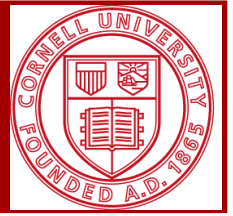




FRUIT NOTES

Lake Ontario Fruit Program



Volume 13 Issue 8

Every effort has been made to provide correct, complete, and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are still possible. These recommendations are not a substitute for pesticide labeling. Please read the label before applying any pesticide.

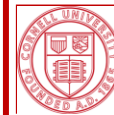
April 24, 2013

Simple Pruning Rules for a Mature and Efficient Peach Tree

M. Miranda Sazo, T.L. Robinson, and S.A. Hoying

There are 4 general peach pruning rules that apply to all peach trees in NY State:

1. Prune during dry weather and warmer temperatures at pink or bloom stages. Pruning under these weather conditions limits the spread of *Cytospora* canker. *Cytospora* canker is a cool weather disease that is most active in the spring and fall. It infects during cool wet conditions. Try to select an extended dry weather period during bloom. Trees are growing rapidly and wounds will heal quickly, effectively sealing out the fungal spores. This is especially important in blocks near existing peaches, cherries, or hedgerows where the fungi are always present. There are no chemical controls for *Cytospora*, only cultural management! The first step in pruning a peach tree in NY State is to remove all visible cankers throughout the tree. If they occur on the trunk or main scaffolds, consider "surgery" to remove infected tissue back to the wood. Lastly pruning at bloom also allows you to assess the crop and make intelligent decisions about how much wood can be taken off and still preserve a full crop and encourage good shoot growth.
2. In general do not leave stubs when pruning peaches. Stubs commonly can become infected with canker since they do not easily form healing callus, flush cuts callus over and heal quickly. However, most modern peach training systems require replacement branches in the lower part of the canopy, which will not grow from flush cuts. Thus we recommend leaving stubs in the lower portion of the tree where re-growing fruiting wood is a challenge (see recipe for V-Systems below).
3. Remove all very fine wood (smaller than the diameter of a pencil) throughout the tree particularly on the trunk and main scaffolds. Remove all shoots less than 6" long because short shoots produce small fruit. This wood, especially when shaded, dies and becomes a site for canker infection on the structural parts of the tree. Ideally all fruiting wood throughout the tree is "pencil sized".
4. Reduce crop load during pruning to reduce the hand-thinning job later. We say, "Prune to thin"! Peach trees often set 10 times as many fruits as needed for a full crop! Hand thinning is expensive, time consuming, and the quality of your work can affect ultimate fruit size (the bottom line). By removing ½ of the potential flowers during pruning you can significantly reduce the amount of hand thinning required later. With a good bloom this entails pruning off 1/3 to 1/2 of the remaining branches and thinning out fruiting wood keeping the best pencil size. As with apples, the earlier the thinning is done the better result in fruit size so reducing crop load at bloom via pruning will give better fruit size than waiting until hand thinning.



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Building Strong and Vibrant New York Communities

In addition to the general pruning rules there are specific rules for each planting system (Open vase, V-systems and Central Leader systems). Each system requires a different pruning scheme. Pruning a mature perpendicular-V or Quad-V tree is generally a simpler procedure than pruning an open-vase tree of equivalent age. Due to the regimented structure of the system, each tree is virtually identical. As a result, pruning can be performed quickly and efficiently because only a single ladder position is needed to prune each scaffold.

When pruning a mature perpendicular-V or quad-V tree, we recommend using a system of **renewal pruning** in which the previous season's fruiting shoots (hangers) are cut back to the main scaffold as closely as possible while still ensuring the development of a replacement shoot. When doing this pruning at bloom it is easy to identify the last vegetative bud on a shoot that is closest to the trunk and cut to that bud to ensure a replacement shoot. If flush cut pruning is done on the trunk then no replacement shoots develop. Renewal pruning on V-systems also entails the removal all previous-season shoots with tertiary branches originating from auxiliary buds during the summer. With this type of pruning, the highest-quality fruiting wood

(12-19 inches long and 1/4 inch in diameter) is developed each year for fruit production in the upcoming season. Renewal pruning also keeps the fruiting wood close to the trunk and prevents having all of the fruiting wood on the tips of branches and in the upper part of the tree.

When pruning a V-system tree, pay particular attention to shoots in the bottom 1/2 of the tree along the scaffold arms. Prune to keep bottom shoots actively growing and continually fruitful. To keep shoots growing in the lower portion of the tree they must receive adequate light during the season. This requires removing upper branches that shade the interior of an open center tree or a V-tree. Prune out most, if not all of the vigorous upright growth in the tree, which shades the lower half of the tree. Prune it all the way to where the branch originates. Keeping good light exposure to the bottom of the tree will also require 1-2 summers pruning's to keep interior of trees open by removing vigorous and upright interior growth.

Limit the height of the tree by head tops of scaffold arms maintaining approximately 10-12 feet in height and keeping tops very narrow and approximately in line with the main trunks by removing all large wood in the top facing in the row.

Taking Care of Apple Trees Before, During, and After Planting

M. Miranda Sazo, T.L. Robinson, S.A. Hoying, and M. Fargione

Only a relatively small proportion of Western NY fruit growers had optimal soil moisture conditions for early tree planting. A few of them also successfully incorporated the use of GPS-guided apple planting for precisely straight rows. We congratulate those growers who were able to plant trees early and those who are adopting more precise orchard management practices.

The majority of trees in WNY are still waiting to be planted. It is now extremely important to keep your trees in good condition while waiting to plant. We recommend the following: (1) when you receive trees open the boxes, open the plastic box liner to prevent fungal development on the trees and to

allow trees to breathe, (2) inspect trees for quality and condition, contact the nursery immediately if anything is wrong, (3) check to see that roots are moist and covered, if not water well, (4) store in a cooler or cold room at 34° F. The room should have been well aerated to remove any ethylene remaining from stored apples, (5) if cold room is not available, find a root cellar or common storage that stays as cold as possible, do everything you can to prevent nursery trees breaking dormancy before planting, trees already growing in the box will use limited reserves to re-grow those shoots in the field, (6) never store nursery stock with apples. The ethylene gas will severely damage trees, (7) plant as

soon as soil conditions warrant, and (8) do not plant if the soil is still too wet.

There are different ways to plan, prepare, and establish a successful high-density apple orchard. However, the decisions made now and methods used this 2013 year for establishing that orchard will have consequences for the next 20 years. We stress the importance of (1) advance planning for a minimum of two years to get the proper tree with the right rootstock and to prepare the soil well the year before, (2) the use of nursery trees of excellent quality whether they are bought or produced on the farm, (3) early spring or fall planting to allow early root establishment and maximum tree growth in the first year, (4) quick installation of a trellis support and irrigation lines soon after planting, and (5) optimal leader growth of 18-24" for each of the first 2-3 years as a result of a balanced nutritional program, irrigation, excellent weed control and overall good orchard management.

Today a modern high density planting must be supported with **12 foot posts** so trees are properly supported to quickly reach the top trellis wire (10 feet) by the end of the second or third year. A good, strong, and tall support system for a high density orchard must be viewed as an investment (rather than just an orchard establishment cost!) that allows fruit production in the early years while preserving the vertical tree structure (without ever allowing the top to bend if unsupported!) and developing a full canopy for future large, mature yields from the bottom to the top of the tree.

Planting the Young Apple Tree Carefully. The roots of a young tall spindle apple tree contain much stored nitrogen, hormones, and other elements, which are used in forming both new root growth and new top growth. Any broken or injured roots should be trimmed off, but the root system should not be reduced more than necessary prior to planting. Once your soil has dried out sufficiently and you are able to plant, keep your trees out of the sun and protected from drying winds (never allow the roots of the tree to dry out). If possible, soak roots for a couple of hours before planting using a pond, tub or barrel. Growers should plant trees

with at least 4-6 inches of rootstock out the ground. The soil should be packed firmly around the roots in order to establish good contact. At about two weeks after planting the trees should receive a small dose of nitrogen (1/4 lb. of calcium nitrate) carefully applied in a doughnut shaped band around each tree.

Pruning and Managing the Tall Spindle Apple Tree after Planting. If you plant a Tall Spindle apple block you should not head the leader. Heading of the leader of a young apple tree after planting is undesirable as it removes a significant portion of the tree structure already produced in the nursery. Even if a whip is planted, the leader is not pruned or headed at planting for the Tall Spindle system. Heading the leader disrupts and changes forever the natural growth and branching patterns of a young apple tree on a dwarfing rootstock intended to be grown as a Tall Spindle tree. Instead of heading a whip, we recommend applying Maxcel (500ppm) to stimulate branching of an "unheaded" whip so a more "calm tree" without much new upright growth as result of the heading cut. The Maxcel should be applied at a rate of 6.4 ounces/gallon with a backpack sprayer using a single nozzle to the leader from the tip down to 24 inches above the soil at 10-15 days after bud break. To improve branching even more you may combine the Maxcel treatment at 10-15 days after bud break with scoring (at bud swell) above every other bud along the leader from 24 to 45 inches high.

If you plant a Tall Spindle apple block with feathered trees you should remove any feathers larger than 2/3 diameter of the leader with a bevel cut, (3) if there are less than three feathers remove them with a bevel cut and treat the tree as a whip as described above.

Branch Management of Moderate and Highly Vigorous Apple Trees. It is essential with Tall Spindle orchards planted at 3 feet in-row spacing to tie down the feathers below horizontal soon after planting (before mid-June). Growers should invest the necessary time and effort to manage feathers of a young Tall Spindle orchard if the trees are growing vigorously. For example, all feathers on Fuji or

Macoun (two vigorous apple cultivars) should be tied or weighted down below the horizontal at planting or before mid-July to induce cropping and to prevent them from developing into large lower scaffolds. Tying is best done within one month after planting but can also be done in June, July, and even until August. The following materials are particularly suitable for tying down feathers below horizontal for the Tall Spindle system: (1) a strip of 5/8"-wide Avis-strap nailed or tied from the base of the trunk then split into strands and tied to each of the lower feathers, (2) a pre-cut 20-inch black annealed wire (sold as a 1000 pieces/bundle) each hooked around the feather directly down to the trellis wires, the conduit pipe or bamboo supporting pole, or the main trunk, and (3) a 4-inch long ghent rubber band (six-month-life with 880 rubber bands per bag) where the rubber band is tied on the trunk and the feather is placed through the band when it is stretched out. After about 4-6 months the rubber band stretches and is less effective for strong

feathers while Avis-strap strings and the pre-cut black annealed wire are suitable for bending both weak and vigorous feathers.

Ensuring Great Tree Growth the First Year. After the trees are planted, the graft union height adjusted, the trees are pruned and feathers are tied down, growers should focus on the basics of good tree management the first year: (1) Excellent weed control through the end of August, (2) regular small doses of nitrogen (1/4 lb of CaNO₃ every month for the first 4 months), (3) good water supply to minimize water stress of the young tree. Using trickle irrigation apply small amounts of irrigation water (3-5 gallons per week) each week of the growing season unless sufficient rain falls that week. Growers can now precisely determine how much water to apply to newly planted apple orchards using the Cornell apple irrigation website on the NEWA webpage at: <http://newa.cornell.edu/index.php?page=apple-irrigation>

Disease Management in Stone fruit

D. Breth and K. Cox

Apricots are in bloom, plums are approaching white bud. Sweet cherries are just past swollen bud. Peaches are at swollen bud to early pink bud depending on variety. As soon as blossoms begin to color, brown rot management becomes important. Although, we may not have a wet bloom, it may remain cool for the next week.

Brown rot and European Brown rot:

In NY and even neighboring states there is resistance to sterol demethylation inhibiting fungicide (DMI or SIs: Indar, Orbit, Tilt, etc.) in populations of *Monilina fructicola*, the causal agent of brown rot, is fairly widespread. Although, we have not found any populations with complete resistance to the QoI/Stroby fungicides, a slow incremental resistance to the QoI component of Pristine (QoI/Stroby & SDHI) is becoming increasingly prevalent in orchard populations. In addition to the typical North American species of the brown pathogen, European brown rot caused by *M. Laxa* is likely to play a larger role in brown rot infections during this time of the year. Oddly, in culture *M. Laxa* is incredibly sensitive to both DMI

and QoI (Stroby) chemistries even in orchard were the North American is fairly resistant. Tart cherries, sweet cherries, apricots and nectarines are the most susceptible to European brown rot, which must be managed during cool wet weather at bloom.

There would need to be considerable rainfall this week to result in an outbreak of blossom or shoot blight in apricots and plums. However, with last year's brown rot carryover inoculum in western NY, it's going to be important to implement a blossom blight management program.

Assuming a considerable amount of brown rot inoculum overwintering from the 2012 season with the light crop, begin fungicide sprays at pink or white bud using Bravo/Echo/Equus (chlorothalonil). If you had blossom or shoot blight in 2011, there is a strong possibility that you have European brown rot in your planting. In this case, start with one of the DMI or SI fungicides instead. This would include Rovral (a type of SI), which can be used in all stone fruit crops for 2 sprays per season but not after

petal fall, or one of the standard DMIs (Indar, Orbit, Quash). If you can afford Roval, even consider using in DMI resistance blocks as populations with DMI resistance seem to be sensitive to this somewhat unrelated SI fungicide. After this application, continue with a Bravo/Echo/Equus (chlorothalonil), program until shuck-split has passed. Rotate between fungicide classes for the preharvest sprays to manage fungicide resistance in brown rot populations. Also, consider the following:

- Alternate SI (Indar 2F, Inspire Super, Orbit, Quash) with QoI (Pristine or Cabrio on cherries only) fungicides or with captan during cover sprays to prevent the development of quantitative fungicide resistance (resistance based on rates, which is incremental).
- If allowed on the crop and practical for your spray plan, use an AP fungicide (Scala SC, Vanguard). Vanguard at 5 oz./acre is labeled for a maximum of 2 sprays per season (but not on sweet cherries), or Scala at 9-18 oz./acre (but not on cherries) using the low rate in mixtures with other fungicide. Scala is labeled for use on apricots, peaches, and plums. Vanguard is labeled on apricots, tart cherries, peaches, and plums.
- A rather new option would be to use Inspire Super as you would get the Vanguard (a.i. cyprodin) in addition to the DMI difenoconazole. This product can't be applied to sweet cherries, but tart cherries should be allowed. In our research trials at Geneva, Inspire was effective against brown rot on apricot.
- Bear in mind that if the weather is favorable for brown rot, product failures are possible even with a little quantitative (incremental) resistance.
- If you experience a management failure following Pristine, or Gem use, we would like to check your population for species and their mitochondria to make sure that no genetic exceptions exist in regards to QoI resistance.
- The key to preventing the development of fungicide resistance is to use appropriate rates. Do not reduce rates or practice alternate row spraying.
- Make sure to provide considerable protection in the period from petal fall to pit hardening. This is a period when stone fruit (except tart cherry) are highly susceptible to brown rot infection. Infections at this time may not necessarily

become active or apparent until the fruit get closer to ripening.

Black Knot on plums and cherries:

The black knots you see right now in plums and tart cherries will provide ascospores that will shoot under rainy conditions and infect succulent green twigs of the current season's growth usually at the leaf axils.

Ascospores can be available from these black, tumor-like infections as early as bud break until terminal shoot growth stops, but it is the period between white bud and shuck split that most of the ascospores are available and most susceptible tissue is exposed. If we have a dry spring, this critical primary infection season can be extended through June. Only a few hours of rain apparently are required at temperatures above 55° F to result in a black knot infection, whereas much longer rainy periods are required to produce infection at temperatures below 55° F.

Knots or galls from the current season's infections may become visible by the late summer of the year of infection but are usually not noticed until the following spring, when they begin to enlarge rapidly. The young knots from the previous year are capable of producing a few ascospores, but in general ascospores are often not formed until the second spring. In some situations the knots that you are seeing in your trees now is a result of an infection 2 seasons ago!

Control of this disease requires some vigilance in pruning out visible swellings from last season as well as the hardened black knots that have fully matured. Check your hedgerows for wild black cherry trees that also harbor black knot. It may take a few seasons to clean up an epidemic. Be sure to burn the black knots you remove from the orchard since they will continue to contribute ascospores until they are destroyed. In severe pressure, you should consider application of fungicide as early as budburst, but under lower pressure, fungicide can be delayed until white bud. The fungicide that has performed best in trials is chlorothalonil sold as other generics (Bravo/Echo/Equus), but alternatives include captan or Topsin M (not registered for black knot other than plum). Be sure to stop chlorothalonil applications at shuck split. Chlorothalonil and captan applied for black knot will also provide brown rot blossom blight protection in tart cherries and plums and will also help with fungicide resistance management for brown rot.

Pest Updates

D. Breth

Fire blight text alerts: if you know how to text with your phone, you can text Debbie at 585-747-6039 to get on the FB alert list. ***If you are enrolled in the LOF program*** with your partner county CCE office, we will send you a short blossom blight alert based on the risk predictions of the models. We will need to know your cell phone number and phone carrier to send a text message to you. Sign up anytime now – but these alerts will not start until we get to pear and apple bloom.

Order mating disruption supplies now! If you plan to use mating disruption to help you conquer codling moth populations on your farm from last season, here are some suggestions...

The best control is achieved when mating disruption pheromones are used over large contiguous acreage, but we have worked in orchards as small as 5 acres. It depends on what is surrounding the orchard you plan to disrupt; the larger the area, the better. Do not reduce rates of pheromone dispensers at least until after the first season results in no damage at harvest. Do not take shortcuts in applying insecticides even if you have invested in mating disruption pheromones.

Several pheromone products are available for disrupting the mating behavior of codling moth and oriental fruit moth. We've experienced the most success with time-release products such as Isomate CM/OFM TwinTube dispensers at 200 per acre, or Checkmate Duel CM/OFM at 200 per acre. A third option is the Suterra Checkmate Puffer, deployed at 1 unit per acre, with 1-2 rows of hand-applied dispensers around the outside edges of the orchard.

Some growers have shown success using sprayable pheromones to avoid the labor of

installing hand-applied dispensers. This is very management-intensive, is ineffective with rainfall, and growers tend to wait to see moth flight before planning an application. The delay between first moth catch and applying pheromone allows a period of time when mating will occur; consequentially, we see egg laying and larval fruit penetration when sprayable pheromones are applied after the flight. For assistance in designing a dispenser distribution plan for your farm, feel free to call Debbie Breth.

How do you adjust insecticide timings when using MD pheromones ?

When pheromone products are implemented at the proper rate under high overwintering insect pressure, it will still be necessary to apply 2-3 well timed sprays for the first generation of CM using the same DD timings where no disruption is used. You will also need 1-2 insecticide sprays for the second generation, which should result in no fruit damage by the end of the season. The impact of the first season of MD under high pressure is the elimination of September insecticides targeting these pests. In the second season, if no damage occurred during the first season, continue using pheromones at the same rate, but you should be able to reduce insecticide applications to 2 for the first generation and 1 for the second generation. In the third season with mating disruption, our experience has shown we can reduce insecticides that target CM to 1 per generation and reduce the pheromone rate by 25% of Isomate CM/OFM from 200 to 150 dispensers per acre and Suterra Puffers from 1 puffer per acre to 1 puffer per 1.25 acres. I will include further detail on managing codling moth as we get closer to the control timing.

Strategies for Controlling Pear Psylla Pre-Bloom after Oil

Peter Jentsch

For full text of article in Scaffolds:

<http://www.scaffolds.entomology.cornell.edu/2013/SCAFFOLDS%204-22-13.pdf>

A diversity of insecticides with different modes of action are available in NYS, allowing for further pre-bloom options. One such option for ovipositional deterrence is through the use of Surround WP, a kaolin clay product, at 50 lb/A, made at first egg observation. In recent trials conducted at Cornell's Hudson Valley lab and in a regional grower orchard, Surround WP gave significantly better control of pear psylla adult egg laying than 2% oil at the same timing in a single spring application, even with considerable rainfall. Multiple applications of Surround WP used at the 50 lb/A rate, beginning at delayed dormant followed by a white bud and a petal fall application, gave us excellent control of 1st generation psylla, the Lepidoptera complex, European apple sawfly, and plum curculio in field trials. It is somewhat weak on San Jose scale and the plant bug complex. I would recommend a <2.5 mph tractor speed and >100 GPA to obtain the highest degree of efficacy with this product.

The second approach is the use of an insect growth regulator such as Esteem 35WP at 4–5 oz/acre or Centaur 0.7WDG at 34.5–46.0 oz/A, used during the pre-bloom period to decrease egg hatch and reduce the viability of eggs laid by treated adults. It should be applied with 0.25% v/v horticultural spray oil prior to sustained egg-laying (mid-April in the Hudson Valley). Esteem may be applied once at pre-bloom or once pre-bloom and once at petal fall as a tactic for both psylla reduction and as a resistance management strategy to alternate yearly with Agri-Mek. Remember, its mode of action is as an ovicide and to control early instar nymph development, so it will not directly reduce the adult or nymph population.

Using oil is a pre-requisite to at least two follow-up strategies. One option after oil is the use of an adulticide, to kill the adults after they have completed migration into pear orchards, and before significant eggs have been laid. In the Hudson Valley, oil is generally applied during the first week of April and migration is completed in late April. If the 2013 season, just starting, continues in a similar manner, the cooler temperatures may prolong migration.

Adulticides would be employed in mid- to late April to reduce the adult population. The choices for managing adult psylla include Thionex 3EC (2.67 qts/A) – note that EPA has mandated a stop-use date of July 31, 2013 for endosulfan in pears; the neonicotinoids Actara 25WDG (5.5 oz/acre), Assail 30SG (4.0–8.0 oz/acre), and Calypso 4F at 4–8 oz/A. The use of 1 quart of oil per 100 gal of finish spray solution (0.25% v/v) has been found to increase the neonicotinoids' effectiveness, but is not required by the label. The NY label allows a total of 11.0 oz/A (0.172 lb a.i./A) of Actara (or 0.172 lb a.i. of thiamethoxam-containing products such as Endigo ZC per acre) per growing season. Multiple applications of Actara require the applicator to have the most recent Special Local Need (SLN) label.

Pyrethroid adulticides control options include Ambush 25WP (pre-bloom only) at 12.8–25.6 oz/acre, Asana (9.6–19.12 fl oz/A), Pounce 25WP (pre-bloom only) at 12.8–25.6 oz/A, Proaxis 0.5CS at 2.6–5.1 fl oz/A, Warrior II at 1.28–2.56 fl oz/A, and Danitol 2.4EC at 16–21.3 fl oz/A. In general, researchers have found the pyrethroids to be less effective at higher temperatures on many different insect species and, as such, pyrethroid use should be considered primarily during the cooler pre-bloom periods. There is also evidence that pyrethroids can cause resurgence in Comstock mealybug populations in pome fruit. Delegate 25WG used at 4.5–7.0 oz/A is another good alternative for use against the 1st generation pear psylla nymph population during the pre-bloom period. However, an ideal timing for this product would be during the early hatch of obliquebanded leafroller, which usually coincides with the end of the 2nd generation and onset of the 3rd generation psylla (mid-June).

To add to the discussion of early pest management for psylla, we would be remiss not to mention that the use of postbloom Agri-Mek has been the standard method of psylla management in New York since 1996. Although we have not seen an outright failure or loss of efficacy with Agri-Mek in NYS, it appears to be losing control when applied 7–10 days post-petal fall at the high rate, in two applications 21 days apart. To maintain effectiveness, a rotational program of Agri-Mek

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- Precision Chemical Thinning Meeting May 1, [A137 Barton Lab \(Building Change\)](#), NYSAES, Geneva

with other effective materials should be considered for resistance management purposes. Agri-Mek SC is the currently available product as a more concentrated formulation with 8% active as a suspension concentrate. It can be used from 10 days to about 4 weeks post-PF, but its efficacy decreases as the foliage hardens off. It requires the use of a minimum of 0.25% v/v horticultural spray oil to penetrate the foliar waxy cuticle and achieve translocation within the leaf for optimum nymph feeding uptake. Agri-Mek SC can be used in multiple applications of 2.25–4.25 oz/A beginning at 7 to 14 days after petal fall, with a follow-up application 21 days post-PF as per label

requirements, totaling no more than 2 applications or 8.5 oz/season, and no later than 28 days prior to harvest. The 2nd application targets newly developed foliage preferred by psylla nymph populations.

An alternative to Agri-Mek is the use of Actara 25WDG at 5.5 oz/A. Actara is in the neonicotinoid class of insecticides, and is effective against both nymph and adult populations. We have found it has slightly better efficacy when used with a 0.25% v/v horticultural spray oil. It will also effectively control plum curculio and Comstock mealybug when applied at petal fall (not registered for use in Nassau or Suffolk Counties).

Save the Dates

Wednesday, May 1 , 3-5 PM- Precision Chemical Thinning Meeting, A137 Barton Lab- ([Building Change](#)), NYSAES, Geneva— Parking available behind Barton Hall. For all consultants and WNY growers interested to implement the “Precision Thinning” approach. This is an improved method of conducting chemical thinning that utilizes both the carbohydrate model as a tool for predicting response prior to application of chemical thinners and the fruit growth rate model for early assessment of thinning response immediately after application.