Poma Tech

Morning Brew: Conversations on Tree Fruit Pest Management

6 AM, April 1st, 2024

Poma Tech Inc. is a 501(c)(3) Not for Profit, addressing the evolving pest management research and educational needs in support of the tree fruit industry while mitigating food insecurity across the Hudson Valley region of NYS.

Agenda:

- Welcome
  - Introduction
  - 2023 Season in review
  - Tree phenology
  - Weather forecast - Application windows

Pre-bloom Diseases Apple Scab

After 1st Application (Copper & Oil). Apple scab

a. Insect management pre-bloom

b. Pear: Pear psylla

Apple: San Jose Scale, Dogwood Borer, European Red Mite

THE JENTSCH LAB

INSECT BIOLOGY, ECOLOGY, AND MANAGEMENT IN HUDSON VALLEY AGRICULTURAL COMMODITIES

Peter Jentsch

Employed with Cornell's Hudson Valley Lab for 32 years

- Technician, Sr. Extension Associate / Entomologist & Superintendent (2016)
  - Product Testing pesticide screening trials; Invasive pest research (BMSB, SWD)
  - Biological control of BMSB (Samutrai Wasp)
  - Presentations on Insect Pest Topics and research results

- Started Poma Tech Inc. a 501(C)(3), in 2021. Mission to support growers of tree fruit with web based and on-farm pest management support.

- Year 4 of Morning Brew: Discussions on weekly pest management predictive modeling & relevant topics

Rainfall accumulations & temperature events:

The start of the 2022 season began relatively mild in March with near average rainfall through April.

Rainfall accumulations
3.50” in March (3.6” Ave.)
7.11” in April (3.8” Ave.)

Caused severe in row orchard erosion and flooding leading to root exposure, standing water and significant trees stress (root anoxia) in low lying rows. Poor Drainage = Loss of tree growth

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May had average rainfall with 4.43" (4.4" Ave.)

June began the onset of severe drought with below average rain events totaling **2.93"** (4.4" Ave.).

Very low levels of rain did produce moderate levels of apple scab and fire blight infection in tree fruit blocks of sensitive varieties.

July experienced very low weekly levels of rain resulting in moderate levels of drought with accumulations of **1.02”** (4.2” Ave.) of rain.

July also had **8 days at or above 90ºF**
Required weekly irrigation and sunburn protection in UV sensitive fruiting varieties.

- Wildlife began to seek moisture in developing fruit
- Significant loss of fruit by small mammals and birds in the upper and perimeter canopy
- Substantial fruit injury Honey Crisp in small isolated blocks, orchard edge and interior end rows.

August also experienced **11 days at or above 90ºF** with lower than normal rainfall with accumulations of **1.23”** (4.2” Ave.).

Severe drought conditions with irrigations ponds and wells dry by mid-August in the mid-Hudson orchards.

Severe bird injury losses to a high percentage of Honey Crisp fruit throughout the season.

King fruitlets missing on HC

2022 Tree phenology: Late Season

- Late green-tip on 4th April (42 year mean of 29th March)
- Honeybees arrived the week of 28th April
- King Bloom 7th May of 75%, six days later then the Mean (1st May)
- 7-day bloom period to 80% PF, 2 days shorter then the 9-day average.
- Petal Fall (May 14th) began the ‘growing season’ 4-days later than average.
- Aggressive thinning made to Gala, Ruby Frost and Honey Crisp
- Despite season-long drip irrigation with rainfall down by over 8” by August. Early-season crop varieties (Gale) were harvested with small and variable fruit size.

Tarnished Plant Bug (TPB)

Injury from this pest was observed to be at 2.0% by the 26st of May in the UTC Macoun this season with typical inverted punctures found on sampled fruit.

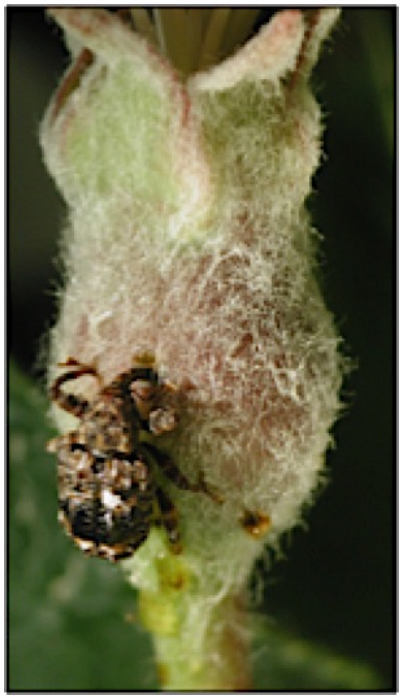
Observed TPB injury during harvest fruit evaluations in Macoun on 7th August+ in untreated plot ranged between 0-3%

Plum Curculio (PC)

Ovipositional injury occurred during the two weeks following petal fall (14th May).

First observation of PC presence and damaged fruitlets was the 21st May (<1%). Macoun, the variety used in efficacy screening studies, had exceeded 8 mm in diameter by 21st May, at which time 5.0% was observed at 7 days post PF.

Injury from this pest was observed moderate to severe this season with 28% ovipositional injury assessed on 2nd June in Macoun.



PC ovipositional injury to fruit remained moderate to severe in **UTC trees into the season expressing 18-60% injury**

European Apple Sawfly (EAS)

Activity occurred in very low numbers again this season with early varieties showing a range from 0.0% to 0.2% injury in Macoun cluster fruit evaluations with early harvest assessments at < 0.1%.

This was the seventh year in which EAS populations were at very low fruit damage levels.

Spotted Tentiform Leafminer (STLM)

Populations remain at very high levels in seasonal pheromone trapping with two distinct flights.

Since the planting of semi-dwarf trees that correlate with the onset and use of the neonicotinoid class of insecticides the STLM has not been observed to cause injury to foliage to a degree requiring insecticide management.

Seasonal parasitism of early larval stages continues to be observed in trees with ‘soft’ insecticide programs. Reduced use of broad spectrum OP use likely has led to parasitic biological control of the STLM larval stage

San Jose scale (SJS)

Crawler emergence of 1st generation was predicted to occur during the second week of June (10th – 14th June), biofix based on the 1st adult pheromone capture on **21 May** and using a 260-360 DD_{50BE} model.

Second generation was predicted based on second flight occurring **16 July**. In general, SJS scale levels were low in infested trees.

The **infestation means ranged from 0.3% to 25.0% injury observed research plots** on 19th August representing combined 1st and 2nd generation fruit infestation levels.

In conventionally treated orchards, the SJS has become a major insect pest to manage in apple, requiring targeted applications for multiple generations. In recent years we've observed a **3rd generation in late September**.

Lepidopteran complex:

Overwintering larvae
Speckled green fruit worm (SGFW) *Orthosia hibisci*
Red banded leafroller (RBLR), *Argyrotaenia velutinana* (Walker)
Obliquebanded leafroller (OBLR) *Argyrotaenia velutinana* (Walker)


Utah State Univ.

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
IRAC Class
5 Spinosyns (Delegate)
11 Bt's (Dipel)
28 Diamides (Altacor)

Mid-late season leafroller damage levels of infestation were observed in harvest ratings for **ranging between 3.0-40.0% injury at harvest of Macoun on 16th August.**


Todd M. Gilligan and Marc E. Epstein, CSU, Bugwood.org


J. F. Walgenbach file

Codling Moth (CM)

The internal lepidopteran complex, lesser apple worm (LAW), oriental fruit moth (OFM), and codling moth (CM), showed relatively high levels of damage to apple

1st generation sustained CM adult flight occurred on 21st May with first hatch / larval emergence predicted for 2nd June using 220 DD_{50BE} from CM biofix.

Damage from 1st and 2nd generation CM evaluated at harvest on **Macoun showed 24.0% injured fruit in screening trials** of most infested treatment.

Apple maggot (AM)

1st adult capture on 8th July from abandoned orchard in Milton, NY was very late this season.

Drought created poor conditions for adult emergence due to hard pack soils in commercial blocks and as such, threshold of 5 flies per trap per block was not observed in commercial orchards this season.

Injury in treated and untreated trees in our research block had a **range of 10-29% tunneling from AM**.

Aphids: Woolly Apple Aphid (WAA)

Observed in commercial in many varieties often beginning in Ginger Gold, Fuji and Red Delicious apple.

The aphid feeds on the sap from plants, excreting or ‘shunting’ excess and concentrated sap, which will act as a substrate for sooty mold. High infestations can colonize the calyx end of fruit becoming problematic at harvest, making the fruit unmarketable.

Populations established in low levels in pruning wounds and leaf petioles by **22 July,** infesting fruit and requiring management by **1st August**.

Single Movento application made at 6 oz./A at petal fall kept populations in check until mid-August, at which time additional applications were required.

Rosy Apple Aphids: Neonicotinoid application at PF provided seasonal management in 2022.

Black Stem Borer (BSB)

Significant tree loss in commercial orchards during the 2021 growing season. Fuji and Honey Crisp on dwarfing M9 rootstock in locations with well drained ripped shale outcroppings in Hudson Valley sites in Marlboro and Walden under drought conditions were found to contain BSB entry sites and rapid apple decline (RAD). These sites were under irrigation both seasons, yet proved insufficient during drought to maintain low levels of stress induced ETOH.

Few sites with BSB induced RAD were observed in low lying situations with seasonal standing water.

Invariably, young trees coming from nurseries appear to have insufficient root systems on M9 & often B9, to withstand extreme wet or dry soil conditions during the first few years after planting.

Glufosinate-ammonium (Interline® Rely®) appears to be causing significant tree trunk injury and subsequent tree decline and loss.

Herbicide injury, drought and flooding may be predisposing trees to BSB infestation.

European Red Mite *Panonychus ulmi* (Koch) (ERM)
Two Spotted Spider Mite *Tetranychus urticae* (Koch) (TSSM)

Considerable late season bronzing in commercial orchards during the 2022 growing season.

Varieties most impacted included Red Delicious, Fuji and Honey Crisp followed by Stayman and Empire.

Repeated applications of conventional miticides made during the late summer were sufficient to maintain levels of population below threshold to reduce foliar damage.

High temperatures exceeding 90ºF beginning in late May into June exacerbated egg production while providing ideal conditions for rapid generational times.

European Red Mite

Two Spotted Spider Mite

Stink bug complex

Brown marmorated stink bug (BMSB), *Halyomorpha halys*
Green Stink Bug (GSB) *Acrosternum hilare*

Observed throughout the southern Hudson Valley for the past 14 years with the first BMSB confirmation in NYS on December 2008.

Commercial orchards employing alternate row middle coverage of efficacious insecticides (pyrethroid formulations) maintained injury levels well below 1%.

Threshold Tedders trap capture on Aug 14th

Woodchuck populations

- Increasing in number in commercial orchards
- Trunk gnawing and girdling and killing young trees
- Reduce cambium bark in older trunks, likely reducing fruit production.

Tree Phenology

Ruby Frost: @ early mouse ears

Milton, NY – March 31st

Apple: HoneyCrisp, Snapdragon, Fuji showing green in 30-75% of buds.

(Snap Dragon) pushing beyond delayed dormant with green tissue nearing ¼" green

Disease: Preventative cooper applications applied over the past week with oil should provide residual protection into the weekend infection period beginning late afternoon Friday, March 31st .

NEWA ascospore at 4% for April 1st , present total discharge at 2% with expected infection eveny March 31st – April 2nd.

Insects:

Increasing pheromone trap captures increasing for Speckled green fruitworm (SGFW 9/trap) and Redbanded Leafroller (RBLR 3/trap).

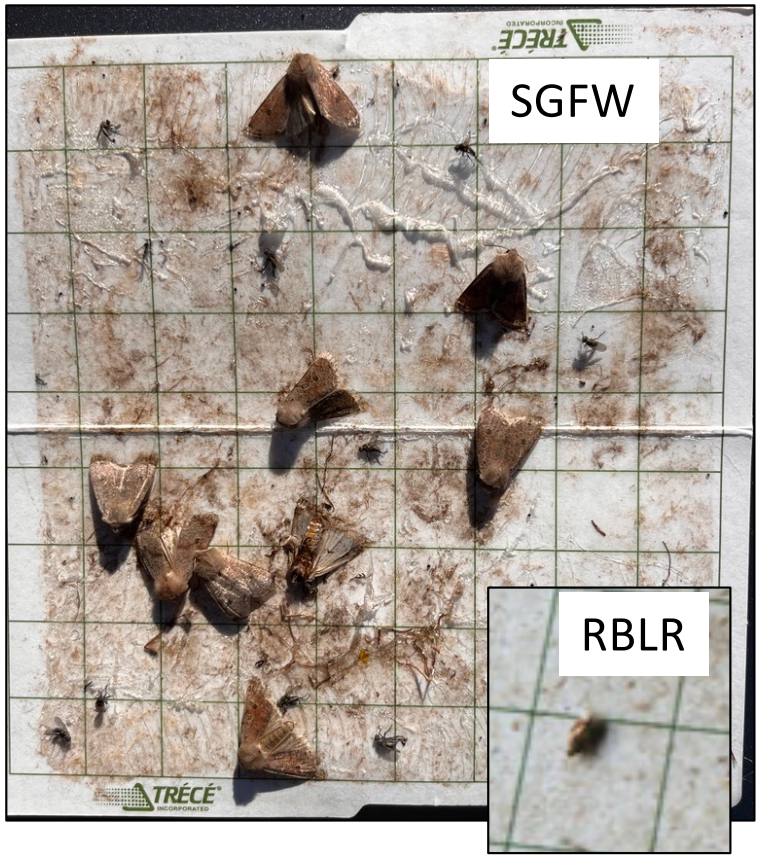
No Black Stem Borer (BSB) adult flight observed in EtOH traps.

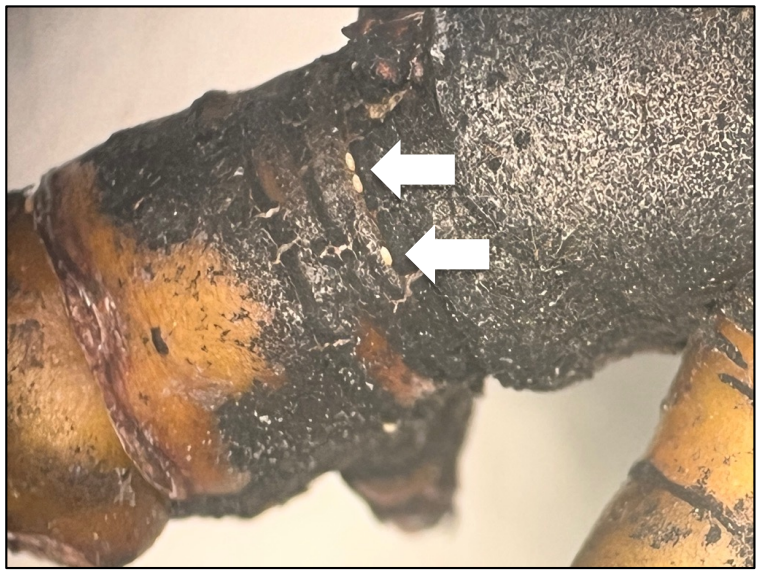
No DWB larva observed in perimeter assessments of commercial orchards.

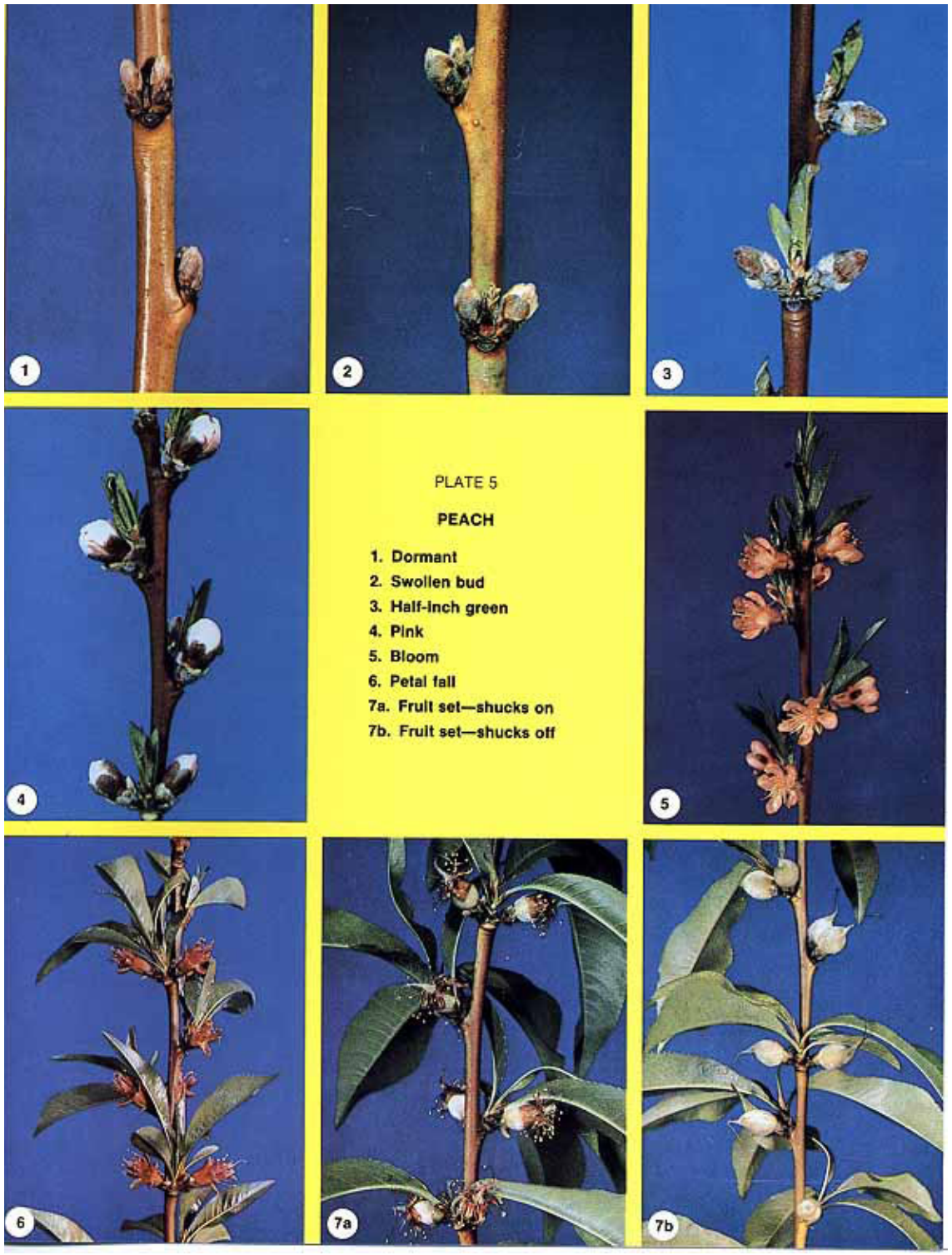
No European Red Mite overwintering eggs observed in infested varietied last season upon effective management in August.

San Jose Scale (SJS) observed in individual trees infested in 2022.

Pear psylla eggs increasing to >0.9/eggs bud



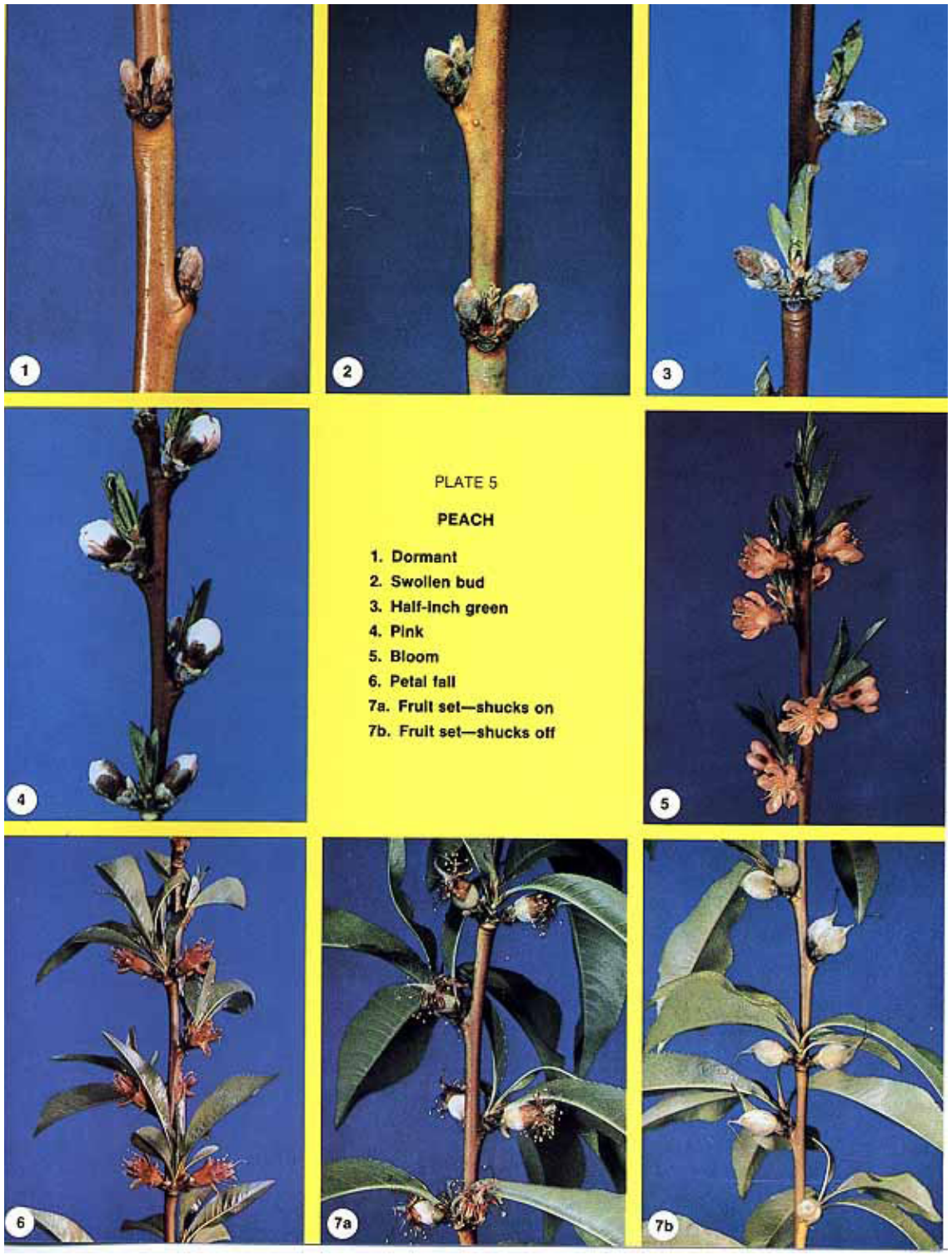




2023 Mid-Hudson Valley Stone Fruit

>Swollen bud:

* Early green showing on terminal tips
* High percentage of dead buds



Mid-Hudson Valley Stone Fruit

Swollen bud:
*Early green showing

Peaches: Milton, NY

- High percentage of flower bud kill
- Mid-hill cut branches show 7 flowers on three young branches approx. <10% bud survival.

Mid-Hudson Valley - Milton

Green tip: Fuji, Pink Lady, Ruby Frost,

Honeycrisp
*Early mouse-ear ¼" green.

Upcoming cold temperatures:
April 1st, Sunday 25°F
< 10% bud kill

Critical Spring Temperatures for Tree Fruit Bud Development Stages

Pome Fruit									
Apples	Silver tip	Green Tip	½ inch green	Tight Cluster	First Pink	Full Pink	First Bloom	Full Bloom	Post Bloom
Old temp	16	16	22	27	27	28	28	29	29
10% kill	15	18	23	27	28	28	28	28	28
90% kill	2	10	15	21	24	25	25	25	25
Pears	Bud Swell	Bud Burst		Tight cluster	First White	Full White	First Bloom	Full Bloom	Post Bloom
Old temp	18	23		24	28	29	29	29	30
10% kill	15	20		24	25	26	27	28	28
90% kill	0	6		15	19	22	23	24	24

Apple Phenology (Marshal Mac on M-26 1980-2020)

Year	GT	HIG	T.C.	Pink	Bloom	PF	PF DD_{43}	PF DD_{50}
2022	4/4	4/9	4/14	4/21	5/7	5/14	528.0	255.0
2021	3/29	3/39	4/5	4/17	4/21	5/5	480.0	245.0
2020	3/23	4/6	4/13	4/26	5/9	5/19	535.1	245.7
2019	4/10	4/15	4/19	4/22	5/8	5/15	533.1	257.2
2018	4/18	4/28	4/30	5/4	5/9	5/14	514.5	274.6
2017	4/2	4/11	4/17	4/24	4/27	5/8	603.0	312.0
2016	3/17	4/04	4/11	4/18	4/25	5/12	597.8	186.0
2015	4/13	4/20	4/27	5/4	5/6	5/12	527.8	304.5
2014	4/14	4/18	4/28	5/6	5/12	5/19	594.9	321.5
2013	4/13	4/18	4/24	4/30	5/7	5/13	510.6	262.2
2012	3/16	3/18	3/25	4/8	4/16	4/21	506.5	267.5
2011	4/4	4/11	4/25	5/1	5/9	5/16	526.0	268.3
2010	3/20	4/2	4/6	4/10	4/20	4/28	305.0	168.5
2009	4/6	4/13	4/20	4/24	4/29	5/7	452.0	219.6
2008	4/10	4/14	4/21	4/24	4/29	5/7	404.5	207.4
2007	4/2	4/21	4/24	5/2	5/7	5/14	397.0	228.3
2006	4/3	4/10	4/17	4/22	4/26	5/8	419.2	220.0
2005	4/7	4/11	4/18	4/26	5/8	5/16	493.7	258.6
2004	4/12	4/19	4/22	4/27	5/3	5/13	558.5	304.7
2003	4/7	4/16	4/24	4/28	5/1	5/19	595.0	324.7
2002	3/25	4/10	4/14	4/15	4/16	5/7	498.0	283.2
2001	4/11	4/17	4/25	4/28	5/2	5/10	481.3	288.0
2000	3/27	4/2	4/14	4/24	5/1	5/8	488.3	346.0
1999	4/2	4/7	4/12	4/26	5/2	5/13	530.1	174.4
1998	3/27	3/29	4/1	4/10	4/23	5/4	498.1	382.0
1997	4/4	4/11	4/21	4/28	5/1	5/14	422.7	250.0
1996	4/15	4/19	4/22	4/29	5/6	5/20		
1995	4/11	4/19	4/24	4/29	5/8	5/19		
1994	4/11	4/14	4/20	4/29	5/5	5/12		
1993	4/12	4/19	4/24	5/1	5/3	5/10		
1992	4/13	4/21	5/4	5/7	5/12	5/18		
1991	4/5	4/8	4/11	4/17	4/27	5/7		
1990	3/21	4/16	4/23	4/26	4/29	5/11		
1989	3/29	4/17	4/28	5/3	5/9	5/19		
1988	4/4	4/9	4/28	5/5	5/8	5/19		
1987	3/29	4/10	4/18	4/22	4/29	5/16		
1986	3/31	4/7	4/19	4/27	5/3	5/8		
1985	3/30	4/12	4/15	4/22	5/4	5/12		
1984	4/10	4/26	4/30	5/6	5/16	5/24		
1983	4/12	4/27	4/30	5/2	5/5	5/18		
1982	4/15	4/22	4/30	5/4	5/13	5/17		
1981		4/8	4/16	4/22	5/5	5/14		
1980	4/15		4/24	5/2	5/5	5/10		
Earliest day	**3/16**	**3/18**	**3/25**	**4/8**	**4/16**	**4/21**	305.0	168.5
Latest day	**4/18**	**4/28**	**5/4**	**5/7**	**5/16**	**5/24**	603.0	382.0

Midrange: **3/31** (+/-14D) Mean days in bloom 9.4 days

4/7 (+/-20.5D)

4/14 (+/-20D)

4/22 (+/-14D)

5/1 (+/-15D)

5/7 (+/-16.5D)

2023: Delayed Spring?

Greentip 23rd March

Ruby Frost, Gala (Orange Co.)

!/4" Green 31st March

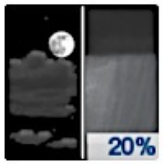
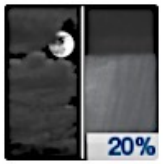
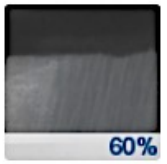
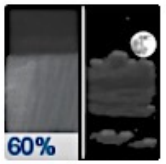
Ruby Frost (Milton)

Green tissue in early Gala

April 2nd Degree Day Accumulations. Milton, NY 135_{43BE} 39_{50BE}

Current conditions at
Poughkeepsie, Dutchess County Airport (KPOU)
Lat: 41.63°N Lon: 73.88°W Elev: 164ft.

Weather Predictions - Application windows

Tonight	Monday	Monday Night	Tuesday	Tuesday Night	Wednesday	Wednesday Night	Thursday	Thursday Night
								
Mostly Clear	Mostly Sunny	Partly Cloudy then Slight Chance Showers	Slight Chance Showers	Mostly Cloudy then Slight Chance Showers	Showers Likely	Showers Likely	Showers Likely	Showers Likely then Partly Cloudy
Low: 25 °F	High: 61 °F	Low: 43 °F	High: 64 °F	Low: 48 °F	High: 61 °F	Low: 56 °F	High: 74 °F	Low: 39 °F

Detailed Forecast

Tonight	Mostly clear, with a low around 25. North wind 5 to 9 mph becoming calm in the evening.
Monday	Mostly sunny, with a high near 61. South wind 5 to 14 mph, with gusts as high as 24 mph.
Monday Night	A slight chance of showers after 1am. Mostly cloudy, with a low around 43. South wind 5 to 8 mph becoming calm after midnight. Chance of precipitation is 20%.
Tuesday	A slight chance of showers before 2pm. Mostly cloudy, with a high near 64. Light and variable wind becoming south 5 to 10 mph in the afternoon. Chance of precipitation is 20%.
Tuesday Night	A slight chance of showers after 2am. Mostly cloudy, with a low around 48. South wind 5 to 7 mph becoming calm. Chance of precipitation is 20%.
Wednesday	Showers likely, mainly after 2pm. Cloudy, with a high near 61. Chance of precipitation is 60%. New precipitation amounts of less than a tenth of an inch possible.
Wednesday Night	Showers likely, mainly before 8pm. Mostly cloudy, with a low around 56. Chance of precipitation is 60%.
Thursday	Showers likely, mainly after 2pm. Mostly cloudy, with a high near 74. Chance of precipitation is 60%.
Thursday Night	Showers likely before 8pm. Mostly cloudy, with a low around 39. Chance of precipitation is 60%.
Friday	Mostly sunny, with a high near 53. Breezy.
Friday Night	Mostly clear, with a low around 32.
Saturday	Mostly sunny, with a high near 55.
Saturday Night	Partly cloudy, with a low around 34.
Sunday	Mostly sunny, with a high near 61.

Monday

event

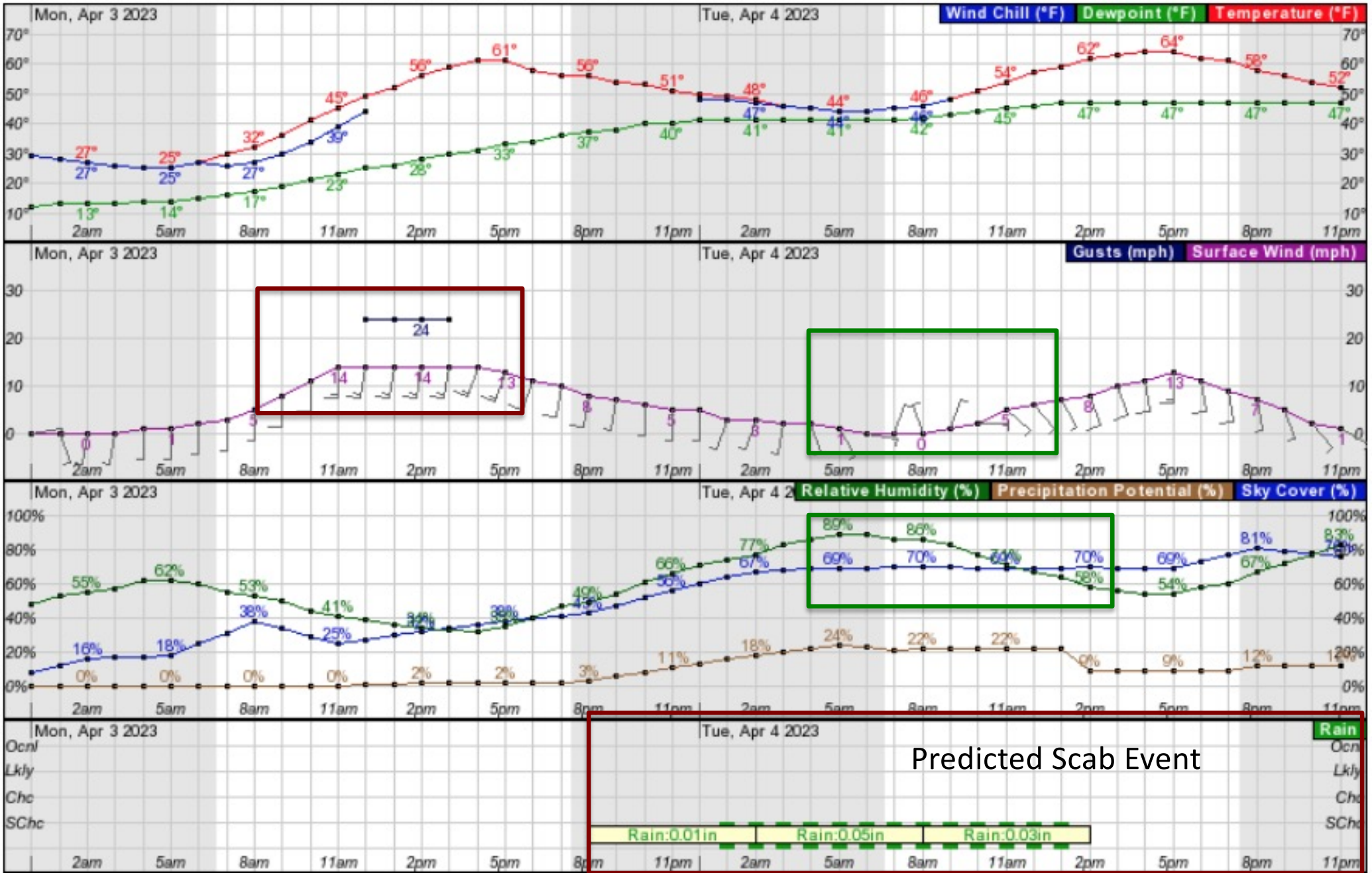
Today…wind after 10 AM - gusts to 24 mph

Tuesday

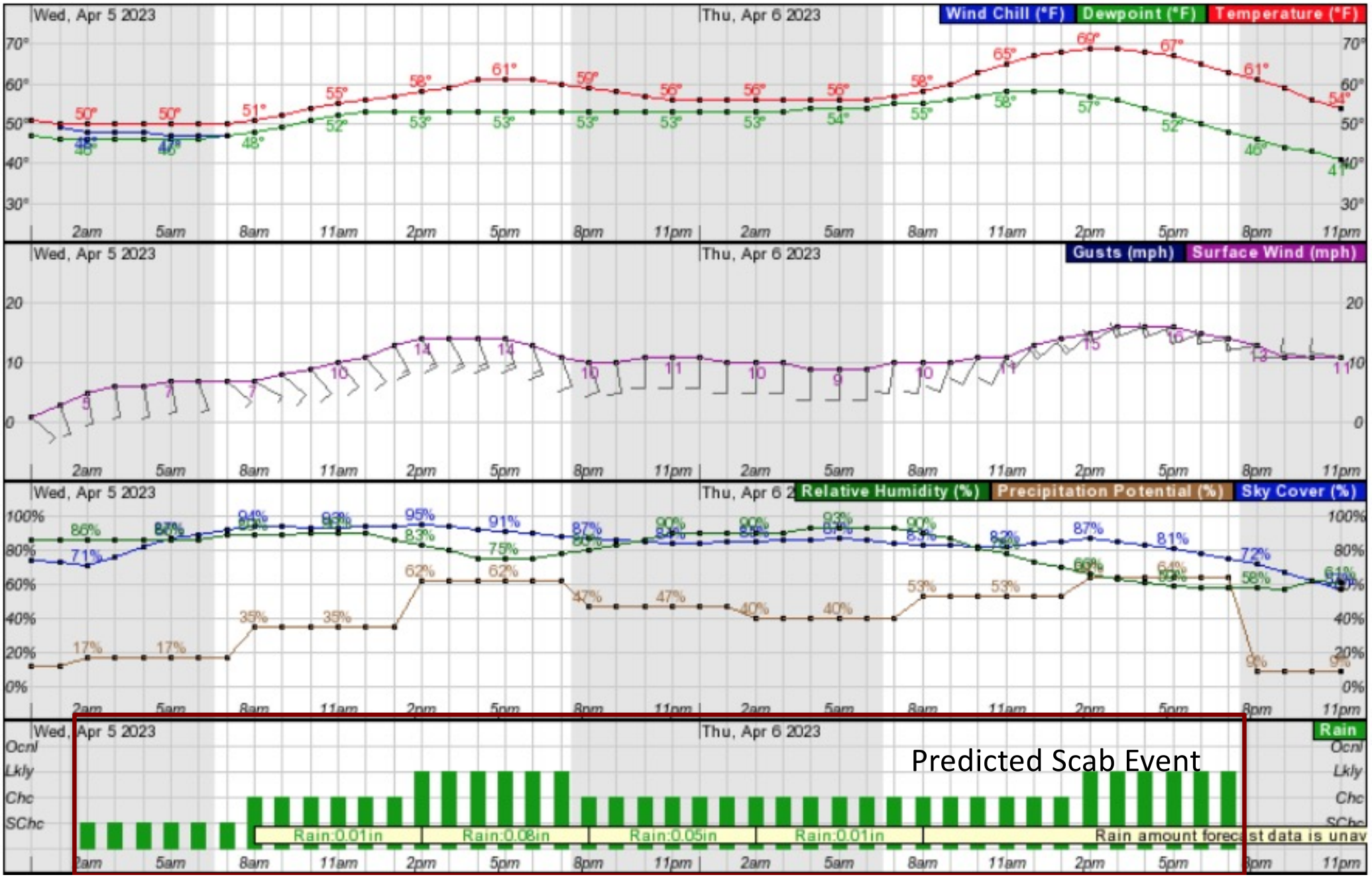
Tuesday -Thursday: Predicted apple scab

Low to moderate wind

rH good for adhesion / chance rain



Wednesday -Thursday: Predicted apple scab event



Mon 03	62°/42°	Partly Cloudy	4%	SSW 18 mph
Tue 04	63°/47°	AM Showers	39%	NE 6 mph
Wed 05	58°/53°	Showers	57%	ESE 6 mph
Thu 06	70°/41°	Scattered Thunderstorms	62%	WSW 9 mph
Fri 07	57°/31°	Partly Cloudy	1%	WNW 14 mph
Sat 08	56°/33°	Mostly Sunny	0%	NW 8 mph
Sun 09	64°/41°	Mostly Sunny	7%	SW 10 mph
Mon 10	64°/46°	AM Showers	34%	SSW 9 mph
Tue 11	61°/43°	Showers	58%	WSW 9 mph
Wed 12	62°/43°	AM Showers	48%	NW 9 mph
Thu 13	65°/42°	Partly Cloudy	24%	WNW 9 mph
Fri 14	67°/46°	PM Showers	34%	WNW 8 mph
Sat 15	68°/47°	Partly Cloudy	19%	NW 9 mph
Sun 16	68°/46°	Partly Cloudy	19%	WNW 9 mph

Apple Scab / SJS / ERM

Prior copper / oil

Or

Manzate / Captan

Apple Scab Modeling

NEWA

Results for Milton (Crist), NY

Ascospore Maturity Summary

Date	Ascospore Maturity	Daily Ascospore Discharge	Cumulative Ascospore Discharge
Mar 31	2%	<1%	2%
Apr 1	3%	1%	3%
Apr 2 Forecast	3%	0%	3%
Apr 3 Forecast	3%	0%	3%
Apr 4 Forecast	4%	<1%	3%
Apr 5 Forecast	5%	<1%	4%
Apr 6 Forecast	7%	2%	7%
Apr 7 Forecast	8%	<1%	7%

Apple Scab Modeling

NEWA

Results for Milton (Crist), NY

Infection Events Summary

Date (2023)	Infection Events	Average Temp (°F) for wet hours	Leaf Wetness (hours)	Hours > 90% RH	Rain Amount
Mar 31	combined	44	5	0	0.02
Apr 1	yes	52	9	8	0.32
Apr 2 Forecast	no	-	0	0	0
Apr 3 Forecast	no	-	0	0	0
Apr 4 Forecast	combined	45	1	1	Night: 21% Day: 20%
Apr 5 Forecast	combined	57	18	7	Night: 17% Day: 61%
Apr 6 Forecast	yes	63	18	6	Night: 46% Day: 63%
Apr 7 Forecast	no	-	0	0	Night: 10% Day: 2%

Green Tip

Pest	IRAC & FRAC	Product	Rates	PHI (days)	REI (hrs)	Efficacy
Apple scab	7	*†Sercadis	4.5 fl oz/acre	0	12	High
	7	*Aprovia	5.5-7.0 fl oz/acre	30	12	High
	M1	Badge SC	3.5-7.0 pts/acre	0	48	
	M1	§Badge X2	3.5-7.0 lb/acre	0	48	
	M3	Manzate ProStik	3.0-6.0 lb/acre 1.0-2.0 lb/100 gal water	BL, 77(A)	24	
	M3	Penncozeb 75DF	3.0-6.0 lb/acre 1.0-2.0 lb/100 gal water	BL, 77(A)	24	
	M3	Polyram 80DF	3.0-4.5 lb/acre	BL, 77(A)	24	
	M4	Captan 50WP	8.0 lb/acre 1.0-2.0 lb/100 gal water	0	24	
	M4	Captan 80WDG	5.0 lb/acre 0.65-1.25 lb/100 gal water	UDH	24	
	U12	Syllit FL	1.5 pts/acre	7	48	
	9	Scala	7.0-10.0 fl oz/acre	72	12	
	9	Vangard WG	3.0-5.0 oz/acre	0	12	
	9 + 7	*†Luna Tranquility	11.2-16 fl oz/acre	72	12	High
	11 + 7	*†Luna Sensation	4.0 to 5.8 fl oz/acre	14	12	High
	11 + 7	*†Merivon	4-5.5 fl oz/acre	0	12	High
Powdery Mildew	9 + 7	*†Luna Tranquility	11.2-16 fl oz/acre	72	12	Moderate
	11 + 7	*†Luna Sensation	5.0 to 5.8 fl oz/acre	14	12	High
	11 + 7	*†Merivon	4-5.5 fl oz/acre	0	12	High

Pear psylla		§DES-X	2 gal/100 gal water	0	12	Moderate
		§M-Pede	2 gal/100 gal water	0	12	Moderate
		§Surround 95WP	50 lb/acre	UDH	4	Moderate
	3A	Ambush 25WP	12.8-25.6 oz/acre	PB	12	Moderate
	3A	*Asana XL 0.66EC	9.6-19.2 fl oz/acre 7.3-12.8 fl oz/100 gal water	28	12	Moderate
	3A	*Danitol 2.4EC	16-21.3 fl oz/acre	14	24	Moderate
	3A	*Pounce 25 WP	12.8-25.6 oz/acre	PB	12	Moderate
	3A	*Mustang MAXX	1.28-4.0 fl oz/acre	14	12	Moderate
	3A	*Warrior II 2.08CS	1.28-2.56 fl oz/acre	21	24	
	4A	*†Actara 25WDG	5.5 oz/acre	14/35 (A)	12	High
	4A	Assail 30SG	4-8 oz/acre	7	12	Moderate
	4D	*†Sivanto Prime	10.5-14.0 fl oz/acre	14	4	High
	5	Delegate 25WG	4.5-7 oz/acre	7	4	High
	7C	Esteem 35WP	4-5 oz/acre	45	12	High
	16	*†Centaur 0.7WDG	34.5-46 oz/acre	14	12	High
	28	*†Exirel (FMC)	13.5-20.5 fl oz/acre	3	12	High
	6 + 28	*†Minecto Pro	10.0-12.0 fl oz/acre	28	12	High

THE JENTSCH LAB

INSECT BIOLOGY, ECOLOGY, AND MANAGEMENT IN HUDSON VALLEY AGRICULTURAL COMMODITIES

Thank you for your participation