

## Hudson Valley of New York; Hudson Valley Research Laboratory

Person(s) Reporting:

Srdjan Acimovic (PPPMB), Peter Jentsch (Ent.), Dan Donahue, Extension Assoc., Cornell ENYCHP

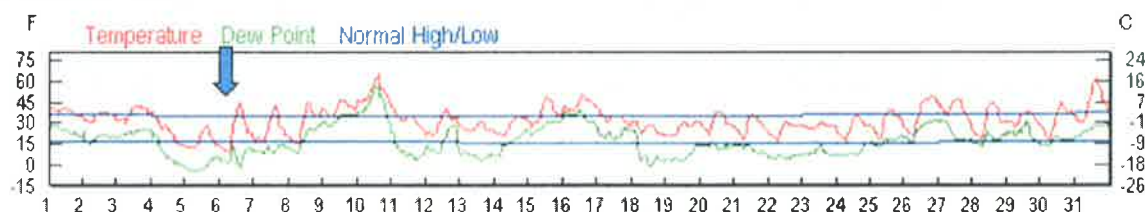
### Overview of weather conditions in 2016

**Rainfall accumulations:** The start of the 2016 season began very dry in March increasing above the average through April with rainfall accumulations of 2.20" in March (3.6" Ave.), 4.40" in April (3.8" Ave.), and 2.55" in May (4.4" Ave.). The month of June saw a significant increase in rain events totaling 7.31" (4.4" Ave.), with enough rain to produce moderate levels of apple scab infection, especially in newly planted blocks. Each week in July had less than 0.5" of rain requiring weekly irrigation as only 1.23" of rain fell (4.7" Ave.). August experienced below average rainfall with accumulations of only 3.34" (4.2" Ave.). Total rainfall for the March 1<sup>st</sup> through September 1<sup>st</sup> growing season totaled 21.03" of rain, below the seasonal average of 25.1".

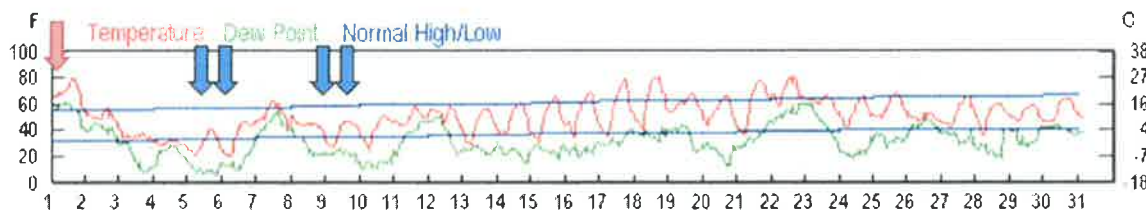
**Tree phenology:** The onset of dormancy was interrupted in December with unseasonably high temperatures between 60-64°F mid-month reaching 72°F on Christmas eve.



December 2015



January 2016



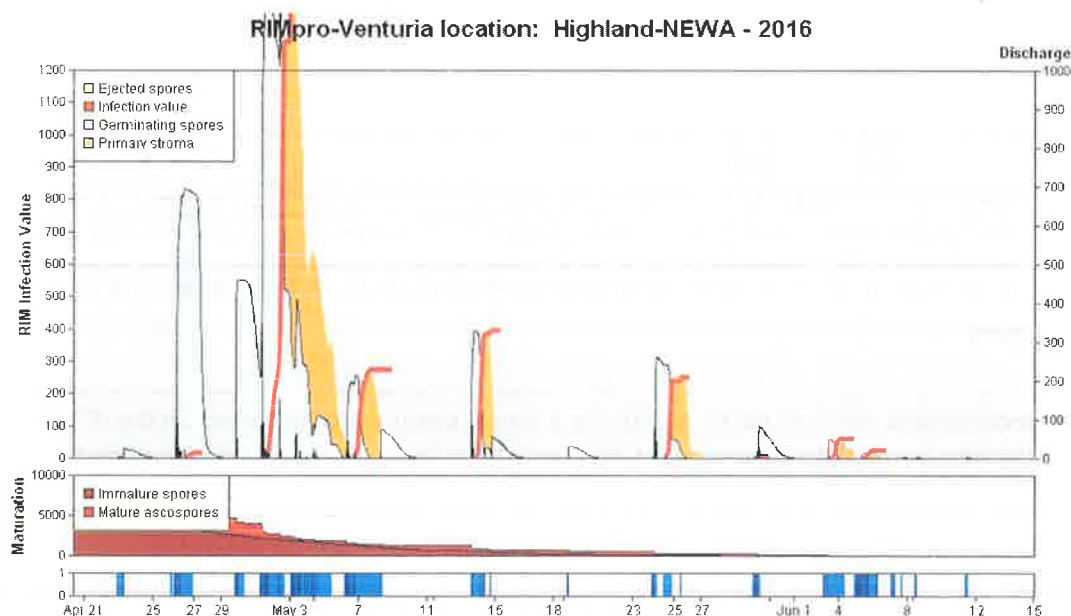
April 2016

Bud development was hampered in 2016 by a freeze event which occurred on the 4<sup>th</sup> and 5<sup>th</sup> of April (23.9°F and 18.9°F respectively) followed again by temperature in the mid-20's°F. This event killed most stone fruit buds in the Hudson Valley, reducing pome fruit bloom depending on variety and site across the region. The season began as one of the earliest seasons on record. However, by petal-fall, the season was only one-day earlier than the 37-year mean.

McIntosh green tip (17 March) occurred 18 days earlier than the 37-year historical mean (see McIntosh phenology), one day shy of the earliest recorded day. King bloom on McIntosh began on the 25<sup>th</sup> of April. Predominately cool temperatures prevailed ranging between 50°F and 80.7°F for an extended bloom period lasting 17 days, 7 days longer than the mean of 9.4 days. This was followed by 10 days of mean high temps of 59 °F to 83°F post petal fall. The 80% PF in McIntosh occurred on 12<sup>th</sup> May. There was ample sunlight yielding strong pollination and conditions for fruit set yet under conditions of severe cold injury from freeze temperatures on two nights of April 5<sup>th</sup> and 6<sup>th</sup>. Early water stress was a concern for tree fruit growers which lingered throughout most the season. Degree-day accumulations were the highest on record dating back to 1997 for base 43, the accumulating 597.8DD compared to the mean of 484.7DD<sub>43</sub> by petal fall on 12<sup>th</sup>. By the 23<sup>rd</sup> of May, McIntosh king fruit had sized to 17mm with lateral fruitlets at 14.5mm.

### Pest Type: Pathogen

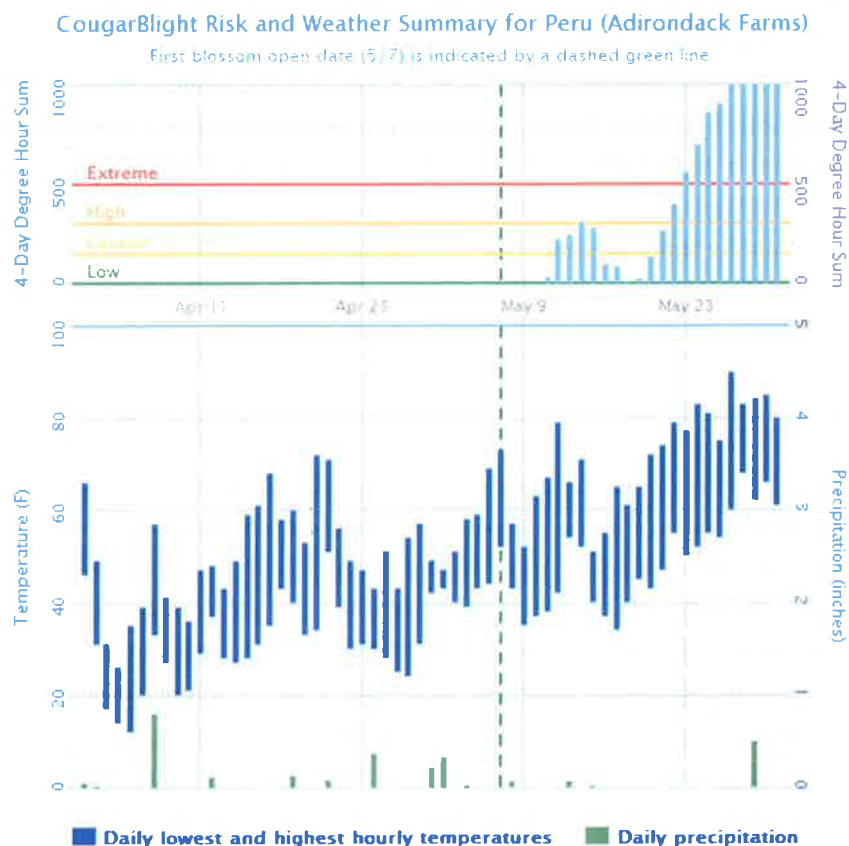
**Apple scab** infection periods (8) based on RIMpro prediction model that were predicted from 17 April onward turned out not to be leading to infections since conditions after rainfall events were cold and fast drying. Weather forecasts at this period were often unreliable farther than 2-3 days ahead and predictions for 7 days ahead changed substantially from day to day. In addition, it was complex to determine and recommend when and what to spray for scab early in April due to cold injury to the leaves on 4<sup>th</sup> and 5<sup>th</sup> April. Even though infections were predicted to occur in April, it seems that none of the discharged ascospores that germinated in water droplets led to infections. The first major ascospore discharges that led to infections were on May 1<sup>st</sup> to May 4<sup>th</sup>. It was predicted that around 90% of ascospores were discharged from pseudothecia at this period. Much weaker infection periods continued on May 6<sup>th</sup>, 13<sup>th</sup>, 14<sup>th</sup> and 24<sup>th</sup>, and June 3<sup>rd</sup> and 5<sup>th</sup> (Figure available below).



In Hudson Valley first scab symptoms were observed on 15 May on Jersey Mac fruit. However, Dr. David Rosenberger who found these infections warned that these infections indicate two things: 1) infections were probably initiated from conidia overwintering from last year in buds, and 2) if all sprays that were recommended before May 1<sup>st</sup> were omitted, green tissues were under risk from pre-bloom infections. Many fungicides are available for scab control, but due to cold injury to leaves, Manzate or Polyram were recommended 1-2 days after cold event. In case of major infection periods tank mix applications of Manzate with Inspire Super before or 72 h after this infection period were preferred.

**Cedar apple rust and quince rust** symptoms in Hudson Valley started showing on apple fruit and leaves from May 15-18<sup>th</sup> onward. Infection periods continued through Mid-June whenever rain was available and cedars were as close by with sources of infection. Manzate in combination with Luna Sensation or Inspire Super provide good control.

**Fire blight** was not a big problem in Hudson Valley with few strikes occasionally visible in few orchards with fire blight history. Cooler conditions during bloom, especially during the night, did not favor growth of fire blight populations on flowers. However, in Northern-eastern and North-western NY severe fire blight infections that were predicted by models through NEWA, occurred on May 21<sup>st</sup>, 29<sup>th</sup> and 30<sup>th</sup>. Transition from Caution to High and then to Extreme risk from infection occurred in three days from May 21<sup>st</sup> - May 23<sup>rd</sup>. Several key apple cultivars were at the end of bloom at that time allowing more than enough open flowers for fire blight bacteria to grow their populations rapidly and allow intensive spreading to growing shoots.



The key weather conditions that promoted bacterial population growth in on flowers leading to an epidemic were sudden rise of temperatures from 50's and 60's to 70's and high 80's, rain events on May 21<sup>st</sup>, 29<sup>th</sup> and 30<sup>th</sup>, high relative air humidity, prolonged leaf wetness, all followed by few hail storms in June. First blighted clusters and shoot strikes started showing around June 6 indicating on extremely favorable conditions for pathogen development on flowers and massive infections on intensively growing shoots that were long ways from terminal bud set when they become more resistant to infection. Sprays of streptomycin during bloom were not applied in mature orchards. Most of young orchards were sprayed and relatively successfully protected. Overall response to established infections was slow and flower and shoot infections led to formation of many fire blight cankers and rootstock infections via trunk or suckers.

**SBFS - Sooty Blotch & Flyspeck** in Hudson Valley were first detected on 'Honeycrisp' during the week of August 12, 2016. In the untreated control plot these symptoms were visible mostly on the compact fruit clusters where thinning did not occur and on the clusters at the bottom of the tree crown. In this plot, last fungicide spray for plot maintenance after which plot was untreated, was on 6 June 2016 (Captan @ 3lb/A + Flint @ 2.5 oz/A). Hence, from that spray onward, it seems that the incubation period requirement of accumulated 190 hr of wetting was most likely fulfilled or exceeded.

**Bitter Rot** occurring in the orchards has been quite a problem across NY State in 2016. Dr. David Rosenberger reported that next several factors contributed to the overall higher incidence of this disease in the past and in 2016: more frequent summer days with warm wetting (climate change) and new susceptible and late-maturing apple cultivars. Due to late maturing, these cultivars require continued fungicide sprays through the end of September to beginning of October for good control. In 2016, bitter rot outbreaks seem to have occurred in the orchards where 21-day interval or higher between fungicide sprays was used from mid-July and fungicide deposits on fruit have been depleted by 2" rainfall much before or close to the harvest. An additional factor could be that mid-label rates of Captan were used instead of the high rates, and that in that case Captan was not used in mix with Flint, Sovran, Pristine or Merivon.

---

#### **Pest Type: Insect**

**Tarnished Plant Bug (TPB)** presence and fruit injury was slightly above average this season, requiring timely applications for management in orchards with historical fruit damage. Pre-bloom applications of a pyrethroid did not significantly reduce fruit injury compared to the UTC in Gingergold this season. Relatively dry conditions during the pre-bloom period favor TPB activity often requiring applications at both TC and P that in many years show numeric reduction in fruit injury yet this season were not significant during analysis. Lower levels of injury in higher valued fruit such as Sweetango, Honeycrisp, Gala and Fuji typically require TPB management if culls from this insect exceed economic threshold. We observed TPB injury at 5.5% in Ginger Gold on 6 June in untreated plots with increasing damage noted in these plots at harvest.

**Plum Curculio (PC)** damage levels were low in early varieties and moderate in late varieties this season, yet required three applications in most orchards beginning at 80% PF, followed by 1<sup>st</sup> and 2<sup>nd</sup> cover for most mid to late varieties. Rains 9 days after the 1<sup>st</sup> cover application prompted a 2<sup>nd</sup> cover re-application. PC damage began shortly after fruit set given the very warm post bloom temperature we experienced. PC migration into orchards, oviposition and migration completion prediction model was calculated to end on 2<sup>nd</sup> of June at the HVRL using 308 DD<sub>50</sub> from petal fall of McIntosh. Rains during the PF-1C period exceeded 0.61" and an additional 1.92" fell after the 1C application up to the morning of June 2<sup>nd</sup>. Moderate pressure was observed this season with PC injury observations prior to *June Drop* exceeding 10% in Red Delicious. In harvest assessments damage was 16.3% in Ginger Gold.

**European apple sawfly (EAS)** activity occurred in very low numbers this season with early varieties showing 1.8% injury in Ginger Gold and McIntosh cluster fruit evaluations. This was the third year in which EAS populations were at very low levels.

**Spotted Tentiform Leafminer (STLM)** populations remain at very high levels in seasonal pheromone trapping with two distinct flights. Since the planting of our semi-dwarf test plots that correlate with the onset and use of the neonicotinoid class of insecticides employed in apple, the STLM has not been observed to cause injury to foliage to a degree requiring insecticide management.

**San Jose scale (SJS)** crawler emergence was predicted to occur during the first week of June using 1<sup>st</sup> adult capture on the 16<sup>th</sup> of May using 400 DD<sub>51</sub> model. Nymphs were observed on fruit on the 10<sup>th</sup> of June, 8 days after the predicted emergence date. In general SJS scale levels were high in infested trees. The infestation means ranged from 27.3% to 86% injury observed in HVRL research plots on 26<sup>th</sup> August. In conventionally treated orchards, the SJS has become a major insect pest to manage in apple, requiring targeted applications for multiple generations. In 2015 we observed a 3<sup>rd</sup> generation in late September.

**Lepidopteran complex:** Overwintering larvae of the spotted green fruit worm (SGFW), red banded leafroller (RBLR) and OBLR larva during the pre-bloom period through fruit set remain a concern for most Hudson Valley and Lake Champlain pome fruit growers. The tools for use against the Lepidoptera complex are diverse in mode of action, very effective with excellent residual activity. Relatively low levels of infestation was observed in the pre bloom and early season leafroller complex.

**Codling moth (CM)** 1st generation sustained adult flight occurred on 19<sup>th</sup> May with larval emergence predicted for 31<sup>st</sup> May using 220 DD<sub>50</sub> from CM biofix. The internal lepidopteran complex, lesser apple worm (LAW), oriental fruit moth (OFM) and CM showed moderate levels of damage to apple, with frass produced by the internal lep. complex appearing during mid-late June through early July. Moderate levels of damage from the internal Lepidopteran complex was observed with 9.3% damage from 1<sup>st</sup> generation evaluated on 16<sup>th</sup> June on Red Delicious and with 7.0% & 23.1% for 1<sup>st</sup> and 2<sup>nd</sup> generation on Gingergold respectively. The 2<sup>nd</sup> generation

adult sustained catch for the CM biofix occurred on 20<sup>th</sup> July with management for larval emergence prediction using 250 DD<sub>50</sub> to occur on 28<sup>th</sup> July.

**Obliquebanded leafroller** (OBLR) monitoring and management by tree fruit growers continues to be a high priority. Targeting up to three seasonal application windows while employing a single mode of action for each period, growers can achieve successful management of the OBLR larva. These include the pre-bloom through Petal Fall period for the overwintering generation, often using IGR's such as Proclaim and Intrepid, the Summer generation using either Altacor / Belt or Delegate, and later in August applying either Altacor / Belt or Delegate. Recommendations for applications were made using insect phenology predictions for early emergence, using 340 DD<sub>50</sub> from biofix to manage emergence of larvae, predicted to occur on mid June. In general, low-levels of leafroller feeding was observed on developing foliage and fruitlets this spring. Trap captures were moderate for 1<sup>st</sup> generation OBLR averaging 9.0 / day during the peak periods (5<sup>th</sup> June). The 2<sup>nd</sup> generation flight of OBLR biofix was low during August, averaging 2.0 / day during the peak periods (8<sup>th</sup> August). We are seeing a trend of increasingly high levels of RBLR with mixed populations of **tufted apple bud moth** (TABM) and **sparganothis fruitworm** (SFW) during the season, contributed to the overall leafroller damage each year.

**Apple maggot** (AM) emergence was late this season with first emergence on 11<sup>th</sup> July. Threshold of 5 flies per trap per block was observed on the 18<sup>th</sup> of August. AM density was low to moderate throughout the region with reduced emergence due to the lack of late season rainfall in July and early August. Low populations of adults were noted in the mid-Hudson Valley with seasonal accumulation totals near 40 flies per trap (mean n=4) by 31<sup>st</sup> August. Highest populations occurred late in the season as rainfall in August providing more ideal emergence conditions for the adult fly.

The **brown marmorated stink bug** (BMSB), *Halyomorpha halys*, has been observed throughout the southern Hudson Valley for the past 7 years with the first BMSB confirmation in December 2008. Since that time increasing populations have been documented in urban environments and present on many farms throughout the season in the lower to mid-Hudson Valley region. We have observed a second generation over the past two years, developing in mid-late August in HVRL voltinism studies. However, in 2016 we did not find adult egg laying after the development of 1<sup>st</sup> generation in the field.

Although there appears to be stink bug feeding in apple this season, both BMSB and the **green stink bug**, *Acrosternum hilare* BMSB was found from mid-season through harvest on pome fruit in lower to mid-Hudson Valley with increasing northern observations and fruit injury occurring in Columbia County in 2013. It has been found reproducing in deciduous trees such as Sugar Maple, *Acer saccharum*, White Ash, *Fraxinus americana*, Tree of Heaven, *Ailanthus altissima*, and eastern black walnut *Juglans nigra* in high numbers with lower numbers observed in Staghorn Sumac, *Rhus typhina*, and wild grape, *V. vinifera*. Late season nymphs and adult trap captures of BMSB using Tedders traps employing traditional black light traps, the USDA #10 lure

and the *Plaudi stali* aggregation pheromone lure, methyl (E,E,Z)-2,4,6-decatrienoate, was observed along the orchard edges in Orange, Ulster, Dutchess and Columbia Counties throughout the season. In 2016 we monitored the population throughout NYS in 44 tree fruit orchard sites, employing a trap threshold of 10 total BMSB adults per trap to recommend management timing for tree fruit production. We are presently recommending that growers access <https://www.eddmaps.org/bmsbny/> for weekly updates on BMSB monitoring of adults and fruit injury requiring management.

**Spotted wing drosophila (SWD)**, *Drosophila suzukii*, (Matsumura) (Diptera: Drosophilae) were first observed by ENYCHP CCE in Rensselaer County, NY by late August, 2011. We monitor SWD in four counties throughout the lower to mid-Hudson Valley this season using baited traps across small fruit, grape and tree fruit. The first SWD trap captures were found Ulster County on the week of the 21<sup>st</sup> of June with sustained captured on 10<sup>th</sup> of July, Dutchess County on the week of the 29<sup>th</sup> of June with sustained captured on 8<sup>th</sup> of July, Orange County on the week of the 20<sup>th</sup> of July with sustained captured on 27<sup>th</sup> of July and Columbia County on the week of the 8<sup>th</sup> July with sustained captured on the 9<sup>th</sup> of July with positive finds in Rensselaer and Albany counties by early July. Growers who harvested frequently and kept to a 3-7 day spray program were able to maintain low infestations levels (<15%) this season. We update <https://www.eddmaps.org/swd/> site for weekly updates on SWD monitoring of adults and fruit injury for early season management thresholds.

---

#### **Major Problems/Successes this Year:**

- a. Drought conditions reduced incidence of apple scab this season.
- b. Drought prompting native stink bug movement to tree fruit with feeding in mid-season observed on apple and late August on pear.
- c. BMSB sentinel egg placement in Ulster and Orange found both native and invasive parasitoid presence on yellow cards with *Trissulcus japonicus* observed emerging from two site in Marlboro, NY
- d. Attract and kill stations (AtK) were found to effectively reduce SWD injury to raspberry in conventional and organic commercial berry production.

#### **Unusual Events:**

- a. Unusually high temperature in December, February & freeze events in early April reduced overall crop load.
- b. Near complete loss of stone fruit in the Hudson Valley
- c. Relatively low populations of tree fruit insects during most of the season
- d. Season-long drought required season long irrigation
- e. Fire blight in Lake Champlain region

## 2016 Hudson Valley Apple Harvest Summary as of 10/17/2016

Dan Donahue, Extension Associate, Cornell ENYCHP

An extraordinarily mild winter appears to have resulted in a reduced degree of winter hardiness in apples. The early accumulation of heat units led to McIntosh green tip at the Cornell Hudson Valley Research Lab on March 16<sup>th</sup>, three weeks earlier than average. Development continued at a faster than normal pace, reaching ½" green to early tight cluster, depending on the variety, by April 5<sup>th</sup>. Disaster struck on the evenings of April 5<sup>th</sup> and 6<sup>th</sup> as temperatures dipped into the single digits in Columbia County, and the low teens in Ulster. According to published cold injury charts, flower bud mortality should have been close to 100%. In reality, a substantial number of buds survived and resumed development. At pink stage, the weather cooled, with the bloom period being cold, wet, and much longer than normal. The period from pink to petal fall was as long as three weeks for some varieties. The quality of pollination appeared questionable. Viable bloom did emerge, the quality of fruit set was considered to be uncertain, at best. Concern over poor pollination conditions, cold injury to spur tissue, and what unseen damage lurked in the tree caused pomologists to be very cautious with thinning recommendations at our regional thinning meetings on May 12<sup>th</sup>. As the days progressed, the crop began to look stronger. Early season efforts at chemical thinning were ineffectual due to growers choosing low rates, and the cool conditions. Some grower decided to forgo chemical thinning entirely, implementing a hand thinning strategy later in the season.

By May 23<sup>rd</sup> it became clearer that surviving flowers, with viable pistils (most flowers) that set fruit, weren't going to drop off on their own. CCE ENYCHP issued an E-Alert suggesting that chemical should be used at normal rates based on the NEWA carbohydrate model. The resulting crop had a "clumped" distribution on the tree, reflecting the loss of the king bloom, along with a high degree of set of the side bloom, and poor thinning performance. In late June, growers and industry professionals estimated the Hudson Valley crop to be 70% of the 2015 crop. Maturity estimates calculated in early August resulted in a prediction of Gala, Mac's, and Honeycrisp running three days earlier than 2015.

August turned out to be much warmer than average for the Hudson Valley. A local media outlet reported that we experienced more 90+ days this past August than any other August on record. However, the high temperatures did not result in an increase in the rate of maturity development. In comparing harvest maturity data from 2015 with 2016, Gala maturity was slightly ahead, McIntosh roughly the same, and Honeycrisp a few days behind. For later varieties such as Empire, Red Delicious, Fuji and Rome, maturity approximated general calendar dates. In general, flesh firmness and Brix were up this year, and color was down. For Gala, McIntosh, and Honeycrisp, retailers lowered color standards to accommodate. The Bitter Pit disorder was rampant in Honeycrisp this year, with incidence ranging from 2 – 60+ percent in sampled blocks. September and October were very dry, with growers continuing trickle irrigation when available, and re-deploying their solid-set equipment. Even with the short crop, fruit size was disappointing. As this article is written, Standard Fuji, "Maslin" Pink Lady, and Law Rome are being harvested. All in all, I'd estimate most varieties will pick out at 50% of last year's crop, with Gala being the bright spot at 75%.