Cornell University Cooperative Extension

Eastern NY Commercial Horticulture Program

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Berry News

SWD Egg Laying in Extreme Drought & Heat

(*Editor's note: This post is from the SWD blog dated July 21 by the NYS IPM Program: http://blogs.cornell.edu/swd1/ If you don't yet subscribe to this blog, we suggest you do. Visit the link and look for the box in the column on the right to subscribe.*)

The earliest ever arrival in New York State of this fast-reproducing insect rang alarm bells in anticipation of heavy infestations in early or mid-season berry crops that often escape damage. However, larval infestations have been curiously low in summer raspberry and blueberry crops sampled in many areas, including the Finger Lakes region. We suspect that the hot, dry conditions we have been experiencing could explain these low infestations.

Photo: Breathing tubes of SWD eggs, magnified by a microscope, on the surface of blackberry fruit.

Small flies like SWD are sensitive to desiccation (drying out) and therefore prefer to lay their eggs in darker, more humid conditions. SWD are more likely to lay eggs in shaded fruit, lower in the plant canopy, and even prefer laying eggs during the cooler, low-light conditions of dusk over other times of the day.

A halt in egg laying is reported in California when conditions are dry and temperatures climb above 85-90°F. A recent study conducted by our colleagues in Oregon has found that humidity not only plays a positive role in egg laying behavior, but also in the number of mature eggs carried by female SWD. (Tochen et al. 2016. Humidity affects populations of *Drosophila suzukii* (Diptera: Drosophilidae) in blueberry. J. Appl. Entomol. 47-57.) In other words, a female exposed to more humid conditions will make a greater investment of resources to grow new eggs and she will choose to lay more of those eggs.

This sensitivity to hot, dry conditions may explain the curiously low infestation rates we've seen so far in 2016, given the high daily temperatures and drought conditions. And, there are significant implications for management. Plant canopy management may be an important cultural strategy for SWD control. In addition to improving fruit quality, proper pruning can open up plant canopies. An open canopy aids in better spray coverage when applying foliar insecticides and also helps in decreasing the humidity within the microclimate of that canopy. There are ongoing studies taking a direct look at the effects of pruning and humidity on SWD infestations, so stay tuned for more information in the future.

This post was contributed by Dr. Anna Wallingford, postdoctoral research associate, in Dr. Greg Loeb's small fruit and grape entomology program, Cornell University, NYSAES, Geneva, NY.

In this issue of Berry News:

Late Season Strawberry Care– Including Foliar Disease Management

Kathy Demchack, Pennsylvania State University

This is the time of year when your strawberry plants are initiating flower buds for next year's crop. So, anything you can do take care of your plants now will help to increase next year's yields. Failure to take care of them now could set the stage for poor yields next year. So, what do we need to do?

- Make sure the plants have adequate water (1-2" per week).
- Make sure the plants have sufficient nitrogen (20 to 30 pounds applied during the mid-August to mid- September time frame, or slightly more on sandy soils). If you've experienced a lot of rain since renovation, you may want to apply the nitrogen a bit earlier than usual, especially if plants are light green and are not growing as fast as usual. Nitrogen you applied at renovation may have been washed through the soil, especially if it was in a nitrate form.
- Keep an eye out for foliar diseases and apply an effective fungicide for any fungal diseases. Injured leaves = less photosynthesis = less food for flower buds and healthy root growth, and a lot of inoculum overwintering can damage your plants, including fruit, next year. The trick is correctly identifying which leaf disease(s) you have, and knowing whether any the symptoms you are seeing are caused by fungus or a bacteria. Fungicides only work on diseases caused by fungi. Here's a description of leaf diseases in order from most common to least common.

Leaf scorch: Spots on leaves start our circular and dark red to purple. Eventually the center may turn brown, spots may coalesce, and entire leaves and become affected and die, given the whole plant a scorched appearance. Some common fungicides are effective against this disease, which can be easily confused which angular leaf spot, on which fungicides will have no effect

Angular leaf spot: At first, light green "windowpanes" between the veins show up on the leaf when it is held up to the light. From the top, these areas may have a blackened appearance at first. Later on, as affected areas enlarge and coalesce, the leaves may develop a reddish tinge, with leaf tissue eventually dying and turning brown. This disease (along with gray mold) was responsible for a lot of caps on the fruit turning brown or black this past spring. Fungicides don't affect this disease, but copper can help (see cautions below). Since leaf scorch and angular leaf spot are easily confused, here are some photos to help tell the difference. These photos are of the same two leaves, held differently so sunlight either shines down on them, or through them. The primary disease affecting the leaf on the left is leaf scorch, and the leaf on the right is angular leaf spot. In Figure 1, sunlight is shining down on the two leaves, the leaves appear very similar. In Figure 2, where leaves are held up so that sunlight shines through the leaf, you can see that light does not shine through the leaves with leaf scorch on the left, but the "windowpane" effect of angular leaf spot can be clearly seen in the leaf on the right. Note that in these two leaves, there is some of each disease present on each leaf, but the disease causing most of the spots is different.

Figure 1 – Sunlight shining down on two different leaves makes the leaves appear to be infected from the same disease. Leaf on the left has leaf scorch, leaf on the right has angular leaf spot.

Figure 2– The same 2 leaves held up to the sunlight. The leaf on the left has leaf scorch and the lesion looks about the same, but the leaf on the right that has angular leaf spot exhibits the "windowpane" effect.

Powdery mildew: Usually the first symptom noticed is leaf curling, where leaves fold inward along their length. There may be a purple tinge to the leaves. White powdery growth on the upper leaf surface may or may not be seen, but if you look at the leaves under magnification, as with a 16x hand lens, you may be able to see the growth of fungal mycelia on either leaf surface. On the leaf undersides, be careful not to confuse strawberry leaf hairs (they're straighter and thicker) with the mycelia.

Phomopsis leaf blight: As lesions grow, they form a V-shape, with the wide portion of the "V" at the leaf's edge.

Common leaf spot: I'm seeing less of this all the time - most of today's common strawberry varieties have resistance. Spots are small (1/8 to 1/4 inch across), and develop white to gray centers, which may fall out.

Once you've figured out which disease(s) you have, how do you treat them? First, any cultural controls that improve air circulation will help greatly. Keep rows narrowed, and keep plantings weeded. As a general rule of thumb, Nova and Pristine work well on any of the above diseases except for angular leaf spot – just be sure to tank-mix or alternate chemistries, such as with Captan, as both are susceptible to resistance development. Captan or Captevate work quite well on leaf scorch, common leaf spot, and phomopsis leaf blight, but not powdery mildew or angular leaf spot. Copper helps with angular leaf spot, but phytotoxicity is a concern, so follow precautions on the package and discontinue use if phytotoxicity appears.

Source: Pennsylvania Fruit Times Vol. 28, No. 7

Managing Japanese Beetles in Blueberries

Rufus Isaacs, Michigan State University

Japanese beetles have only one generation per year, but these beetles emerge over a long period from late June through August and they live for over 30 days. They feed on the foliage and fruit of blueberry plants, causing damage to the plant and increasing the risk of fungal diseases. Their emergence during mid-summer can also result in their presence during harvest, creating a risk of contamination. They are also highly mobile insects and can fly into fields from surrounding areas. This article provides information on insecticide options based on tests over the past few years conducted at the Trevor Nichols Research Complex and at growers' farms.

Making your farm less attractive to beetles - Many farms have sodded row middles and perimeters around fields, with irrigation being broadcast during the summer months. This is done for good farm management reasons, but it also creates ideal conditions for Japanese beetles to lay eggs, since they prefer to lay eggs in mown grass and in moist soil. While it may not make sense to do this in all farm situations, removing the grass or using a non-grass cover crop in row middles, or restricting irrigation to the crop row through a drip system are all approaches to reduce the suitability of sites for reproduction of this pest. Certain weeds are another magnet for Japanese beetles. Beetles are much more abundant in crop fields where there is poor control of wild raspberry, blackberry, Virginia creeper, wild grape, or sassafrass. These weeds are highly attractive and beetles will aggregate on these attractive plants and then lay eggs in the soil nearby. Plan now for a fall application of herbicide to control these plants and reduce the attractiveness of your fields.

A few thoughts about trapping - Traps are sold widely for Japanese beetle monitoring and control. However, these insects are very easy to see so they can be monitored by looking directly on the crop – you will know when they are present from the feeding damage and by seeing the beetles. Traps are highly attractive and draw beetles to them over large distances, so putting a trap near your crop fields will draw beetles from the surrounding landscape.

Photo courtesy of Cornell Berry Diagnostic Tool http://www.fruit.cornell.edu/berrytool/index.htm

Many of the attracted female beetles do not get trapped and end up landing on foliage nearby and feeding/mating then laying eggs in the soil near the trap, so this creates a hot-spot for next season. Mass trapping of beetles is also not economically feasible in commercial fruit plantings, and there is little evidence that this strategy will work to reduce beetle populations and crop injury. **The take-home message is that traps should be avoided because they will not help reduce Japanese beetle damage in fruit crops.**

Broad-spectrum insecticide options - The carbamates Sevin and Lannate provide immediate control of beetles present during the application. They are also stomach poisons, so if beetles eat treated foliage they will also receive a higher dose. This can be a good property for control of Japanese beetles since they eat so much that a strong dose of insecticide is taken up. Lannate has a short residual activity of a few days, whereas Sevin provides a week or more of protection. Sevin has a 3 or 7 day PHI depending on the crop, and Lannate ranges from 3- 14 days. The organophosphate Imidan (buffer Imidan to pH 6.0 in the spray tank) both provide excellent lethal activity on adult

continued on next page

beetles, although it can take a few days for their effects on Japanese beetles to be seen as the beetles take up the insecticide. Imidan provides 10-14 days of activity, with a 3 day PHI.

The many pyrethroids registered such as Danitol, Asana, and Mustang Max, give instant knockdown and mortality of adult beetles, with 7-10 days of activity. However, note that in high summer heat these insecticides provide shorter periods of activity than in cool weather. Beetles that do not receive a lethal dose of pyrethroid may also be repelled from treated fields, providing an additional mode for reducing infestation of crops at harvest. PHI's for pyrethroid insecticides vary from 1 to 14 days, so check the label before use.

Reduced-risk insecticides - The labeling of the neonicotinoids such as Provado, Actara, and Assail provides selective options for Japanese beetle management. These insecticides provide 2-5 days of lethal activity from the surface residues before being absorbed into the foliage. Thereafter, beetles must eat treated foliage to get a dose of the insecticide. Once inside the foliage, these locally-systemic insecticides are rainfast and provide repellency and knockdown activity, but with much less direct mortality from the residues. These neonicotinoids will also provide some control aphids and leafhoppers. The rate of these insecticides allowed in different crops will have a large impact on their effectiveness, and growers should consider the higher end of the rate range to achieve some lasting control of Japanese beetles.

Short PHI and organic options - For growers looking for beetle control immediately before harvest or in organically grown fruit crops, some selective insecticides with 0 day PHI's can provide a tool to repel beetles and help achieve beetle-free fruit during harvest. Compounds containing neem (Azadirect, Neemix etc.) have a 0 day PHI and pyrethrum (Pyganic) has a 12 hour PHI. These compounds are labeled for organic use, and have a short but effective impact on adult Japanese beetles, with some mortality, some knockdown off the crop, and some repellent activity. Typically there is only 1-2 days of activity against beetles because the residues do not remain active for long. The non-organic form of Pyganic, called Evergreen, also has a 12 hour PHI, and is much more effective against Japanese beetle than Pyganic due to the addition of a chemical that inhibits the beetle's ability to break down the insecticide.

A final option for protection against Japanese beetle is SURROUND WP, a white clay material applied to create a white coating on the surface of foliage and fruit to provide protection against insects. When applied to provide a good coating (typically requiring 2 or more applications), SURROUND has performed very well against Japanese beetle in trials conducted in blueberry and grape. If considering this approach to Japanese beetle control, be aware that the white coating on the fruit may require some removal after harvest to make the fruit marketable. This may be challenging for some types of fruit. For example, in blueberries the white residue was removed well from the surface during processing but deposits in the calyx cup were not removed even after running berries through a typical wet processing line with food grade detergents.

Soil-applied insecticides – Japanese beetles typically lay their eggs in moist grassy areas and many fruit farms have a large amount of this highly suitable habitat. An additional approach to reducing the impact of Japanese beetles in a farm is to reduce the overall population by targeting the grub stage of this pest to reduce the abundance of beetles in the following year. If the location of high grub densities near fruit fields is known, these areas could be treated with a soil insecticide to get maximum return on this treatment. Our experience in Michigan blueberry fields has been that application of Admire (16 oz/acre) to grassy field perimeters in late June/early July reduced the abundance of beetles on bushes for the first few weeks of their flight period in the next growing season. After that, beetles flying into the area from outside swamped out this effect, so there is only a short-lived benefit from targeting the grubs in fields surrounded by infested grassy areas. However, as part of an overall IPM program to minimize the impact of Japanese beetle, this approach can help reduce the number of beetles growers must control. Platinum is another soil-applied insecticide that can be used for this grub control strategy. *Source: MSU Blueberry Newsletter, Volume 5, Issue 7.*

FYI: **2016 Southeast Regional Caneberry Production Guide** is now available in three formats:

In collaboration with David Lockwood at the University of Tennessee, Elena Garcia at the University of Arkansas and Gina Fernandez, NC State University/NC Cooperative Extension Service (NCCES), and the Southern Region Small Fruit Consortium, we are pleased to announce that the

1. An online version that includes links to videos http://content.ces.ncsu.edu/southeast-regional-caneberry-production-guide. This is the first NCCES numbered publication to include videos!

There is also a PDF version in 2 formats. Both are 44 pages long and includes all the text, color images and figures that the online version has but no videos.

2. The PDF version that is a smaller file size (3.2 MB) is available at the end of the link listed above. (lower quality but really not bad).
3. A high quality PDF version (12 MB) is available on request.

Cultural Practices for Gray Mold Control in Brambles

Mike Ellis & Mizuho Nita, Ohio State

Editors note: Rain and cooler nights may create some serious Gray Mold pressure. The list of considerations below are to remind growers of the cultural practices of importance. For chemical control options refer to the Cornell 2016 Pest Management Guidelines for Berry Crops or give Laura or Jim a call.

Photo courtesy of Cornell Berry Diagnostic Tool http://www.fruit.cornell.edu/berrytool/index.htm

Cultural practices are the major means of control for several important bramble diseases, including gray mold. The following practices should be carefully considered and implemented whenever possible in the disease management program.

- Avoid Excessive Fertilization: Base fertility on soil and foliar analysis. Avoid use of excessive fertilizer, especially nitrogen.
- Control Weeds In and Around the Planting: Weeds in the planting prevent air circulation and result in fruit and foliage staying wet for longer periods. Controlling wild brambles (which are weeds) near the planting is also important because they can serve as a reservoir for several important diseases and insect pests.
- Practice Sanitation (Removal of Overwintering Inoculum): Pruning out all old fruited canes and any diseased new canes (primocanes) immediately after harvest and removing them from the planting breaks the disease cycle and greatly reduces the inoculum.
- Manage the plant population and canopy to increase air circulation and exposure to sunlight: Ideally, rows for red raspberries should not be over 2 feet wide and contain about 3 or 4 canes per square foot. Specialized trellis designs for Rubus spp. can further improve air circulation and increase exposure to sunlight, as well as increase harvest efficiency. Trickle irrigation, (vs. overhead sprinkler irrigation), greatly reduces wetting of foliage. Removing young fruiting shoots (before 4 inches long) from the lower 20 inches of canes will remove fruit that might become soiled.
- Adjust Production Practices to Prevent Plant Injury and Infection: Many plant pathogens take advantage of wounds in order to penetrate and infect the plant. Using sharp pruning tools will help minimize damage to canes during pruning operations. Prune only when necessary (avoid cosmetic pruning of primocanes) and avoid pruning during periods when plants are wet or immediately before wet weather is forecast. Provide proper cane support through trellising or otherwise tying the canes to in avoiding abrasions from sharp spines and wind whipping of plants during windy conditions. Proper spacing between rows and the use of the proper size equipment will also prevent plant damage.
- Proper harvesting and storage methods are critical components of the disease management program. It is of little value to produce high quality fruit in the field if it is bruised or crushed during harvest or permitted to rot during storage.

Raspberry and blackberry fruit are very perishable. Even under the "Best conditions" these tender fruits are extremely susceptible to physical damage and postharvest rots. The following practices need to be considered well in advance of initiating the harvest. The proper implementation of these practices will aid greatly in providing your customers with the best quality fruit possible.

a) Handle all fruit carefully throughout all phases of harvest, transport and sale. Bruised or crushed (leaky) fruit are much more susceptible to fungal infection and rot than firm, intact fruit.

b) Harvest all fruits as soon as they are ripe. During periods of warm weather, harvest may require picking intervals as short as 36 to 48 hours. Pick early in the day before the heat of the afternoon. Overripe fruit in the planting will attract a number of insect pests and provide a source for inoculum buildup of fruit rotting fungi.

c) It is highly desirable to combine harvesting and packing into one operation. This prevents unnecessary handling and additional physical injuries.

d) Train pickers to remove damaged or diseased berries from the field. Some growers have programs where they pay the picker as much, or more, for damaged berries picked into separate containers, than for healthy berries. This is a good sanitation practice that reduces inoculum levels of fruit rotting fungi in the field. Providing handwashing facilities in the field so pickers can periodically clean their hands, should be helpful in reducing the movement of fungus spores that are encountered by touching rotten (diseased) berries.

e) Pick into shallow containers. Ideally, fruit should be no more than 3 to 4 berries deep; this greatly reduces bruising and crushing the fruit, which results in juice leakage that encourages the development of fungal fruit rots.

f) Refrigerate fruit immediately after harvest. Fruit should be cooled as close to 32°F as possible within a few hours after harvest. This temperature should be maintained

BRAMBLE DISEASE CONTROL STRATEGIES Key: ++ = most important controls; + = helpful controls; - = no effect.	
Disease Control Considerations`	**Fruit rot**
Good air/water drainage	++
500+ ft from wild brambles	
Rotation	-
Cultivar tolerance or resistance	-
Avoid adjacent plantings	-
Eliminate wild brambles	-
Disease-free stock	-
Aphid control (vectors)	-
Rogue infected plants	-
Speed drying (weeds, pruning)	++
Prune 3 days before rain	
Dispose of diseased pruned canes	-
Maintain plant vigor	-
Fungicide sprays	+/-
Harvest before overripe	++
Fruit storage conditions	++

throughout storage and, if possible, throughout shipment and sale. If you do not have refrigeration, fruit should be placed in the coolest place possible. Never allow the fruit to sit in the sun.

g) Avoid condensation of water on fruit after it is removed from cold storage. This is best accomplished by enclosing it in a waterproof over-wrap before it leaves the refrigerated area. The over-wrap should be kept in place until the fruit temperature has risen past the dew point.

h) Sell the fruit immediately ("Move it or lose it"). Many berries produced in the Midwest are sold to pick-your-own customers or directly at farm markets, and are not refrigerated prior to sale. Customers should be educated to handle, refrigerate, and consume or process the fruit immediately in order to assure the highest quality possible. We must remember that even under the best conditions, raspberry and blackberry fruits are very perishable.

Source: North Carolina State University, Team Rubus blog July 2013 See the original article at www.fruit.cornell.edu/nybn/newslettpdfs/2013/nybn1205a.pdf

Strawberry Root Weevils & Strawberry Rootworms

Amy Ivy, ENYCHP

Figure 1: Damage to 2-year old strawberry planting by the strawberry root weevil. Photo by Amy ivy

Figure 2: The adult stage is very small and hard to find.

Fortunately very few growers in our Eastern NY region have experienced the kind of damage to matted row strawberry plants as seen in this photo. But those who have are feeling the pain.

Two kinds of weevils have attacked strawberry roots in the northern part of our ENY region, the black vine weevil and the strawberry root weevil. The damage is done by their small, legless grubs which feed heavily on the roots in spring and fall. The adults emerge briefly in mid-summer and cause only minimal damage to the leaves. To identify the larvae we rear them to the adult stage and then have them confirmed by entomologists at Cornell. Black vine weevil larvae is also known to damage blueberry roots as well.

In 2013 we began working with a grower in the northern section of our region who had a severe infestation of black vine weevil larvae destroying his crop. This year another farm had a first-time outbreak (see photo) but this infestation turned out to be strawberry root weevil. Both weevil adults cannot fly so it is quite a mystery as to how they arrived on each farm. We encourage anyone who is experiencing similar damage to contact Laura or Jim so we can learn more about their movements.

Strawberry rootworms are different, and cause much less damage. While the weevil adults make characteristic notching along the leaf margins, rootworms make distinctive holes in the leaves. Rootworm larvae also feed on strawberry roots but do not cause as extensive damage as do the weevil grubs.

There is no soil insecticide to deal with these pests. But the good news is that we have had success in bringing the Clinton County infestation down to tolerable levels by applying native beneficial nematodes through a project with Elson Shields, Professor of Entomology and Tony Testa at Cornell. We are getting ready to make a similar nematode application to the new location this September in the hopes of seeing similar results there. The nematodes do not cause a rapid knockdown of the grub population but instead take a year or two to have an impact. But then, because they are native to the region their population persists in the soil for years, helping to keep pest and host in balance.

For more information call Laura, Jim or Amy or visit: http://www.fruit.cornell.edu/berry/ipm/ipmpdfs/Root%20weevil%20bio%20mgmt.pdf

Save the Date!

When: August 15, 2016, 9:00 – 4:15
Where: Cornell Cooperative Extension Albany County, Voorheesville, NY

With all the talk about climate change you might be wondering how it will affect food production, pests, and even landscapes - and what you can do about it. The Second Annual NYS Integrated Pest Management conference can help!

A wide variety of speakers from NYS and the Northeast will provide information on the current state of knowledge on climate change, changes in our weather patterns, and how collecting climate and weather data can help us predict and manage pests. Join us to learn and discuss!

$45 includes materials, lunch, and breaks.

The draft agenda, registration information, and map can be found at:
tinyurl.com/hq8tbm2

If you have questions, please contact Amanda Grace at arw245@cornell.edu or 315-787-2208.

New York State Integrated Pest Management Program

NEWA stations record temperature, leaf wetness, relative humidity, precipitation, solar radiation, wind speed and direction.

Current Average Farmers Market Prices

Product (NC = nonconventional)	Unit	Mid-Hudson	Capital	Saratoga - Lake George	Northern
Blueberries	pint	$3.25	$4.25	$4.25	$3.00
Blueberries NC	pint	$5.00	$4.44	$5.67	$3.88
Raspberries	1/2 pint	$4.50	$5.06		$4.25
Raspberries NC	1/2 pint	$4.00	$4.75		
Strawberries	pint	$4.00	$3.00		
Strawberries NC	pint		$3.58		

Site	2016 Weekly Total 7/19-7/26	2016 Season Total 3/1-7/26	2015 Season Total 3/1-7/26	2016 Weekly Rainfall (inches) 7/19-7/26	2016 Total Rainfall (inches) 3/1-7/19	2015 Total Rainfall (inches) 3/1-7/26
Albany	197.2	1596.7	1638.5	0.05	10.05	14.31
Castleton	191.6	1541.9	1530.3	0.17	12.71	14.73
Glens Falls	177.2	1419.4	1398.0	0.46	19.77	14.26
Griffiss	169.5	1298.9	1306.0	1.56	20.48	22.35
Guilderland	181.5	1436.0	1306.0	0.41	14.41	20.27
Highland	214.6	1694.0	NA	0.43	13.75	18.04
Hudson	206.9	1672.5	1653.0	0.57	16.81	17.68
Marlboro	204.5	1610.2	1586.5	0.55	13.51	14.0
Montgomery	212.2	1612.1	1631.5	0.77	11.36	15.64
Peru	469.7	1612.1	1312.3	0.57	9.0	17.4
Red Hook	194.7	1587.7	1566.9	0.28	11.54	14.5
Willsboro	167.3	1290.9	1274.0	0.28	11.62	21.86
N. Adams, MA	159.6	1267.2	1258.5	0.07	13.33	16.47

Upcoming Events

August 13-17 – International Strawberry Symposium
Quebec, Canada.

http://www.iss2016-quebec.org/ This meeting is research oriented, but it might be a once in a lifetime kind of event. Follow it up with a much more farmer appropriate educational event below.

August 17-18 – North American Strawberry Growers Summer Tour
Quebec, Canada.

Several years ago Laura attended this event in the greater Montreal area. It was a FANTASTIC opportunity and I would strongly encourage growers to try and make time. Bring a spouse or partner and have some fun! http://www.nasga.org/

ENYCH Program Educators:

Fruit
Dan Donahue
Phone: 845-691-7117
Email: djd13@cornell.edu
Tree Fruit

Anna Wallis
Phone: 443-421-7970
Email: aew232@cornell.edu
Tree Fruit & Grapes

Laura McDermott
Cell: 518-791-5038
Email: lgm4@cornell.edu
Berries

James O'Connell
Phone: 845-691-7117
Email: jmo98@cornell.edu
Berries & Grapes

Vegetables
Chuck Bornt
Cell: 518-859-6213
Email: cdb13@cornell.edu

Amy Ivy
Phone: 518-561-7450
Email: adi2@cornell.edu

Teresa Rusinek
Phone: 845-340-3990 x315
Email: tr28@cornell.edu

Erik Schellenberg
Phone:845-344-1234
Email: jk2642@cornell.edu

Crystal Stewart
Cell: 518-775-0018
Email: cls263@cornell.edu

Maire Ullrich
Phone: 845-344-1234
Email: mru2@cornell.edu

Business and Economics

Jesse Strzok
Phone: 518-429-1464
Email: js3234@cornell.edu

Content Editor: Laura McDermott-
Layout: Abby Henderson

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