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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 1/1-6/13):	1045	653
(Geneva 1/1-6/13/2010):	1201	753
(Geneva "Normal"):	957	564
(Geneva 1/1-6/20 Predicted):	1203	753
(Highland 1/1-6/13):	1168	730

Coming Events – Ranges (Normal +/- Std Dev):		
Codling moth 1st flight peak	574-1008	313-597
OBLR 1st flight peak	843-1139	491-707
OBLR summer larvae hatch	1038-1460	625-957
OFM 1st flight subsides	841-1127	490-700
Pandemis leafroller 1st flight peak	870-1182	496-722
Peachtree borer 1st catch	789-1353	451-835
Pear psylla 2nd brood hatch	967-1185	584-750
San Jose scale 1st flight subsides	851-1233	506-764
San Jose scale crawlers present	1033-1215	619-757
STLM 2nd flight starts	986-1154	585-719

TRAP CATCHES (Number/trap/day)

Geneva	6/2	6/6	6/9	6/13
Redbanded Leafroller	0.3	0.3	0.2	0.0
Spotted Tentiform Leafminer	0.4	0.0	0.0	0.1
San Jose scale	5.0	2.9	1.3	1.5
Oriental Fruit Moth	0.1	0.0	0.2	0.3
Lesser Peachtree Borer	0.7	0.0	0.0	0.0
American Plum Borer	0.3	0.4	0.5	0.4
Pandemis Leafroller	-	0.1*	0.2	0.0
Obliquebanded Leafroller	-	0.0	0.0	0.1*

Sodus Center (Wayne Co.)	5/31	6/3	6/7	6/10
Oriental Fruit Moth	3.0	1.0	0.5	0.5
Lesser Appleworm	2.0	1.0	3.0	3.5
Codling Moth	16.0	4.5	0.5	5.0

Highland (Peter Jentsch)	5/23	5/31	6/6	6/13
Redbanded Leafroller	1.3	0.5	0.0	0.0
Spotted Tentiform Leafminer	2.4	2.5	10.6	49.0
Oriental Fruit Moth	6.2	4.4	1.4	0.5
Lesser Appleworm	0.4	0.3	0.1	1.6
Codling Moth	1.9	6.1	3.9	7.1
Obliquebanded Leafroller	-	0.0	0.2	13.3

* = 1st catch

PEST FOCUS

Geneva: Obliquebanded Leafroller 1st trap catch today, 6/13

Wayne Co: Obliquebanded Leafroller 1st trap catch 6/7

Highland: San Jose Scale DD model predicts June 1 for the onset of applications to control emerging crawlers. Development delayed this season with crawlers predicted to emerge within the next week.

1st Obliquebanded Leafroller trap catch 6/1. We have accumulated 299 DD50 since then; predicted emergence should begin 17 June.

ORCHARD RADAR DIGEST

[Box Text: SHIFT INTO SECOND]

[M = Marlboro, Ulster Co.; G = Geneva]

Roundheaded Appletree Borer

RAB egglaying begins: June 7 [G]. Peak egglaying period roughly: June 17 to July 2 [M]/June 25 to July 10 [G].

First RAB eggs hatch roughly: June 14 [M]/June 22 [G].

Dogwood Borer

First DWB egg hatch roughly: June 19 [M]/June 28 [G]

Codling Moth

1st generation CM development as of June 13: 1st gen adult emergence at 93% [M]/77% [G] and 1st gen egg hatch at 58% [M]/25% [G].

Obliquebanded Leafroller

1st generation OBLR flight, first trap catch expected: June 1 [M]/June 10 [G].

Where waiting to sample late instar OBLR larvae is not an option (= where OBLR is known to be a problem, and will be managed with an insecticide against young larvae) – Early egg hatch and optimum date for initial application of an effective insecticide: June 17 [M]/June 26 [G].

Oriental Fruit Moth

2nd generation OFM flight begins around: June 22 [M]/June 30 [G].

San Jose Scale

1st generation SJS crawlers appear: June 9 [M]/June 19 [G].

Spotted Tentiform Leafminer

2nd STLM flight begins around: June 8 [M]/June 17 [G].

[Section: INSECTS]

JUNE RECONNOITER
(Art Agnello, Entomology, Geneva)
[Box Text: JUNE BUGS]

Here's hoping we're past the random cold-blast and heat-cooker fronts that have been traipsing through the region over the past few weeks, and that more seasonal temperatures will serve to re-order many of the out-of-sync insect populations and put them onto a somewhat more predictable time schedule now that we're heading into early summer. This is generally about the time that pest events around the state begin to align a little more closely.

Firstly, plum curculio, which for a while looked to be heading for a long career, is by now nearly finished progressing through its orchard-immigration and egg-laying activity, as most of the latest sites in western NY and the Champlain Valley should reach the 308 DD post-PF flag this week corresponding to an end of the need to protect the fruit from oviposition.

Internal leps are still a bit variable in their management windows. Codling moths established distinctly different biofixes around the state this season, from about May 16 in the Hudson Valley, to either May 23 or May 30 (or even later) in western NY. We hit the target spray window of 250 DD 50°F over a week ago in the Hudson Valley and the Capital District, and towards the end of last week in those WNY sites with a May 23 biofix (these latter ones are now somewhere between 290-350 DD). For those sites with a May 30 biofix, the DD totals are more like 225-255 today, indicating anytime over the next few days as an advisable spray window in orchards where growers are using only insecticides for control of high populations of CM, or are in the first season of using mating disruption.

Those growers who have been using mating disruption for 2–3 years, or have low pressure sites in general, can wait until we hit 350 DD (65% of egg hatch occurs by this time). Under conditions of low pressure this will provide adequate control as it did in the good old days when CM populations were not as bad. Timing the first spray will depend on which chemistry you plan to use and the pressure on your farm. For those who used Rimon at petal fall, you will still need to follow up with another spray (of something else, as Rimon is restricted to one application in NY) between the 250–350 DD mark after biofix. Intrepid or neonicotinoids, including Calypso and Assail, should have been applied at peak egg-laying and prior to egg hatch at 150–220 DD; granulosis virus such as Cyd-X, Virosoft, or Carpovirusine, at first generation egg hatch, 220–250 DD; Delegate, Belt or Altacor at first egg hatch, 220–250 DD. The older chemistries such as pyrethroids and OPs should be applied at first egg hatch, 220–250 DD. Pyrethroids have not worked for control of CM in some orchards, so if you have a history of this experience, it would be best to rely on other insecticide classes. If using pyrethroids, do not stretch the intervals to 14 days during these critical egg hatch periods.

Oriental fruit moth trap counts are beginning to subside by now, but the next flight will likely begin by next week (Hudson Valley) or two (Western NY). If you plan to use mating disruption primarily for OFM, mid- to late June would be a good application timing in peaches and apples. The second flight is usually not as heavy as the first generation, but it will contribute to the population that can haunt you in September. Lesser appleworm moths are flying now, and mating disruption for OFM will also disrupt LAW, and insecticides timed for CM will control LAW.

What about obliquebanded leafroller? We hung traps on June 3 in Wayne Co. and caught them in nearly every one by June 7. In scouting forays during bloom, we found a certain amount of damage, but not terribly high levels of overwintered larval infestations, so the population doesn't appear to have been overly high (not that this will diminish the need to attend to them during the next brood). So the biofix is set for the OBLR timing model at June 7 across the WNY region. The recommended treatment time in high pressure orchards is at first egg hatch, which occurs around 350 DD base 43°F (normally around June 20 in Geneva, a bit later in the Lake Ontario sites; we'll keep you updated). Orchards that have low OBLR pressure can wait until about 600 DD, when scouting will show if populations are an issue.

Other arthropods of note include aphids and mites, although very few have been noted yet according to the reports of people looking for them; these should be showing their beady little eyes soon given a little heat. Some foliar inspection for green peach and black cherry aphids in stone fruit blocks would be advised. When you get a chance, please take a moment to have a look for all these up-and-comers, so that you won't be surprised when they start doing what comes naturally.

[Section: GENERAL INFO]

DEGREE DAY DELIBERATIONS
(Juliet Carroll, NYS IPM Program, Geneva)
[Box Text: HOT STUFF]

Several inquiries regarding degree days have surfaced as NEWA newa.cornell.edu use has increased. Degree days (DD) are, essentially, a mathematical way to calculate the accumulation of heating units over time. (Cooling units; i.e., chilling hours, can also be calculated, though this is not currently programmed into NEWA.) A brief description of DDs is available from the University of Illinois at http://ipm.illinois.edu/degreedays/calculation.html.

Keep in mind...

- NEWA serves many agricultural and horticultural commodities.
- There are several formulas that can be used to calculate degree days.
- Max and Min temperatures are collected during a 'defined' 24-hour period.

Because DDs are a way of expressing heating units, entomologists, plant pathologists, horticulturalists, and agronomists have utilized DD calculations to model the development (phenology) of arthropod pests, plant diseases, plants, crops, and weeds. For instance, we know that the best fit for explaining the development of ascospores of the apple scab fungus is using degree days calculated with a low cutoff temperature of 32°F. We also know that codling moth development does not progress below 50°F. This is also the case for most plants, thus DDs calculated with a base temperature (or low cutoff) of 50°F are commonly referred to as growing degree days, or GDD.

NEWA serves many agricultural and horticultural commodities

Several crop, pest, and disease phenology models are programmed into NEWA. Some rely solely on DD tables, some display results directly (DD accumulations are not apparent to the user), and some provide DD windows when IPM decisions and interventions are needed (hanging traps, spray windows, etc.)

Degree Days (DD) calculated in NEWA at
http://newa.cornell.edu/index.php?page=degree-days

and their application to plant and pest phenology models.

Base Temperature	**Use(s)**
4°C	cabbage maggot
32°F	apple scab
40°F	onion maggot
43°F	obliquebanded leafroller, spotted tentiform leafminer
45°F	oriental fruit moth
47.14°F	grape berry moth
48°F	alfalfa weevil
50°F	growing degree days (GDD), codling moth, plum curculio, apple maggot, San Jose scale
55°F	fire blight shoot blight symptom development
86/50°F	European corn borer (86°F high cutoff, 50°F base temperature)

Implementation of these models is guided by research and extension faculty at Cornell University, as well as extension educators in Cornell Cooperative Extension. NEWA also provides a platform for stakeholder input to improve model performance and webpage results. For example, if you are looking at the "Results" pages generated by the Apple Insect Models on NEWA, those screens are generated by accumulating temperature data for the location of interest, generating a DD value (using Baskerville-Emin calculations, see below), and then comparing that total against a lookup table of DD ranges and corresponding text messages that are used to populate the Pest Status, Pest Development, and Pest Management boxes on the screen.

There are several formulas that can be used to calculate degree days

In NEWA, historically, the simple Max-Min formula is what has been used for DD calculations. This formula can readily be calculated by hand and was also included in many of the Cornell Pest Management Guidelines. The Baskerville-Emin (BE) formula uses a sine wave algorithm and results in more precise DD calculations. This formula was implemented in NEWA in ~2006.

We chose to place the simple DD formula choices at the top of the drop down selection list on the NEWA Degree Day Data webpage http://newa.cornell.edu/index.php?page=degree-days to reduce confusion among our long-time NEWA users. Those choices that use the BE DD formula are noted as "BE" in the name.

Currently, in all the NEWA apple disease and apple insect phenology models that utilize DD accumulations, the BE formula is being used. Kerik Cox and Art Agnello have chosen to use BE DDs because of their higher precision. Furthermore, BE DDs have been used in the entomology field observations in Geneva, NY, for the past 15 years or more.

If you are comparing the Scaffolds "Upcoming Pest Events" tabulated DDs with what is tabulated for Geneva in NEWA, make sure you compare these with the BE DDs to get the best match. "Best match" because, having used two calculators to crunch an involved equation and come up with two answers that don't *exactly match*, it is true that software programs can differ slightly in the way they handle rounding of decimal places, etc., which can create some slop in the mathematical answer.

Max and Min temperatures are collected during a 'defined' 24-hour period

Another area that introduces variability in DD accumulations is how the 24-hour period is defined. For some, the 24-hour day begins at midnight, for some it ends at midnight. That is, in some systems midnight is 0:00, in some it is 24:00. In NEWA, midnight marks the beginning of the day and is tabulated as 0:00 in the Hourly Data pages. NEWA's 24-hour period runs from 12:00 AM (= 0:00) until 11:59 PM. Data is collected for NEWA's database at the top of the hour. Therefore, some NEWA weather stations may miss the true Max and true Min temperature for a given day, because it might have occurred at 2:16 PM. Another source of variability! NEWA's new weather stations with the IP100 ethernet interface, described at http://newa.cornell.edu/index.php?page=get-weather-station, will be programmed to collect the true daily Max and Min values.

Enter daylight savings time when, essentially, an hour is lost and then gained in the annual time continuum. NEWA will soon begin utilizing the same methodology as the National Weather Service (NWS) for dealing with this 23-hour-long day and 25-hour-long day during the year.

The NWS has Weather Observer sites reporting daily Max and Min temperatures. These sites collect data, once per day, at specified times that can affect DD value calculations. Consider the time when you look at the values from your Max-Min thermometer and then clear them. If you look at these first thing in the morning and invariably at 5:00 AM, then you are collecting a true 24-hour Max and Min temperature for the period 6:00 AM until 5:00 AM the following day. If you collect this data in the afternoon, the 24-hour period range would be different. Over time, climatologists have found that "afternoon" observations typically accumulate more DDs than "morning" ones.

The bottom line

When comparing DD data, keep in mind the sources of variability in DD accumulations. And don't sweat the discrepancies you find too much; like they say, you can measure it with a micrometer, but what's the sense if you have to cut it out with a hatchet? Nothing is better than looking outside and seeing if you have green tip or counting the insects in your traps. We certainly don't expect an adult codling moth to pop out on the dot at 489 DD (b43) from Jan 1, or plum curculio to stop immigrating into the orchard at 308 DD (b50) from petal fall; there are simply too many sources of variability (e.g., in whose data one is using, how it was collected, in how representative a site, and at what point in time, etc.) to make this level of tracking practical.

NEWA provides theoretical predictions and forecasts. *The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest presence, and disease occurrence determined through scouting or insect pheromone traps.*

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