogens. The Plant Health Instructor, APS. Available at: https://www.apsnet.org/edcenter/advanced/topics/Pages/BiologicalControl.aspx.

Weekly Apple Scab Update for NY (4/15 to 4/20/19)

Below are apple scab predictions for NY apple regions based on the NEWA disease forecast system (http://newa.cornell.edu/index.php?page=apple_disease). Information is kept concise. Alerts will also be posted to Twitter @FruitPathology with updates occurring throughout the week, which would allow notifications to send to mobile device. The various outputs are explained below table.

<table>
<thead>
<tr>
<th>Hudson Valley</th>
<th>Wayne</th>
<th>Niagara</th>
<th>Champlain Valley</th>
<th>Finger Lakes</th>
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<tbody>
<tr>
<td>Maturity</td>
<td>18%</td>
<td>5%</td>
<td>3%</td>
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</tr>
<tr>
<td>Discharge</td>
<td>4%</td>
<td>3%</td>
<td>&lt;1%</td>
<td>-</td>
</tr>
<tr>
<td>Recommendation</td>
<td>Monitor your specific cultivars for green tip. Apply your copper green tip application before the rain event, if possible. Overall threat of infection is fairly low.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Predictions are regional; the model works best under local conditions. Always check weather and crop stage before making a management decision.

Infection predicted:
- “Low”: <10% ascospores discharged; “Moderate”: 10-20% ascospores; “High”: >20% ascospores discharged; “None” – no infection predicted for the week;
- “Date”: An infection event is predicted for the date listed. If a multi-day infection event is predicted, the first full date of the infection will be listed

Ascospore maturity: The ascospore maturity during the predicted infection event. If no infection event is predicted, the maturity by the end of the week is listed.

Discharge: The percent ascospore discharge during the predicted infection event(s). If no infection event is predicted, the cumulative ascospore discharge by the end of the week is listed.
### UPCOMING PEST EVENTS

| Current DD* accumulations (Geneva 1/1–4/15): | 112.0 | 43.7 |
| (Geneva 1/1–4/15/2018): | 73.8 | 24.1 |
| (Geneva "Normal"): | 133.3 | 56.7 |
| (Geneva 1/1-4/22, predicted): | 186.6 | 81.8 |
| (Highland 1/1–4/15): | 196.4 | 88.6 |

**Coming Events:**

<table>
<thead>
<tr>
<th>Ranges (Normal ±StDev):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green apple aphids present</td>
</tr>
<tr>
<td>Green fruitworm peak flight</td>
</tr>
<tr>
<td>Obliquebanded leafroller larvae active</td>
</tr>
<tr>
<td>Pear psylla 1st egg hatch</td>
</tr>
<tr>
<td>Pear thrips in pear buds</td>
</tr>
<tr>
<td>Rosy apple aphid nymphs present</td>
</tr>
<tr>
<td>Redbanded leafroller 1st catch</td>
</tr>
<tr>
<td>Spotted tentiform leafminer 1st catch</td>
</tr>
<tr>
<td>McIntosh half-inch green</td>
</tr>
</tbody>
</table>

*all DDs Baskerville-Emin, B.E.

### INSECT TRAP CATCHES

<table>
<thead>
<tr>
<th>Number/Trap/Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geneva, NY</td>
</tr>
<tr>
<td>Highland, NY</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Green fruitworm</th>
<th>Green fruitworm</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/8</td>
<td>4/12</td>
</tr>
<tr>
<td>4/15</td>
<td>4/1</td>
</tr>
<tr>
<td>7.0</td>
<td>1.0*</td>
</tr>
<tr>
<td>7.5</td>
<td>11.0</td>
</tr>
<tr>
<td>5.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Redbanded leafroller</th>
<th>Redbanded leafroller</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/8</td>
<td>4/1</td>
</tr>
<tr>
<td>0.0</td>
<td>1.5</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.0</td>
<td>40.5*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spotted tentiform leafminer</th>
<th>Oriental fruit moth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/8</td>
<td>4/15</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>0.0</td>
<td>0.5*</td>
</tr>
</tbody>
</table>

* first catch

### PHENOLOGIES

**Geneva:**

- **Apple**
  - (McIntosh, Red Delicious): green tip
  - (Empire, Idared): green tip
- **Pear** (Bartlett, Bosc): early bud burst
- **Sweet Cherry, Tart Cherry**, **Peach, Plum, Apricot:** early bud burst

**Highland:**

- **Apple**
  - (McIntosh): 55% half-inch green
  - (Ginger Gold): 54% tight cluster
- **Pear** (Red Delicious): 54% half-inch green
- **Smoothie:** 56% tight cluster

**NOTE:** Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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