# scaffolds FRUIT JOURNAL

Update on Pest Management and Crop Development

September 2, 2008 VOLUME 17, No. 24 Geneva, NY


INSECTS

## OFF SCREEN

ORCHARD RADAR DIGEST

Geneva Predictions:

**Codling Moth**

Codling moth development as of September 2: 2nd generation adult emergence at 98% and 2nd generation egg hatch at 85%.

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## REAR VIEW MIRROR

2008 FRUIT ARTHROPOD PEST REVIEW (Art Agnello, Entomology, Geneva)

❖❖ This has been a challenging season for growers, mainly because of the repeated hail events (which were unprecedented) and the alternating hot & cold spells (which weren't). This translated into more concerns about potential disease consequences than arthropod-related ones, but things were not altogether boring when it came to the insect situation. In general, there were no significant crises stemming from unanticipated or unattended insect or mite infestations, which is a trend we're happy to see continue for the forseeable future.

The spring started out rather cooler than "normal" (as defined by the long-term average), until we reached the 3rd week in April, when temperatures reached into the 70s and 80s for more than 10 days. By month's end, we were considerably ahead of normal DD accumulations, and many sites recorded their earliest **oriental fruit moth** biofix in recent memory (April 24 in Geneva). Macs in many orchards were at full pink bud well before May 1, and in bloom before May 5. The warm weather prompted early **plum curculio** and **European apple sawfly** activity, which were in the orchard waiting for fruits to attack days ahead of their developing. By mid-May, a cooling trend settled in, which slowed up the varietal bloom progression, so orchards could be found at anywhere from pink to petal fall around the state. Things moderated through the remainder of May during the fruit set period, bringing the heat unit accumulation back down below normal.

Early in June, a hot spell sent temperatures into the 80s and 90s for over a week, which

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finished off plum curculio egg-laying activities, brought out **obliquebanded leafroller** right on schedule, and initiated some **codling moth** emergence. On June 16, the first and most damaging of the season's dozen or so hail strikes traversed the state's fruit regions, throwing everyone's plans into disarray. By the second half of the month, obliquebanded leafroller populations were notable by their scarcity, and summer **aphids** were beginning to build.

**Apple maggot** emerged just ahead of schedule at the end of June, and, aided by more than adequate moisture from regular rain showers, built to some impressive numbers through July and much of August around the state. Another brief hot spell the week after July 4 raised the prospects of **European red mite** outbreaks, which never really materialized. The most problematic insect of the remainder of the summer seemed to be **Japanese beetle**, which continued emerging until mid-August. **Internal leps** such as codling moth and OFM were trapped at relatively high numbers in various western NY trouble spots, but in most cases were attended to by management programs featuring some good selective insecticides and supplemented by mating disruption.

Some later summer pests that typically show up were not evident this year, including **twospotted spider mites**, which are often associated with hot and dry weather. **Woolly apple aphid** was evident in a number of places, again showing up early but not necessarily taking off the way they are capable of doing.

Other sporadic summer pests were also to be found, depending on the specific locality: **pear psylla** and **potato leafhopper**, **stink bugs**, and **San Jose scale** all generated their share of attention in one area of the state or another. As usual, we'll be looking out for the last few pests that always occur in some numbers, to get an idea of their importance as the fruit starts coming in for packing: **Comstock mealybug**, **white apple leafhopper** and **tarnished plant bug.**❖❖

## PEST EVENTS UPDATE

HOW THE NUMBERS TURNED OUT
(Dave Kain & Art Agnello, Entomology, Geneva)

GENERAL INFO

❖❖ It's not all over yet of course, but our annual tally of degree day accumulations showed some interesting deviations this year, most of which ultimately resolved into another fairly normal "one for the books".

Following are comparative listings of some of the pest events that occurred this season (in Geneva) with calendar and degree-day normals. The values and dates are given +/- one standard deviation; i.e., events should occur within the stated range approximately 7 years out of 10.❖❖

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scaffolds
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| EVENT | DATE Normal (+/-days) | 2008 | DEGREE DAYS (BASE 43 F) Normal (+/-DD) | 2008 |
|---|---|---|---|---|
| APPLE MAGGOT | | | | |
| 1st catch | 2-Jul(+/-9) | 30-Jun | 1424(+/-196) | 1416 |
| Peak | 4-Aug(+/-11) | 24-Jul | 2327(+/-226) | 2085 |
| Flight subsides | 2-Sep(+/-10) | | 3015(+/-243) | |
| AMERICAN PLUM BORER | | | | |
| 1st catch | 16-May(+/-5) | 19-May | 438(+/-48) | 518 |
| 1st flight peak | 4-Jun(+/-8) | 16-May | 785(+/-168) | 1110 |
| 1st flight subsides | 28-Jun(+/-5) | 19-Jun | 1319(+/-94) | 1163 |
| 2nd flight start | 14-Jul(+/-9) | 14-Jul | 1749(+/-270) | 1785 |
| 2nd flight peak | 31-Jul(+/-8) | 28-Jul | 2222(+/-246) | 2192 |
| CODLING MOTH | | | | |
| 1st catch | 19-May(+/-7) | 26-May | 489(+/-92) | 583 |
| 1st flight peak | 5-Jun(+/-12) | 19-Jun | 805(+/-212) | 1163 |
| 1st flight subsides | 8-Jul(+/-13) | 30-Jun | 1596(+/-275) | 1416 |
| 2nd flight begins | 21-Jul(+/-14) | 10-Jul | 1899(+/-347) | 1680 |
| GREEN FRUITWORM | | | | |
| 1st catch | 5-Apr(+/-8) | 14-Apr | 94(+/-36) | 113 |
| Peak | 18-Apr(+/-8) | 14-Apr | 158(+/-55) | 113 |
| Flight subsides | 8-May(+/-10) | 12-May | 351(+/-108) | 440 |
| LESSER APPLEWORM | | | | |
| 1st catch | 12-May(+/-11) | 15-May | 392(+/-139) | 480 |
| 1st flight peak | 21-May(+/-11) | 19-May | 543(+/-196) | 518 |
| 2nd flight starts | 10-Jul(+/-9) | 3-Jul | 1664(+/-271) | 1489 |
| 2nd flight peak | 17-Aug(+/-25) | 21-Jul | 2617(+/-524) | 2003 |
| 2nd flight subsides | 22-Sep(+/-25) | | 3141(+/-347) | |
| LESSER PEACHTREE BORER | | | | |
| 1st catch | 25-May(+/-8) | 15-May | 589(+/-103) | 480 |
| Flight subsides | 9-Sep(+/-5) | | 3221(+/-225) | |

| EVENT | DATE Normal (+/-days) | 2008 | DEGREE DAYS (BASE 43 F) Normal (+/-DD) | 2008 |
|---|---|---|---|---|
| OBLIQUEBANDED LEAFROLLER | | | | |
| 1st catch | 9-Jun(+/-6) | 9-Jun | 883(+/-56) | 910 |
| 1st flight peak | 15-Jun(+/-6) | 9-Jun | 990(+/-145) | 910 |
| 2nd flight begins | 8-Aug(+/-9) | 4-Aug | 2455(+/-200) | 2384 |
| ORIENTAL FRUIT MOTH | | | | |
| 1st catch | 3-May(+/-8) | 24-Apr | 275(+/-52) | 264 |
| 1st flight peak | 16-May(+/-11) | 8-May | 443(+/-99) | 407 |
| 2nd flight begins | 30-Jun(+/-5) | 30-Jun | 1382(+/-107) | 1416 |
| 2nd flight peak | 12-Jul(+/-10) | 10-Jul | 1708(+/-240) | 1680 |
| 3rd flight begins | 11-Aug(+/-9) | 31-Jul | 2521(+/-202) | 2275 |
| 3rd flight peak | 29-Aug(+/-13) | 27-Aug | 2957(+/-300) | 2967 |
| 3rd flight subsides | 14-Sep(+/-22) | | 3170(+/-242) | |
| PANDEMIS LEAFROLLER | | | | |
| 1st catch | 7-Jun(+/-6) | 9-Jun | 840(+/-74) | 910 |
| Flight peak | 14-Jun(+/-8) | 12-Jun | 1014(+/-145) | 1002 |
| Flight subsides | 4-Jul(+/-5) | 3-Jul | 1511(+/-117) | 1489 |
| PEACHTREE BORER | | | | |
| 1st catch | 17-Jun(+/-11) | 12-Jun | 1057(+/-289) | 1002 |
| Flight subsides | 23-Aug(+/-13) | | 2835(+/-310) | |
| REDBANDED LEAFROLLER | | | | |
| 1st catch | 17-Apr(+/-7) | 17-Apr | 142(+/-34) | 127 |
| 1st flight peak | 4-May(+/-9) | 5-May | 300(+/-70) | 368 |
| 1st flight subsides | 1-Jun(+/-9) | 26-May | 720(+/-153) | 583 |
| 2nd flight begins | 1-Jul(+/-6) | 30-Jun | 1418(+/-168) | 1416 |
| 2nd flight peak | 14-Jul(+/-7) | 21-Jul | 1762(+/-222) | 2003 |
| 2nd flight subsides | 8-Aug(+/-11) | 11-Aug | 2440(+/-239) | 2555 |
| 3rd flight begins | 22-Aug(+/-9) | 21-Aug | 2809(+/-160) | 2775 |
| 3rd flight peak | 29-Aug(+/-11) | | 2981(+/-245) | |

| EVENT | DATE Normal (+/-days) | 2008 | DEGREE DAYS (BASE 43 F) Normal (+/-DD) | 2008 |
|---|---|---|---|---|
| SAN JOSE SCALE - adult males | | | | |
| 1st flight begins | 21-May(+/-8) | 26-May | 531(+/-88) | 583 |
| 1st flight peak | 30-May(+/-7) | 2-Jun | 667(+/-67) | 700 |
| 1st flight subsides | 16-Jun(+/-9) | 30-Jun | 1049(+/-195) | 1416 |
| 2nd flight begins | 15-Jul(+/-9) | 14-Jul | 1756(+/-173) | 1785 |
| 2nd flight peak | 4-Aug(+/-10) | 4-Aug | 2312(+/-200) | 2384 |
| 2nd flight subsides | 2-Sep(+/-11) | | 2994(+/-355) | |
| SPOTTED TENTIFORM LEAFMINER | | | | |
| 1st catch | 18-Apr(+/-8) | 21-Apr | 154(+/-44) | 209 |
| 1st flight peak | 7-May(+/-7) | 8-May | 327(+/-63) | 407 |
| 1st flight subsides | 5-Jun(+/-10) | 12-Jun | 805(+/-139) | 1002 |
| 2nd flight begins | 16-Jun(+/-7) | 23-Jun | 1067(+/-87) | 1251 |
| 2nd flight peak | 8-Jul(+/-9) | 14-Jul | 1589(+/-207) | 1785 |
| 3rd flight begins | 8-Aug(+/-8) | 18-Aug | 2455(+/-197) | 2716 |
| 3rd flight peak | 22-Aug(+/-9) | | 2792(+/-222) | |

| CROP PHENOLOGY | DATE Normal (+/-days) | 2008 | DEGREE DAYS(BASE 43 F) Normal (+/-DD) | 2008 |
|---|---|---|---|---|
| APPLE (MCINTOSH) | | | | |
| Green tip | 13-Apr(+/-7) | 17-Apr | 122(+/-26) | 127 |
| Half-inch green | 21-Apr(+/-6) | 21-Apr | 178(+/-23) | 209 |
| Tight cluster | 27-Apr(+/-6) | 24-Apr | 229(+/-29) | 264 |
| Pink | 4-May(+/-6) | 28-Apr | 294(+/-19) | 323 |
| Bloom | 11-May(+/-6) | 8-May | 385(+/-36) | 407 |
| Petal fall | 18-May(+/-6) | 15-May | 484(+/-39) | 480 |
| Fruit set | 23-May(+/-5) | 19-May | 557(+/-45) | 518 |
| APPLE (RED DELICIOUS) | | | | |
| Half-inch green | 21-Apr(+/-7) | 21-Apr | 195(+/-26) | 209 |
| Tight cluster | 28-Apr(+/-6) | 24-Apr | 248(+/-28) | 264 |
| Pink | 7-May(+/-7) | 1-May | 336(+/-40) | 330 |
| Bloom | 14-May(+/-6) | 12-May | 433(+/-51) | 440 |
| Petal fall | 23-May(+/-7) | 19-May | 550(+/-70) | 518 |

| CROP PHENOLOGY | DATE Normal (+/-days) | 2008 | DEGREE DAYS(BASE 43 F) Normal (+/-DD) | 2008 |
|---|---|---|---|---|
| PEAR (BARTLETT) | | | | |
| Bud burst | 20-Apr(+/-7) | 21-Apr | 163(+/-27) | 209 |
| Green cluster | 28-Apr(+/-7) | 24-Apr | 235(+/-22) | 264 |
| White bud | 4-May(+/-6) | 28-Apr | 289(+/-23) | 323 |
| Bloom | 8-May(+/-7) | 5-May | 349(+/-37) | 368 |
| Petal fall | 15-May(+/-6) | 12-May | 433(+/-32) | 440 |
| SWEET CHERRY | | | | |
| Bud burst | 20-Apr(+/-7) | 21-Apr | 168(+/-25) | 209 |
| White bud | 29-Apr(+/-6) | 23-Apr | 223(+/-20) | 248 |
| Bloom | 3-May(+/-7) | 24-Apr | 276(+/-19) | 264 |
| Petal fall | 11-May(+/-5) | 5-May | 391(+/-30) | 368 |
| TART CHERRY (MONTMORENCY) | | | | |
| Bud burst | 24-Apr(+/-6) | 21-Apr | 196(+/-37) | 209 |
| White bud | 2-May(+/-7) | 24-Apr | 261(+/-26) | 264 |
| Bloom | 8-May(+/-6) | 28-Apr | 347(+/-41) | 323 |
| Petal fall | 17-May(+/-6) | 8-May | 447(+/-44) | 407 |

DISEASES

CORRECTION

❖❖ In the article "Postharvest Fungicides for Apples" that was published in Scaffolds last week, an error in the first sentence of the paragraph about Captan created some ambiguity concerning Captan rates. That sentence should have read, " Captan: the label rates for drenches are 25 oz/100 gal for Captan 80WDG and 1.25 qt/100 gal for Captec 4L."❖❖

ONE MORE TIME?

WHY APPLES MAY NEED A FUNGICIDE SPRAY DURING SEPTEMBER
(Dave Rosenberger, Cornell's Hudson Valley Lab, Highland, NY)

❖❖ Thirty years ago, most apple growers in New York State applied their last fungicide spray to apple trees during the first half of August. After that, they could focus on harvest issues and forget about fungicides until the apple scab season started the following spring. In recent years, many growers have found that a September fungicide spray is essential for controlling sooty blotch and flyspeck (SBFS) that would otherwise reduce pack-outs of late-maturing apple varieties. This is especially true in years when heavy rains in late August or

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early September remove fungicide residues and wet weather thereafter allows flyspeck to appear before fruit are harvested.

Our current understanding of flyspeck development was previously explained in an article in Scaffolds (Vol. 15, no. 15, 26 June 2006), and details will not be repeated here. Based on our current understanding of flyspeck, three factors come into play when deciding if late-maturing apple cultivars should be sprayed during September:

1 - All of the summer fungicides (except captan when it is used alone) will protect fruit for at least 21 days or through two inches of accumulated rainfall if the fungicides are applied at recommended rates. Fungicide residues on fruit are depleted after fruit have been exposed to two inches of rain.

2 - Flyspeck appears on apples prior to harvest only after fruit accumulate roughly 270 hours of wetting in the absence of fungicide residues. To estimate when flyspeck might appear on fruit in autumn, wetting hours that occurred during fungicide protection gaps in July and August (as determined using rule #1 to calculate fungicide depletion) must be added to wetting hours that accumulate after fungicide residues are depleted prior to harvest.

3 - The wettest harvest season in my records occurred in 2006, when heavy rains during the last few days of August removed fungicide protection and we then accumulated an additional 270 hr of wetting during the first 26 days of September. Using that season as a worst-case scenario, one can assume that any cultivars that will be harvested within 25 days from the time of fungicide depletion should not need a September fungicide spray because flyspeck will not have time to appear on fruit before harvest. The exception would be fruit that were previously exposed to extended fungicide protection gaps during summer as described in the preceding paragraph.

After combining these factors with other observations, we have concluded that flyspeck will rarely be a problem in Hudson Valley orchards that received regular fungicide sprays during summer, so long as the final fungicide spray was applied near or after mid-August, and fruit are harvested prior to 20 September. If late August and early September are unusually wet, then a September spray may be needed for fruit that will be harvested between 20 and 30 September. A September spray is often required to protect fruit harvested after 1 October. Of course, these are generalized rules that may need to be adjusted for other geographic areas and/or for inoculum density in the orchard perimeter. Furthermore, these rules apply only if fungicides are applied in such a way that residues actually last as long as predicted based on our small plot studies.

Why have September fungicide sprays become important for late-maturing apple varieties, whereas they were almost never used 30 years ago? I doubt that anyone can provide a definitive answer to this question, but some of the changes in our apple production system may have made it more difficult to control SBFS on apples.

Ag statistics show that apple production in New York increased from about 24 million (1977–79) to 28.5 million (2005–07) bushels of utilized production, despite a decrease of more than 40% in apple acreage over that same time period (1980–2006). In fact, the average yield per acre in New York State has roughly doubled over the past 30 years, largely due to the conversion of orchards to high-density planting systems.

While average production per acre was doubling, average tree height was decreasing. Given a doubling of productivity per acre combined with a 50% reduction in tree height, it might be fair to estimate that apple production per cubic foot of tree canopy has almost quadrupled over the past 30 years. In short, apples today are spaced much closer together within the tree canopy than they were 30 years ago. This dense fruit spacing makes it difficult to achieve complete coverage of the fruit surfaces when fungicides are applied during late

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summer and fall. The clustered fruit on productive limbs also dry more slowly, thereby fostering growth of the SBFS fungi.

Furthermore, because of the narrow row spacing in high-density orchards, a tractor and sprayer must be driven at least twice as far now as compared to 30 years ago if a grower wishes to spray each side of every row. Frequently, growers opt to spray only alternate rows in high-density systems, but that decision further reduces the likelihood of achieving complete fungicide coverage of fruit surfaces during late summer.

When late-season sprays do not contact all fruit surfaces, then control of SBFS on the unsprayed surfaces is dependent on redistribution of fungicide residues during subsequent wetting periods. One can assume that controlling SBFS via rain-dependent redistribution of fungicide residues will require a higher initial fungicide dose than would be necessary if the sprayer was capable of providing even fungicide coverage of all fruit surfaces. An increasing dependence on fungicide coverage via redistribution may help to explain why growers and private consultants are reporting that they must use Topsin M at rates of 1 lb/A in late summer, whereas 30 years ago rates of 6–9 oz/A provided adequate control of SBFS. In fact, rates of 6–9 oz/A of Topsin M still provide good control of SBFS in my small plot trials where trees are sprayed to drip using a high-pressure handgun. Thus, it appears that the fungicide is still as effective as it ever was, but fruit spacing in modern orchards has made it more difficult to cover 100 percent of the fruit surfaces with fungicide when sprays are applied with airblast sprayers.

Orchard fertility is another factor that may affect the incidence of SBFS in modern orchards. Russ Holze, an experienced apple grower and private consultant in the Hudson Valley, recently noted that apple growers today pay much more attention to orchard fertility than they did 30 years ago. Most farmers today expect to see healthy green foliage on their apple trees throughout the harvest season.

Researchers reported many years ago that huge quantities of carbohydrates and minerals are leached out of apple leaves during late summer rains. In fact, in one study published in 1956, researchers estimated that carbohydrates leached from apple tree canopies might total more than 700 lb/A/year (Tukey 1971). Newly formed leaves are relatively resistant to leaching, but leaves become more "leaky" as they age. So far as I know, no one has attempted to determine whether higher fertility levels and modern pest management tools have affected the quantities of carbohydrates and minerals that are leached from apple tree canopies. However, one might assume that higher fertility would result in increased levels of carbohydrate leaching.

Carbohydrates leached from leaves might affect development of SBFS if the growth of sooty blotch and flyspeck on fruit surfaces is at least partially sustained by external nutrients deposited on fruit surfaces. No one has proven that leached nutrients directly affect SBFS, but several lines of evidence support that possibility. In the fall of 2007, late-season SBFS infections appeared primarily on the upper hemisphere of Golden Delicious fruit in a research plot where fruit were well separated (and therefore were hanging vertically from the stem). The half of the fruit toward the calyx was nearly disease free (Fig. 1). This distribution of SBFS is consistent with the hypothesis that growth of the SBFS colonies was fostered by leached nutrients released from leaves above the affected fruit. (Of course, other hypotheses might also explain this distribution.) A second line of evidence comes from an apple grower who, after the Alar scare in the early 1990s, attempted to control SBFS with a "fungicide alternative" that contained various sugars. This grower reported that the sugar solution enhanced growth of SBFS and that his black apples were not very marketable despite their lack of fungicide residues.

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Fig. 1a

Fig. 1b

Figure 1: Golden Delicious fruit sometimes show a greater incidence of flyspeck on the stem-end (Fig. 1a) than on the calyx end (Fig. 1b).

To summarize, no one has yet documented (via scientific trials) that either fruit density within trees or changing fertility practices within orchards are contributing factors for the SBFS problems that have plagued many growers in recent years. However, it may be easier to accept the fact that a September fungicide spray will sometimes be needed in modern orchards if we see this change in fungicide strategy as a normal consequence of doubling our production per acre. In fact, if one considers that 30 years ago NY apple growers had to spray two acres to get the production that now comes from one acre, then adding a September fungicide spray to control SBFS on late-maturing varieties is a small price to pay for the season-long savings that accrue from spraying and maintaining only half as many acres throughout the rest of the year! ❖❖

Literature cited

Tukey, H.B. Jr. 1971. Leaching of substances from plants. Pages 67–80 in: Ecology of Leaf Surface Micro-organisms, T.F. Preece and C.H. Dickinson, eds. Academic Press, NY.

## INSECT TRAP CATCHES (Geneva, NY) (Number/Trap/Day)

| | 8/21 | 8/25 | 9/2 |
|---|---|---|---|
| Redbanded leafroller | 0.3 | 0.5 | 0.8 |
| Spotted tentiform leafminer | 9.2 | 8.5 | 25.0 |
| Oriental fruit moth | 0.2 | 1.8* | 1.2 |
| American plum borer | 0.0 | 0.3 | 0.0 |
| Lesser peachtree borer | 0.2 | 0.0 | 0.1 |
| Lesser appleworm | 0.8 | 0.1 | 0.1 |
| San Jose scale | 200 | 225 | 118 |
| Codling moth | 0.0 | 0.0 | 0.0 |
| Obliquebanded leafroller | 0.0 | 0.0 | 0.0 |
| Peachtree borer | 0.0 | 0.1 | 0.0 |
| Apple maggot | 0.2 | 0.0 | 0.1 |

* first catch

## UPCOMING PEST EVENTS

| | 43°F | 50°F |
|---|---|---|
| Current DD accumulations (Geneva 1/1–9/2/08): | 3052 | 2076 |
| (Geneva 1/1–9/2/2008): | 3111 | 2143 |
| (Geneva "Normal"): | 3140 | 2132 |
| (Geneva 1/1–9/8 Predicted): | 3224 | 2206 |

| Coming Events | Ranges (Normal ±StDev): | |
|---|---|---|
| Oriental fruit moth 3rd flight peak | 2650–3242 | 1828–2252 |
| Oriental fruit moth 3rd flight subsides | 2962–3381 | 2000–2288 |
| Apple maggot flight subsides | 2772–3374 | 1908–2368 |
| Spotted tentiform leafminer 3rd flight peak | 2607–3043 | 1782–2118 |
| Lesser appleworm 2nd flight subsides | 2883–3467 | 1973–2387 |
| Redbanded leafroller 3rd flight peak | 2767–3237 | 1903–2325 |
| Redbanded leafroller 3rd flight subsides | 3124–3436 | 2142–2422 |
| Obliquebanded leafroller 2nd flight subsides | 2965–3489 | 2036–2458 |
| Peachtree borer flight subsides | 2525–3145 | 1710–2194 |
| San Jose scale 2nd flight subsides | 2639–3349 | 1785–2371 |
| Codling moth 2nd flight subsides | 2859–3583 | 1944–2536 |
| American plum borer 2nd flight subsides | 3114–3600 | 2165–2533 |
| Lesser peachtree borer flight subsides | 2996–3446 | 2017–2433 |
| Spotted tentiform leafminer 3rd flight subsides | 3230–3444 | 2246–2432 |


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