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Update on Pest Management and Crop Development
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COMING EVENTS

	43°F	50°F
Current DD accumulations		
(Geneva 1/1-4/7):	30	6
(Geneva 1/1-4/7/2013):	44	10
(Geneva "Normal"):	109	43
(Highland 1/1-4/7/14):	70	18

Upcoming Pest Events – Ranges (Normal +/- Std Dev):		
Green fruitworm 1st catch	52-152	11-71
Pear psylla adults active	31-99	8-34
Pear psylla 1st oviposition	40-126	11-53

Pest Focus
Highland: Pear Psylla egg laying has begun (4/7).
Green Fruitworm 1st catch 4/4.

[Section: HORTICULTURE]

PREDICTING GREEN TIP IN 2014
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[Box text: SEEING GREEN]

A Review of Dormancy and Winter Bud Development

The physiology of trees during dormancy is highly complex. A simplified explanation of what we understand is as follows.

1. In late summer, growth inhibitors (natural chemicals) build up in fruit buds, which prevent them from growing, even though temperatures are favorable. This is to prepare the tree for winter and is called summer dormancy. This type of dormancy is the reason we can summer prune in the month of August and not cause regrowth of the shoots, whereas such summer pruning in June will cause shoot regrowth.

2. As trees experience cold but non-freezing temperatures in the fall and winter, the level of inhibitors in the buds gradually declines. When inhibitor levels are high, buds will not begin to grow even if warm temperatures are experienced. This is termed "rest". At some point in the winter, when enough cold temperatures have been experienced, the level of inhibitors is lowered enough in the buds that

they will begin to grow if warm temperatures are experienced. This point is called "rest completion".

3. The internal physiological events associated with rest completion are still unclear, but the progression from summer dormancy to rest completion has been modeled using accumulated cold temperatures. A temperature accumulation unit termed "a chill unit" was developed, which is defined as 1 hour at the optimum temperature for chilling (45°F). Experimental data has shown that temperatures in a 15-degree band above and below 45 have a positive effect on chilling and contribute a partial chill unit for each hour of such temperatures. In contrast, temperatures above 65°F have a negative effect on chilling and subtract a partial or whole chill unit from the total. Experimental data has also shown that many apple varieties require 1000 to 1200 chill units to reach rest completion. To predict when enough chill units have been accumulated for rest completion, chill units are summed beginning at the onset of summer dormancy in late July. Hourly temperatures are assigned either a positive, negative or fraction of a chill unit. Usually the warm temperatures in August and early September result in a negative chill unit accumulation which does not help end rest. However, with the arrival of cool temperatures in late

September and early October, positive chill units are usually accumulated. Once positive chill units begin to accumulate, a running total is calculated from that point forward and the end of rest is predicted when 1200 chill units have been accumulated. In New York, this usually occurs in late December or early January.

4. Once rest is completed, buds can respond to temperatures greater than 40°F. However, a significant accumulation of warm temperatures (above 40°F) is required before visible bud development can be seen, although non-visible development inside the closed bud is occurring with each hour of warm temperature. This process is termed heat unit accumulation and the units used to measure it are growing degree hours. Experimental data has shown that about 2500 growing degree hours (base 40°F) are required from the end of rest completion until green tip. In most winters in NY, the cold temperatures of Jan., Feb. and early March limit heat unit accumulation so that, even though rest has been completed in late December or early January, buds do not begin to develop until warmer temperatures arrive in late March and April.

Chill Unit and Heat Unit Accumulation During the Winter of 2013/2014

We used the chill unit model developed in North Carolina, which is an improved version of the original chill unit model from Utah, to estimate when chill units began to be accumulated in Western NY. Data from Wayne County (Williamson) showed that the fall of 2013 was quite normal, with chill unit accumulation beginning in mid-Sept. (~Sept. 13) and proceeding with normal chill unit accumulation until late November, when a colder than normal winter began. The very cold winter (many days with below freezing highs) slowed the accumulation of chill units in late November and December, so that by the end of December we had only accumulated 926 chill units of the 1200 needed. In most years, by January 1 we have accumulated the required 1200 units. The very cold January and February of 2014 essentially stopped chill unit accumulation from Jan. 15 to Feb. 15. Our estimates of chill unit accumulation in WNY did not reach 1200 units until March 19. It should be noted that low chill varieties of stone fruits, which require less than 1200 chill units, probably completed rest by about January 1.

Following the completion of rest, fruit trees respond to warm temperatures (accumulating heat units) with non-visible bud development leading toward bud break. The models we use to estimate the date of rest

completion are imperfect. It seems unlikely that apple trees in WNY did not complete rest until March 19. Thus for the purposes of accumulating heat units to predict bud break, we decided to assume they probably were close to completing rest by mid-January, when the month-long cold spell arrived. When starting the heat unit accumulation "clock" in early January, the weather data shows there was very little heat unit accumulation in January and February, thus it really doesn't matter if we start the clock in January or in early March, when the rest completion model indicates rest was complete.

Calculations of growing degree hours in Western NY (Williamson) since early January show that trees have accumulated only 658 growing degree hours by April 7th, of the 2500 hours needed for green tip. (Recall that in 2012, we reached the 2500 hour level by March 22, and in 2013 we reached that level on April 18). This year, we currently have only about 26% of the 2500 total hours needed to reach green tip. This indicates we need significantly more heat units before we reach green tip of apple.

Forecasting Bud Break in the Spring of 2014

Using forecasts for the next 10 days (until April 17), it appears we will rapidly accumulate growing degree

hours (820 new growing degree hours between April 7 and April 17), for a total of 1478 GDH by April 17. This will still be 1000 GDH short of what we need to reach green tip. We can accumulate that amount in a warm week; however, the forecast is for continued cool weather. However, we don't have confidence in weather forecasts longer than 10 days, thus we have not calculated a predicted date to reach 2500 GDH, but it is likely to be 7–10 days after April 17. If green tip in WNY is around April 24 or later, this will allow growers 3 more weeks to finish up winter pruning and get spraying equipment ready.

[Section: INSECTS]

EARLY MANAGEMENT OF PEAR PSYLLA
(Peter Jentsch, Entomology, Highland;
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[Box text: JUST PSILLY]

At the Hudson Valley Research Lab in Highland, NY, it appears green tip is still a few days off. As of our Monday observations (April 7th) of 100 buds on Bartlett, we have observed adults flying and 4 eggs tucked into bud scales of a single bud. So what's the rush? And what's to be gained from early season

management of pear psylla during the early stage of the season?

To start, the pear psylla, *Cacopsylla pyricola*, is a tenacious adversary, causing yearly economic loss to European pear varieties by way of fruit russet, pear decline and "Psylla Shock", a toxic response to psylla feeding. At high densities, pear psylla causes tree stunting, premature leaf drop, reduced fruit size, and premature fruit drop, resulting in substantial losses in yield. Tree decline and often death of sensitive pear varieties such as Bosc can occur if left unmanaged. The deposit of "honeydew" or the shunting of excess sugars from the psylla nymph onto the leaf and fruit, acts as the substrate for sooty mold development, causing leaf scorch and russetting of fruit at harvest. Nymph and adult movement throughout the canopy can increase the spread of *Fabraea maculata* spores, increasing infection that may increase fruit infection and early leaf drop.

In the overwintering stage, the adult lingers about the orchard and woodland edge from fall, through the winter into spring. Adults are often seen in flight during the warm hours of the day, with increasing movement of woodland adults into the orchard over the next few

weeks. After mating, females begin to produce the first of three to four generations, beginning with egg laying and nymph hatch from late March through June. When scouting for early egg laying, focus on the terminal end of the fruiting branches using magnification along the basal plates of buds.

Strategies to manage pear psylla include prebloom applications of ovipositional deterrents, ovicides and insecticides aimed at the adult and nymph populations. Early management should begin upon the first appearance of the eggs, which will likely occur this week. To delay the insect from laying eggs, Surround WP or oil, both acting as a barrier film, can be used. Either of these products will reduce egg laying by adult pear psylla. Delaying oviposition of the adults buys time for a greater number of overwintering psylla to enter the orchard from the hedgerows and woodland for a later adulticide application.

The economics in management options is a driver in decision-making. Surround WP is most effective at the highest labeled rate of 50 lbs/A (roughly $1.00 per pound), costing about $50.00/A. Two to three applications during the prebloom and petal fall period have shown to be a viable approach to early psylla

management. Head to head, a single application of 50 lb/A Surround worked equally as well as a single 2% application of Damoil in reducing oviposition over time, yet performed better in reducing nymph presence in foliage assessments. The stratification or layering of the kaolin clay, the active ingredient of Surround, builds on the limbs to maintain the product on the tree. Early season applications through to petal fall have the additional benefit of controlling plum curculio, along with reducing egg laying from the 1st generation of psylla adults. Surround has not been shown to actually be toxic to the insect, and as such, is an important tool for use in resistant management strategies for this insect. The 2012 Scaffolds article addressing early Surround WP followed by 1% oil strategy in can be found here (http://www.scaffolds.entomology.cornell.edu/2012/SCAFFOLDS 3-26-12.pdf).

The advantages of using oil to control this insect are many. Oil is still a relatively inexpensive material for which no mechanism has been found for the insect to develop resistance. It provides a degree of egg laying deterrence to treated buds and wood lasting a week or two, depending on rates and weathering. Higher rates would be applied at the dormant stage this week, using

one spray of 3% oil, or two of 2% to green cluster. This rate will also reduce overwintering populations of San Jose scale, European red mite, pear leaf blister mite, and Comstock mealybug. If you begin at swollen bud, one spray at 2% or two at 1% up to white bud would suffice. Contacting the adult with oil droplets will cause mortality, while applications over the top of the egg will reduce adhesion, often causing them to dislodge from the tree. Oil applied prior to oviposition acts to delay and synchronize egg laying later in the season, producing a more concentrated nymphal emergence period that enables management using a single insecticide application. One negative observable impact of oil applications has been enlarged lenticels on developing stems, which may have an impact on plant respiration.

Ovicides can also be employed to kill the eggs prior to hatch. The use of Esteem and Centaur work as insect growth regulators (IGRs) to inhibit development of various life stages. Esteem 35WP, used prebloom to kill the egg stage of psylla and reduce the viability of eggs laid by a treated adult, should be applied prior to sustained egg laying, together with 0.25% v/v horticultural spray oil. Esteem may be applied once at prebloom at 16 fl oz/A, or once at prebloom and once

at petal fall at 13–16 fl oz/A, as a tactic for both psylla reduction and as a resistance management strategy. Remember, its mode of action is as an ovicide, so it will not reduce the adult or nymph population directly. It is most effective if the material is on the wood or foliage prior to the eggs being deposited.

Using an ovipositional deterrent is a prerequisite for at least two follow-up strategies. One option, after oil, is an adulticide to kill the adults after they have completed migration into pear orchards, and before significant eggs have been laid. Adulticides would be employed this season from mid- to late April to significantly reduce the adult population. The choices for managing adult psylla include older chemistries such as the neonicotinoids Actara 25WDG at 5.5 oz/A and Assail 30SG at 4.0–8.0 oz/A, and the pyrethroids Ambush 25WP at 12.8–25.6 oz/A; Asana XL 0.66EC at 2.0–5.8 oz/100 gal; Pounce 25WP at 12.8–25.6 oz/A; or Warrior II 2.08CS at 1.28-2.56 fl oz/A.

Cool weather provides conditions optimal for the use of pyrethroids. However, the use of these insecticides over the past 20 years has decreased pear psylla susceptibility to the pyrethroids such as Asana (esfenvalerate) and Warrior (Lambda-cyhalothrin). The

use of Incite (Loveland Industries), a piperonyl butoxide synergist, applied preferably 4–6 hours prior to the pyrethroid application, or in a tank mix, will increase the performance of the pyrethroid. The PBO acts to reduce insect detoxification, allowing it to reach its intended target site within the insect.

[Section: GENERAL INFO]

EVENT ANNOUNCEMENTS
[Box text: HOW LONG?]

REISSIG RETIREMENT PARTY - MAY 17

Harvey Reissig has recently retired after 40 years as a Fruit Entomologist at Cornell's NYS Agricultural Experiment Station in Geneva. Those of us who work with tree fruit insects have come to regard Harvey as one of the gurus of the field, someone who is not only aware of all of the complex interactions taking place in the orchard, but who can keep a handle on the practical aspects of what the insects are doing out there. During his time at Cornell, Harvey mentored and collaborated with a long line of colleagues, students, visiting scientists, fruit industry leaders & insiders and the general public. We cordially invite you to join us in

celebrating his retirement, along with that of his wife, Nancy, who has been an Administrative Assistant in the Entomology Dept. for 23 years, by attending a dinner at Geneva Country Club on Saturday, May 17, 2014.

The buffet menu includes Pasta with Tomato Sauce, Mixed Vegetable Medley, Eggplant Parmesan, Rice Pilaf, Broiled Haddock with Butter Crumb Topping, and Baked Chicken; Finger Lakes wines will be donated by area wineries; cash bar available. Cost per person: $30.00 (checks only, payable to "Cornell University"). For registration and payment, please respond to Kate VanHouter (kev35@cornell.edu; tel: 315-787-2331), NYSAES, Dept. of PPPMB, 630 W. North Street, Geneva, NY 14456. Registration & payment deadline: May 2.

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