

# GOOD FRUIT GROWER

CROP MANAGEMENT & POLLINATION







Sysstem-CAL®

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Apple growers need to do many things early season at the same time to ensure quality fruit at harvest. Four of the most important early seasons tasks are 1) maximizing calcium uptake into the developing fruit, 2) improving fruit size 3) managing terminal growth and 4) managing tree fruit load. Sysstem Cal from Agro-K can improve the performance of the most important PGR tools used for sizing, thinning and managing terminal growth that are critical to maximizing fruit quality and grower profitability. **Now you can do all these critical tasks while also supplying systemic calcium during peak demand. Sysstem-CAL®, Agro-K's foliar calcium is the perfect apple PGR tank-mix partner.**

## Effects of Sysstem-Cal & Maxcel on Size of McIntosh Apples

Treatments		
Petal fall	10 mm	fruit wgt (gr)
Untreated Control	Control	156 c
Carbaryl 1 lb/100 gal + NAA 7.5 ppm	Carbaryl 1 lb/100 gal + MaxCel 100 ppm	191 b
Carbaryl 1 lb/100 gal + NAA 7.5 ppm + Sysstem-CAL 2 qts/100 gal	Carbaryl 1 lb/100 gal + MaxCel 100 ppm + Sysstem-CAL 2 qts/100 gal	255 a

Trial conducted by Duane Greene, University of Massachusetts 2010

## Effects of Sysstem-Cal on Size of Gala Apples

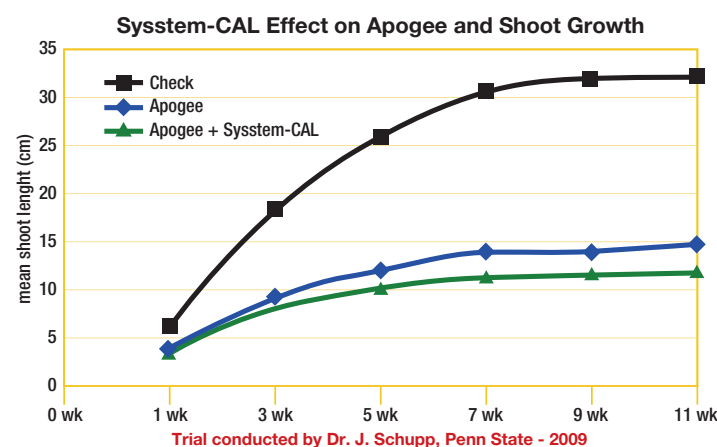
Treatments		Fruit Size		
Petal fall	10-13 mm	<2.75"	2.75" -3"	>3"
Carbaryl 24 oz	Carbaryl 24 oz + Maxcel 2qts	46.0	41.0	13.0
Carbaryl 24 oz + Sysstem-Cal 2qts	Carbaryl 24 oz + Maxcel 2qts + Sysstem-Cal 2qts	39.0	37.0	24.0

Trial Conducted by Reality Research, Wayne Cty, NY - 2010

Large, firm apples, free from bitter pit generate the highest per acre return. Private and university research shows Sysstem-Cal's positive effects on size. Dr. Duane Greene, UMass stated, *"clearly Sysstem-CAL when combined with MaxCel® had a profound effect on increasing fruit size."* Not only does Sysstem-CAL aid in maximizing fruit size, but it also supplies needed calcium at the same time for better firmness and storage life.

In 2011 Dr. Fallahi (Univ. of ID) saw similar results as Dr. Greene (UMass) and had these comments: *"Un-treated controlled had smallest fruits. But those with Sysstem-Cal™ 2Qts + MaxCel® 128oz at 5-10mm@200G/A had the largest fruit of any of the*

*treatments. Fruit from trees receiving Grower's Treatment (Sevin and NAA) had lower firmness at harvest as compared to control and the Sysstem-Cal™ and MaxCel® treatments. Enrichment with Ca from Sysstem-Cal™ could have also contributed to higher firmness in Sysstem-Cal™-treated fruits."*



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## Effects of Sysstem-Cal™ (Sys) and MaxCel® (Max) Yield and Fruit Quality

Treatment	Avg. Weight (g)	Yield Kg/Tree	Sunburn %	Firmness 2.5mths Storage	Rotten %	Ca (ppm)
Control	188.2	29.77	8.2	6.950	5.82	5.45
Maxcel 128oz PF	217.7	29.67	11.1	6.953	8.04	6.02
Sysstem-Cal + Maxcel 128oz 5-10mm	227.1	46.17	6.7	6.699	5.56	6.25
Grower Std.(Sevin & NAA)	221.6	36.78	8.4	6.146	10.71	6.05

Dr. Essie Fallahi, Univ. of Idaho, 2011



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TJ MULLINAX/GOOD FRUIT GROWER

Spraying a pollen and water solution directly onto trees could transform the tree fruit industry. See where the latest research stands in our centerpiece story on page 24.

## Centerpiece

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## Pollination

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TJ MULLINAX/GOOD FRUIT GROWER

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ROSS COURTNEY/GOOD FRUIT GROWER

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*"You can't make good wine with bad fruit."*

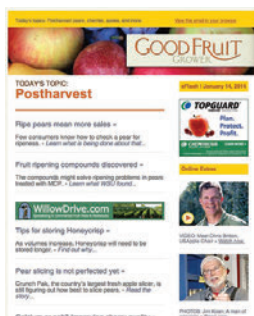
## On the cover

A bee pollinates Bartlett pear blossoms in Sunnyside, Washington.

BY TJ MULLINAX,  
GOOD FRUIT GROWER



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## On the Web

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# QUICK BITES

People and industry in the news.  
Read more Fresh Updates at  
[goodfruit.com/fresh-updates](http://goodfruit.com/fresh-updates)

## Dave Weinstock named associate editor



Dave Weinstock

Dave Weinstock, veteran agriculture journalist, has been named an associate editor of *Good Fruit Grower* by Managing Editor Casey Corr.

"I'm thrilled to have Dave join our staff," Corr said. "Dave grew up on a small farm and remains passionate about agriculture and bringing essential information to our readers. He'll bring a high level of professionalism to our accurate, in-depth reports."

Based in Pennsylvania, Weinstock will be reporting on horticulture topics with a special emphasis on growers east of the Mississippi and on research from Michigan State University, Cornell University, Pennsylvania State University and other sources. Weinstock began his tenure with the magazine by covering the Mid-Atlantic Fruit and Vegetable Convention in Hershey, Pennsylvania.

Weinstock, who holds a bachelor's degree from Pennsylvania State University, began his journalism career with the late journalist Richard Lehnert as his editor at *Michigan Farmer*, where Weinstock worked for 10 years. Since then, Weinstock earned a doctorate in journalism from Michigan State University and has freelanced for *Growing* magazine and *Farming* magazine. His writing and photography have been honored by the American Agricultural Editors Association and other groups.

"After freelancing and teaching journalism for so many years," Weinstock said, "it's good to get back on a magazine staffed with such talented people, doing what I enjoy most: hitting the open road, writing about farms and farmers, researchers and agribusiness professionals."

Weinstock can be reached at [dave@goodfruit.com](mailto:dave@goodfruit.com).

## Grape growers honor industry members

The Washington wine industry honored several longtime industry members for their pioneering involvement and advancement of the industry during the annual meeting of the Washington Association of Wine Grape Growers.

—Dr. Ken Eastwell, recently retired Washington State University virologist and director and creator of the Clean Plant Center Northwest, received the **Grape Growers' Industry Service Award**. Eastwell's career in plant disease virology spanned 34 years. He played a leadership role in the development of the National Clean Plant Network initiative, a plan to network existing clean plant centers in the country to facilitate the introduction, virus-testing and eventual release of clean plant materials to growers.

—Mimi Nye, likely the state's first female vineyard manager and long a role model for women in the industry, was named the **Rick Hanson Memorial Grower of the Year**. Nye has served as vineyard manager at Canoe Ridge Estates Vineyard, owned by Ste. Michelle Wine Estates, since the vineyard's inception in 1981.

—**The Lifetime Achievement Award** was bestowed on a pair of growers from Washington's famed Red Mountain: Jim Holmes of Ciel du Cheval and John Williams of Kiona Vineyard and Winery. Both



Ken Eastwell



Mimi Nye



Jim Holmes



John Williams

men were pioneers in the development of Washington's wine industry, the Yakima Valley Appellation and Red Mountain, which is a sub-appellation of the Yakima Valley AVA.

—The Herbfarm in Woodinville, Washington, was named **Restaurant of the Year**, an award given annually by the Grape Growers to a restaurant that's done an exceptional job showcasing Washington wines. The Herbfarm is known for showcasing both foods and wines of the Pacific Northwest, serving nine-course dinners, paired with wines, that draw inspiration from the seasons.

See more Quick Bites on page 40



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# Testing string THEORY

**Hand-held string thinners  
are gaining in popularity.**

*by Ross Courtney*

*"I think we're going to  
be expanding from testing  
to probably doing acres of  
it this year to help reduce  
our hand-thinning bill."*

*—Jeff Cleveringa*

Once a tool for stone fruit, the string thinner is gaining interest with apple and cherry growers for bloom control.

Powered by a battery that fits in a fanny pack, the hand-held thinners offer a cost-saving middle ground between plucking blossoms by hand and tractor-mounted, motorized string thinners.

After testing in 2015 on fraction-of-an-acre blocks, Starr Ranch Growers of Wenatchee, Washington, plans to use the hand-held thinners on a commercial scale in apples and cherries this year, Jeff Cleveringa, the orchard manager, told more than 400 attendees at the International Fruit Tree Association conference in early February in Grand Rapids, Michigan.

"It's quite effective and it's been working very well for us, and I think we're going to be expanding from testing to probably doing acres of it this year to help reduce our hand-thinning bill," Cleveringa said.

The thinners, mounted on a pole up to 6-feet long,

cost less than \$1,000 each, compared with more than \$10,000 for the high-end, tractor-mounted models of motorized thinners. They employ floppy cords that whirl around the stick and break up bloom clusters to control fruit size and crop load.

For many years, growers of peaches, apricots and other stone fruits turned to string thinners — either motorized or hand-held — because they had few chemical thinning options, Cleveringa told *Good Fruit Grower*. Now, apple and cherry growers are becoming fans, too, he said.

The hand-held devices allow workers to thin with more precision, dropping more blossoms from one part of the tree and less from another. The tractor-mounted versions create more uniform results, working best on flat fruit walls. Starr Ranches has cherry trees with wider spacing and cylindrical canopies, lending themselves to the control of the hand-held models.

Also, the nimbleness of the hand-held tools allow





ROSS COURTNEY/GOOD FRUIT GROWER

Grower Jake Rasch demonstrates his use of string thinning on second-year peach trees while Dr. Bill Shane, right, of Michigan State University discusses orchard management as part of the International Fruit Tree Association Conference in Grand Rapids, Michigan. "This made me money the first year," Rasch said of the thinner.

for a quick reaction, letting workers thin early, as blossoms hit the pink stage, Cleveringa said. That reduces bloom stress on trees and allows side blossoms to replace any king blossoms that the string thinners inadvertently knocked off.

Chemical thinners need to set on a tree for a while, leaving growers to guess on bloom timing based on weather and pollen tube models. "It's fairly predictable, but not guaranteed," Cleveringa said.

Cleveringa warned the conference crowd to watch their timing. Thin too late and you damage the fruit, he said, showing a slide of a scarred apple that developed from a king bloom thinned at petal fall.

"This is what happens if you're late," he said.

Michigan growers use string thinners, too.

"This made me money the first year," said Jake Rasch, a sixth-generation grower, holding a thinner over his head during an association conference tour of his Kent City farm north of Grand Rapids.

While Jake Rasch demonstrated the techniques on a young Glenglo peach tree, his brother, Nick, explained that the Rasch Family Orchards sends out thinning crews in teams of four, two on a platform and two on the ground. They attach the pole thinners to an electric drill, powered by a generator.

"And you get fruit size because you get your bloom off earlier," Nick Rasch said.

He also likes how it allows for quick adjustments compared to the uniformity of a Darwin. "You can kind of select a little bit better which limbs need some blossom thinning and which ones don't," he said.

Back in Washington, about 10 growers in the state are using the hand-held string thinners for apples,

# Things to make sure you remember.



The first months of the year are very hectic with so many pressing obligations that you may tend to forget a very important, even crucial, fact of our industry: there is limited inventory of quality fruit trees for your planting schedule. And there will be for the foreseeable future.

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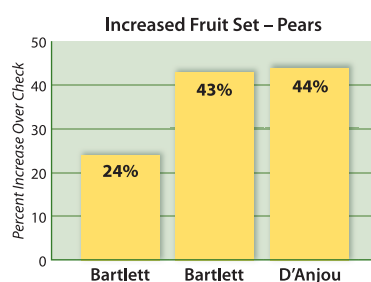
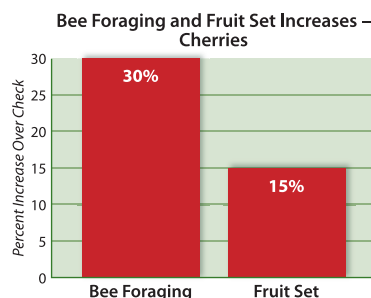
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Bee-Scent research data obtained from  
Dr. Dan Mayer, Washington State University

## IFTA presents awards at national conference

The International Fruit Tree Association presented its 2016 award winners at the annual conference awards banquet in February in Grand Rapids, Michigan.

—**Researcher of the Year:** Dr. Randy Beaudry, Michigan State University, East Lansing, Michigan. Beaudry has several research programs that deal with postharvest preservation of fruit, including modeling respiration of apple slices in packages, inhibiting fungal activities in sliced apples and studying changes in chlorophyll fluorescence in apple ripening.

—**Extension Award:** Amy Irish-Brown, a tree fruit extension educator from Michigan State University in Grand Rapids.

—**Grower Award:** Ed Wittenbach, Belding, Michigan. Wittenbach, with more than 45 years in the fruit business, is a former member of the U.S. Apple Association Board of Trustees and a former member of the IFTA Board of Directors. He and his family replace about 10 percent of their orchard each year to keep pace with changing consumer and market demands, according to Michigan Apple Committee.

—**Industry Service Award:** Ken Hall, former IFTA president, Poplar Grove, Illinois. Hall also was the first president of the IFTA Research Foundation, a fundraising nonprofit designed to help fund research.

—**Hall of Fame Award:** Harold Thome, grower, Grand Rapids. Thome Orchards has been one of the early adopters of precision orchard systems and techniques, such as mechanical hedging and high-density plantings.

—**Ross Courtney**



Randy Beaudry



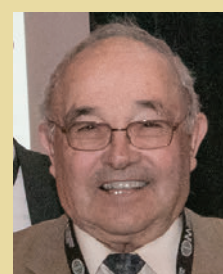
Amy Irish-Brown



Ed Wittenbach



Ken Hall



Harold Thome

cherries and stone fruit, said Karen Lewis, a Washington State University Extension educator in Moses Lake, Washington.

Royal Slope grower Mike Robinson, who is also general manager of Double Diamond Fruit in Quincy, Washington, was one of the early adopters about five years ago. He wanted more control in his apricots than is offered by the tractor-mounted systems, but hand-thinning costs thousands of dollars per acre in labor.

Robinson liked the string thinners so much he began using them on apples about two years ago, determining through trials that one worker holding a string thinner can knock down 50 percent of the blossoms at the same pace as 10 hand thinners. He now owns about 15 string thinners and is still fine-tuning his practice.

String thinners are not perfect, Robinson cautioned. He still sends employees to clean up blossoms by hand in places, while sometimes the thinners tangle with trellis twine. Also, some studies have shown that string thinning can spread fire blight, though he has had no such trouble so far himself.

"It's like every new idea," he said. "It takes time to make it work correctly." ●

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# Growing COLD-HARDY



**Michigan offers a deep winter welcome to growers and researchers during the International Fruit Tree Association's February tour.**

*Photo gallery by Ross Courtney, Good Fruit Grower*



Above, Traverse City, Michigan, grower Leonard Ligon, left, leads a tour in mid-February into the blowing snow to inspect his Honeycrisp orchard on Old Mission Peninsula, Michigan, during the International Fruit Tree Association's conference and tour.

At right, Ligon discusses how fruit and leaf buds protrude from a mechanically hedged branch at the Michigan State University Clarksville station apple research block during another stop.







Lisa Jenereaux compliments grower Bill Lentz on his Sweetango apple trees in Beulah, Michigan, during the IFTA tour of northwestern Michigan in mid-February. Jenereaux, an IFTA board member from Nova Scotia, Canada, told Lentz he was doing about as good as he could with Sweetango on Bud 9 rootstock in sandy soil.



One of Michigan's few V-trellis systems towers over 2-year-old Honeycrisp apple trees at the Riveridge Land Company. Operations manager Justin Finkler made the switch to V-trellis, which is much more common in the Pacific Northwest, to make piece-rate labor more attractive and boost production to 100 bins per acre with 90 percent pack out.



## MORE TO SEE

Look for more IFTA Michigan tour coverage and photos in upcoming issues and online at [goodfruit.com](http://goodfruit.com)



A worker at Smeltzer Orchard Co. sorts Northern Spy apple slices for frozen pie filling in Frankfort, Michigan, during an IFTA post-conference tour stop. The plant can peel, core and slice between 250-300 bins per day.



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# Looking for new POLLINIZERS

**Industry needs an alternative to ubiquitous Manchurian crab apple.**

by Ross Courtney

**F**or decades, apple growers have used Manchurian crab apples to pollinate their fruit.

The crab apples bloom early, and Snowdrift apples bloom a little later. Between the two, orchardists figured they had their bases covered.

Now, a Wenatchee, Washington, researcher says there is more to it. He is searching for new pollinizer trees to give growers more genetically precise alternatives, specifically those that resist rot.

“Think about the biology of your pollinizers,” said Dr. Stefano Musacchi, tree fruit physiologist at Washington State University’s Tree Fruit Research and Extension Center in Wenatchee.

Musacchi is part of a team of researchers working under a five-year, \$1.9 million grant from the U.S. Department of Agricultural Foreign Agricultural Service Technical Assistance for Specialty Crops program.

The work was triggered by a 2012 international trade incident, when Chinese inspectors shut down U.S. imports for two years after they found three types of rot on a shipment of Washington apples. Musacchi’s colleagues, Dr. Karen Lewis, Dr. Mark Mazzalo, Dr. Parama Sikdar and doctoral student Christian Aguilar,

are looking for ways to control the rot through pruning techniques and post-harvest fumigations. Their work helped persuade Chinese authorities to reopen their ports in November 2014.

At the same time, the industry must think ahead, Musacchi said. The research team is searching for long-term options for not only rot problems, but also pollen compatibility, tree shape and bloom dates.

Too often, growers plant pollinizers as an afterthought, choosing what they’ve always used out of habit, Musacchi said. He urges them to be more discerning, making sure pollinizer trees line up with the DNA of the crop tree.

For example, Manchurian crab apples have pollen that is partially incompatible with several important commercial apple varieties, such as Red Delicious, Gala and Honeycrisp.

Most varieties of cultivars and pollinizers have two alleles, the genetic markers in pollen. For fertilization, alleles must be different between pollinizer and fruit flower, hence the term “cross-pollination.”

Working with J. Franck Schmidt and Son Nursery in Boring, Oregon, Musacchi has collected 30 genotypes of crab apples he keeps in pots in the Research and Extension Center’s greenhouse, though he plans to plant some in the ground at the center’s Sunrise research orchard east of Wenatchee. He will tend 143 trees of each strain, crushing their leaves to find the genetic markers, and study when they bloom, the size of their fruit, the shape



COURTESY STEFANO MUSACCHI/WSU TREE FRUIT RESEARCH AND EXTENSION CENTER

**Tree fruit researchers are searching for new pollinizer trees as alternatives to the Manchurian crab apple, such as this one at a Boring, Oregon, nursery..**

of the tree, resistance to disease and other characteristics.

His goal is to find two to three pollinizer genotypes that best match each of the industry’s main commercial cultivars.

“Because everybody was using some genotype as a habit but not really with a scientific base of knowledge,” Musacchi said. ●

## Researcher is targeting bull’s-eye rot



TJ MULLINAX/GOOD FRUIT GROWER

**A bull’s-eye rot canker.**

**Findings show treatments before and after harvest reduce infection rates.**

by Ross Courtney

**A** Washington State University researcher has determined which chemical fungicides work to control bull’s-eye rot, a fungal infection partially blamed for a two-year shutdown of apple exports to China.

Christian Aguilar, a graduate student at WSU’s Tree Fruit Research and Extension Center in Wenatchee, Washington, has concluded that fungicide treatments both before and after harvest will reduce the rates of two strains of bull’s-eye rot — *Neofabraea perennans* and *Cryptosporiopsis kienholzii* — most common to apple growing areas in central Washington.

In pre-harvest trials in 2012, 2013 and

2014, Topsin M (thiophanate-methyl) worked the best of three candidates in reducing bull’s-eye rot, regardless of timing. In the postharvest trials, Penbotec (pyrimethanil) and Mertect (thiabendazole) delivered the best results out of four candidates.

Aguilar told growers at the North Central Washington Apple Day conference in late January in Wenatchee that they should treat their orchards and the fruit from those orchards postharvest if they have a history of bull’s-eye rot or if they see cankers.

“Most likely there will be fruit infection to follow,” she said.

Bull’s-eye rot causes cankers that spread on tree branches and brown, firm lesions that appear in concentric rings on fruit skin. Splashing water, such as by irrigation, spreads the disease. Tree inoculation is most common in April and in fall after harvest, while fruit inoculation is most common in September and October.

Bull’s-eye rot was one of three fungal

diseases found by Chinese officials in a shipment of Washington apples, prompting them to shut down imports from 2012 to 2014. Aguilar is part of a team of researchers working toward solutions under a five-year \$1.9 million grant from the U.S. Department of Agriculture Foreign Agricultural Service Technical Assistance for Specialty Crops program. Other researchers are examining the role of pruning and postharvest fungicides to control the other two diseases and searching for alternative pollinizers, which may be resistant to rot, to the commonly used Manchurian crab apple trees. Also, other researchers will test other chemical controls for bull’s-eye in the future, Aguilar said.

The search for alternate chemicals is important because Topsin-M and Mertect share the same mode of action, raising the potential for cross resistance, she noted in her final project report. Growers are typically advised against using chemicals with the same mode of action both in the field and packinghouse. ●



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# Bee TIPS

**Beekeeper offers tips for healthy  
bees, hearty pollination.**

*by Ross Courtney*



TJ MULLINAX/GOOD FRUIT GROWER  
Placing honeybee hives on top of fruit bins helps keep  
the hive from getting damp when sprinklers  
are running in orchard rows.

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Come pollination season, orchardists are at the mercy of factors they can't control — weather, cold and varroa mites to name a few.

However, Eric Olson of Olson's Honey in Yakima, Washington, suggests several things growers *can* control to make sure their bees have the best chance to set a lot of fruit. He shared them in December at the Washington State Tree Fruit Association annual meeting in Yakima.

"There really is no mystery to pollination," said Olson, one of the largest commercial beekeepers in the nation.

The healthier the hive, the more work the bees will do for you.

—Use 12-paneled hives. The larger, denser hives will foster up to 36,000 bees, and half of the bees will be devoted to forage. A six-paneled hive will support maybe 6,000 bees and spare only 20 percent of them for forage; the rest will have to stay home to keep the brood warm and tend to the queen.

—Place beehives in open areas with lots of sun. Too many orchardists worry too much about spreading out colonies for coverage and end up with hives in the shade or with trees blocking the entrances. Overall hive health and warmth is more important than spacing.

—Don't use windbreaks. "Waste of time," Olson called them. They just block the sun and do more harm than good. Besides, they only fool the bees for a few seconds; once the bees have flown above or around the break, they realize how windy it is and return to their hive.

—Place hives on top of bins or take other measures to keep them warm and dry. This is especially important for growers who use irrigation water for frost control. If hives get wet, they will spend the entire day drying out, which cools them down and keeps them home. Again, bees need to be warm to leave the hive.

—Make sure hives have fresh water. Bees like leaky irrigation faucets and trickling sprinkler heads. They also like mud. If you set out buckets, change out the water routinely and lay burlap over the water surface to prevent the bees from drowning.

—Make sure they have a nectar source. Bees find protein from the pollen in your trees but they need nectar for carbohydrates. Dandelions are a good source. "Obviously, I really believe in dandelions," Olson said. ●

## PLAY

Eric Olson shares how to get the best pollination out of your bees. Watch the Good Fruit Grower video at [bit.ly/bestpollination](http://bit.ly/bestpollination)

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**New results are in on  
Bartlett pears grown on  
Tatura trellis in Australia.**

*by Bas van den Ende and Mick Conti*

**N**ew results are in on an experiment in a commercial orchard near Ardmona, Australia, to test the biological limits of pear production by sustaining exceptionally high yields of good quality, canning-size pears (larger than 65 mm or 2.5 inches).

In an earlier *Good Fruit Grower* article ("Proliferating pears," September 2015), we reported how Bartlett trees on Tatura trellis produced 123 tonnes per hectare/bins per acre canning-grade pears in 2014-15 by changing tree management rather than the rootstock. The following season (2015-2016), the trees produced 114 tonnes per hectare/bins per acre.

Tree management included winter pruning to develop short, horizontal fruiting wood containing spurs and short laterals with terminal fruit buds. Trees were sprayed twice with the growth regulator paclobutrazol (PP333) in early spring to control tree vigor and improve fruit set and fruit growth. Other management practices were repeated from the previous season.

Two foliar sprays of paclobutrazol reversed the effects of flower inhibition and increased the proportion of floral buds that set three or more fruit per bud. Part of the flower promoting phenomena by this compound is attributed to alterations in vegetative shoot growth rates and improved light relations within the canopy, resulting in more competitive sinks for assimilates and nutrients. ●

*Bas Van den Ende is a tree fruit consultant in Australia's Goulburn Valley. Mick Conti is an orchardist in Ardmona.*



The canopies in the highly productive trees at Ardmona consist of horizontal fruiting units, which contain spurs and short laterals with terminal floral buds. Each tree has four leaders, two on each opposite side. There are no branches, only fruiting units that were created over three years.



# of Bartlett pears per acre



PHOTOS COURTESY BAS VAN DEN ENDE

Above, experiments with Bartlett pear trees on Tatura trellis began in 1975 at the Research Institute, Tatura, in the Goulburn Valley, Australia. The pattern of shade in the rows shows that the canopy is open, permitting good distribution of sunlight from top to bottom within the canopy. Maximizing the surface area of the effective thin canopy in the Tatura trellis has significantly contributed to the high yields.

At left, the Bartlett trees are now producing commercial yields near Ardmona that we believe are at the biological limit of pear production. Yields of 114 to 123 tonnes per hectare/bins per acre is two to three times the average yield of commercial orchards with Bartlett trees in the Goulburn Valley.

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## Cold DAMAGE



TJ MULLINAX/GOOD FRUIT GROWER

**Finding and recognizing the signs of cold damage in grapevines is critical for growers in northern regions.**

*by Shannon Dininny*

**G**rapevines require adequate chilling during dormancy for uniform bud break the following growing season, but vines in northern growing areas that are exposed to very low temperatures or sudden extreme low temperatures can be susceptible to damage.

Finding and recognizing the signs of this damage is critical for growers in these regions.

Buds, canes, cordons, trunks and roots can be damaged when temperatures fall below a vine's particular cold hardiness level, and the vine itself can die. Buds are moderately susceptible to cold damage and cannot be repaired.

However, vines also have a compound bud comprised of

Above: Dr. Michelle Moyer, left, shows Stacy and Greg Letendre how to assess damage to grape buds using a two-cut method of exposing the three buds within the vine during winter. Right: If any of the buds are brown — and not green — they were probably damaged by a cold snap.

primary, secondary and tertiary buds that work as a backup plan.

The phloem (vascular tissue that conducts sugars and metabolic products from the leaves to other plant parts) is most susceptible to cold damage in midwinter, but it regenerates itself annually. Xylem, the vascular tissue that conducts water and nutrients from the roots to other plant parts, is the least susceptible to cold damage, but xylem damage is more serious because it

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For more information about assessing for cold damage, as well as spreadsheets to guide you through the process, visit [bit.ly/1WEJQYe](http://bit.ly/1WEJQYe)

so it's a pretty serious subject," Halldorson said.

Gather canes and let them sit overnight (24 hours is best). If the canes look wet before 24 hours, you're seeing signs of cold damage.

Focusing on basal buds, make a parallel cut to the cane. If you see a lot of woolly hairs protecting the bud, cut a little deeper to find the primary bud. Make a vertical cut from the leaf scar to find the secondary bud. The third cut is more downward to uncover the tertiary bud. Green is good; a black or brown colored bud is dead.

Assessing canes is trickier, Halldorson said. It is easy to cut too deep into the phloem and miss the damage completely. In addition, the cambium and the phloem go all the way around the trunk; a grapevine could be green and healthy on one side, but brown and damaged on the other.

"Cut the cane in half," he said. "We're dealing with a lot of tissue here that runs up and down, and it can be really challenging."

A lot of phloem damage isn't the end of the world, because the phloem will generally repair itself, he said. As far as the xylem goes, growers should check the xylem in spring if they're seeing intense bud damage.

"If you don't have really bad bud damage, chances are that your xylem is fine," he said. ●

hinders the vine's ability to uptake water. Once it's damaged, it doesn't repair itself.

Washington State University has developed a cold hardiness model to predict grapevine cold hardiness anywhere temperature data is available. But each vineyard has its own climate and microclimates, and growers should know as much about their vineyard as possible to make it easier to assess if cold damage is a concern when a cold front hits.

### Sampling for damage

Gwen Hoheisel, WSU Extension educator in Prosser, Washington, and Matt Halldorson, viticulturist for Ste. Michelle Wine Estates, offered tips for assessing for cold damage during the Washington Association of Wine Grape Growers annual meeting in Kennewick, Washington, in February.

Growers should consider the number of variables in their vineyards, such as variety, soil types, elevation changes, air-flow and cold spots (low-lying areas that would allow cold air to pool). "Learn your vineyard very well," Hoheisel said. "The more variables you have in your field, the more samples that you need to take, but samples take time and effort."

Growers also should identify a critical temperature at which point they suspect their vineyards might be susceptible to damage, then monitor the weather. "If you think you've crossed this threshold, if you've gotten close, it's worth assessing," Halldorson said. "If you haven't gotten close, don't bother. It's a lot of work."

In collecting samples, Hoheisel said divide a vineyard into zones and sample randomly for 100 buds in each zone. Remember, she said: Structures, wind machines and wind breaks can alter the microclimate in a vineyard, so keep these things in mind when dividing a vineyard into zones.

### Making the cut

Cut above the first two to three buds if you are worried about losing spur positions, but if possible sample the entire cane to ensure that you are looking at the most important node positions (the first three). Look for patterns, by keeping track of where the buds fall on the cordon, and assess for variability.

A grapevine's primary bud is most fruitful, but it is the least cold-hardy. The secondary bud is a little more cold-hardy but is less fruitful. The tertiary bud is the most cold-hardy but only tends to break unless there is damage to the other buds and is almost never fruitful.

"Basically, your bud represents next year's crop, and it represents your money,

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# Uncorked potential with wine ON TAP

**Companies cater to restaurants that don't want to waste a whole bottle on a single pour.**

*by Peter Mitham*

**S**ecuring good quality fruit is fundamental to making good wine, but making sure consumers enjoy that wine in the best possible condition is often out of the hands of the winemaker.

Top-notch bottling practices are nothing against the risks posed by poor storage and oxidation once the wine is opened — a serious problem given the popularity of by-the-glass lists at many restaurants. Often, limiting the choices available to consumers is the only way to make sure bottles aren't opened for single pours and left to deteriorate, which is a waste of both good wine and money.

To facilitate single pours with minimum waste, some wineries have turned to steel kegs that are both reusable

and provide an airtight container to keep wine fresh to the last drop.

"We get both the glass pour as well as a list on the bottle program," said Rob Summers, winemaker with Hester Creek Estate Winery in Oliver, British Columbia. "It supports our bottle program, and it also gives us a chance to get the glass pours or house wine pours where we may not have had an opportunity."

Hester Creek experimented with wines in beer kegs in the past, but what seemed like a good idea fell short because the wines rapidly oxidized. The winery revisited the idea in 2012 when FreshTAP Logistics Inc. of Vancouver, British Columbia, introduced a keg system developed by Free Flow Wines LLC in California. A blend

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FreshTAP Logistics Inc. kegs wines in its Vancouver, British Columbia, warehouse, part of its centralized distribution service.

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PHOTO COURTESY FRESHTAP LOGISTICS INC.

Wineries send wine in totes (and other containers) to FreshTAP Logistics Inc. for keging and distribution.

*“There’s been a surge of new business and new customers, and I think it just takes awhile for people to really understand the category.”*

—Mike Macquisten

of nitrogen and carbon dioxide gas prevents oxidation as the 20-liter (5.2-gallon) kegs are tapped, ensuring wines remain fresh.

Hester Creek is now one of approximately 80 wineries using FreshTAP, which has approximately 12,000 kegs circulating among more than 600 restaurants across Canada. A separate keging facility in Ontario serves FreshTAP clients in that province.

Growth was slow at first, but kegs have caught on, and FreshTAP managing director Mike Macquisten is looking at expansion opportunities.

“It’s finally caught up to the point where we’re really excited about where it’s going,” he said. “There’s been a surge of new business and new customers, and I think it just takes awhile for people to really understand the category.”

The system that FreshTAP uses isn’t the only option available to wineries.

Steel kegs from Torr Industries of Redding, California, hold a wine-filled polyethylene pouch that serves as a

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sophisticated bag-in-box system. The pouch is recyclable and addresses the issue of returning an empty steel keg for cleaning and refilling. This amounts to low packaging and shipping costs, although some winemakers detect an influence of the plastic in the taste of their wines.

There are also plastic kegs on the market. While more prone to cracking than steel, they're lightweight and recyclable, reducing shipping costs and facilitating disposal.

Both of these options address one of the most complex aspects of kegged wines: custody of the kegs themselves. The steel kegs FreshTAP uses cost approximately \$100 each, a significant capital investment as well as a significant loss if they're stolen. Recognizing the issues, FreshTAP serves as the linchpin in the distribution network connecting wineries and restaurants.

Wineries in British Columbia give FreshTAP a vessel filled with wine that's taken to its warehouse in Vancouver for repackaging and distribution. Wineries need only track the vessel FreshTAP picks up, while FreshTAP manages the kegs that restaurants receive. Restaurants also deal with fewer distributors, rather than having every winery deliver its kegs (as is the case in Ontario).

"They get to just make one phone call, and they don't have to worry about it all the way through to the end customer," Macquisten said of wineries.

Direct TAP, a division of FreshTAP that also handles nonkegged products, such as cider, spirits and craft beer, oversees distribution. By boosting the range of products it distributes, FreshTAP was able to visit restaurants and retailers three to four times a week, allowing prompt recovery of kegs. Since wineries pay a per-day fee for the kegs, centralization also saves wineries money.

"(We) distribute for over 40 craft breweries and cideries," Macquisten said. "We have built some really cool software that allows all the manufacturers to tee up their orders and then they go on our trucks, and they get routed. It really helps us with our keg operation, because we're able to pick those kegs up and have the turnaround much faster."

The responsiveness impresses Summers, who is impressed at the growth of his kegged wine sales.

"Before, we had a lot of issues getting empty kegs back," he said. "With Direct Tap, they've been able to tighten that up a lot, and it's made it a lot less painful for us and a lot more organized, for sure."

Hester Creek is now moving more than 2,500 cases a year of Pinot Gris and Merlot via kegs, reducing its packaging requirements as well as allowing tighter control of what it's shipping to restaurants.

The distribution network has also helped Kate Garthwaite, co-founder of Left Field Cider Co. in Logan Lake, British Columbia, which signed on with Direct Tap at the beginning of November 2015 after three years of self-distribution.

"It was getting to be a bit much," she said. "We were at a point where it was taking a lot of time away from production."

Garthwaite still makes regular trips to Vancouver, but having regular, consistent distribution allows her to be more flexible about when she travels and allows her to spend more time with clients when she is there, rather than having to bustle off to the next delivery.

Growth opportunities are now drawing additional players into the sector, with Versay Inc. of Quebec offering imported wines in kegs for a broad range of restaurants across Canada.

"It's more widely accepted now; there's next to no resistance to the fact that you're talking about wine in kegs," said Jean-François Bieler, president of Versay. "The initial reluctance some buyers and some restaurant owners might have had is disappearing fast. So that's a good thing." ●

*Peter Mitham is a freelance writer based in Vancouver, British Columbia.*

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# No bees, but a lot of BUZZ

**Researchers make promising progress on effective artificial pollination system.**

*by Ross Courtney*

*photos by TJ Mullinax*



WSU cherry horticulturist Matt Whiting shows one of several netted cherry limbs used for a mechanical pollination trial. The netting prevents natural pollination.

Pollination comes with problems. Bloom dates don't overlap, honeybee colonies fail, weather doesn't cooperate. The list goes on.

Matt Whiting foresees a day when none of that matters.

"What if I were to tell you now that everything you've heard ... wouldn't be an issue any longer? No problems with pollinizers, no problems with pollinators," Whiting said to growers at the December Washington State Tree Fruit Association Annual Meeting in Yakima, Washington. "That in a nutshell is the vision that we have here."

After two years of experimenting, the stone fruit physiologist and his collaborators believe they have developed an effective artificial pollination system that uses an electrostatic sprayer to apply a suspension of pollen to flowering fruit trees.

Welcome to Whiting's vision of farming without bees.

## About the completed project

Whiting, with Washington State University, started the project in 2014, when he sprayed an existing slurry of pollen and other compounds available through pollen companies. In 2015, he and some engineering faculty at the WSU Irrigated Agriculture Research and Extension Center tried out their own homemade suspension, using a sucrose agent that kept pollen viable for one hour.

Through the spring of 2015, Whiting ran trials in cherry, pear and apple orchards around the state. In each one, using his spray as a supplement to bees, he increased pollen density per stigma compared to natural pollination, sometimes threefold. Fruit set improved anywhere from 10 percent to 200 percent when used to supplement bees.

To test his pollen agent by itself in a controlled environment, he covered several tree branches with nets to keep the bees out. In each of those trials, his sprays worked, but fell well short of natural pollination. So, he's



Juan Farias drives a spray rig outfitted with test equipment for the

a long way from putting bees out of work.

Whiting also tinkered with different rates and realized that increasing the pollen per acre boosted fruit set only to a point. After that, it didn't seem to matter how much he used, he said, but he wants to further study rates, timing and concentrations.

## Grower cred

Whiting struggled for years to have his work taken seriously. About five years ago, grant programs from the U.S. Department of Agriculture called his proposals "too science fictiony," he said.

However, his experiments in 2014 and 2015 — funded by a \$61,209 grant from the Washington Tree Fruit Research Commission — have given him credibility, especially among growers, he said.



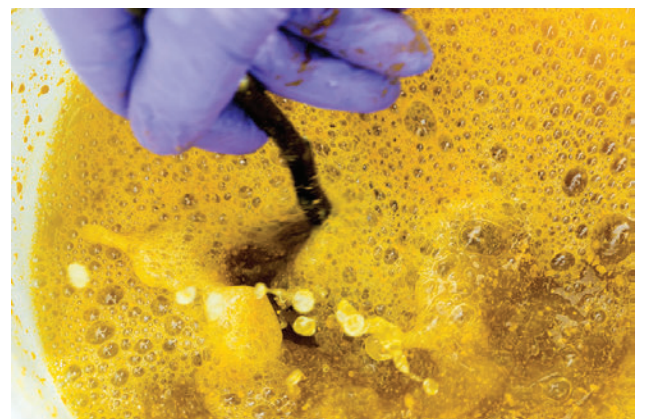
## PLAY

*Learn more about the 2015 trials and watch this pollination system in action. Go to [goodfruit.com/media](http://goodfruit.com/media)*





application of pollination in a cherry block near Prosser, Washington, as part of a trial last spring.



Whiting and research assistant Probir Kumar Das place dry pollen into a mechanical pollination spray tank. Vigorously mixing the pollen slurry is necessary because the pollen tends to clump, clogging filters and spray nozzles.



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"The thing that we have now is proof of concept," Whiting told *Good Fruit Grower*. "With that proof of concept has come a lot of grower interest."

All the growers he worked with on the project asked him to return the following year. A few have purchased their own electrostatic sprayers and plan to do even more pollinating without him, purchasing directly from pollen suppliers. A group of California growers has invited him to visit to discuss his work.

"I like the concept," said Denny Hayden, a Pasco, Washington, cherry and apple grower. "We'll see if the idea proves out, but the concept is great."

Hayden's biggest frustration with honeybees is weather. Cold or windy weather grounds bees, sometimes while the blossoms are at their peak fertility.

"You have, in some cases, hours to get the pollen transferred," said Hayden, a former member of the tree fruit research commission.

Growers pay anywhere from \$40 to \$70 per hive each season. Recommendations call for two hives per acre, though most growers use way more to sleep better at night. Hayden has been known to triple that number.

Luke Anderson, an orchard manager for Allan Brothers, has invited Whiting to try his method on a block of Benton cherries near Mesa, Washington, where he has trouble setting fruit.

"If we can even get close to manipulating (pollination) in our favor, I'm not surprised growers are excited," Anderson said.

The owner of the pollen company collaborating on the work is just as pumped.

"I'll tell you ... it works," said Neil McClure, owner of Firman Pollen Co. in Yakima, Washington.

The industry, with high-density fruit walls and science-based methods, is ready for a new method of pollen delivery, McClure said. McClure admits Whiting still has to answer a lot of questions before he proves the technology is applicable for widespread commercial use, but he believes it's only a matter of time, perhaps 20 or 30 years.

"Truly a revolution in growing," he called it.

Others are more reserved.

"I don't think I'm going out of business any time soon," Eric Olsen, a Yakima commercial beekeeper, quipped during the tree fruit association conference after hearing Whiting speak.

Andy Gale, general manager of Stemilt Ag Services, conducted his own 2015 trials with an Arizona spray vendor on a hard-to-set block of Bing cherries in Mattawa, Washington.

"We really couldn't see the results, to be honest with you," he said, admitting he relied only on "naked eye" perceptions.

He plans to try again this year, perhaps taking more precise measurements of fruit set, he said.

## Background

Declining health of honeybee hives has captured national attention, with research funding going to searches for alternative pollinating insects and development of honeybee forage plants. Education grants send money to high school teachers to conduct bee projects in their classrooms.

Meanwhile, growers already have the option of mechanical pollination, applying pollen as dust with puffers they carry by backpack or mount on an all-terrain vehicle. The method is common in the kiwifruit industry, but tree fruit growers such as Stemilt use it, too. Pollen is a hardy substance that will last for years when kept dry and cold.

But even McClure of Firman Pollen admitted dusting is inefficient, suited best for targeted supplemental efforts, not the full coverage application Whiting proposes.

Meanwhile, pollen is in short supply. Firman cut back about 20 percent this year on its California deliveries, trying to keep Washington at full supply, McClure said. The company sells 2 million grams of pollen a year, for example.



*"The thing that we have now is proof of concept. With that proof of concept has come a lot of grower interest."*

—Matt Whiting

If his idea takes off, Whiting envisions a day when growers plant trees just for pollen, creating a whole new industry, and pollinate only the number of blooms they want, eliminating the need for spring and summer thinning. In fact, Allan Brothers of Naches, Washington, and Firman have planted pollen-only orchards to experiment with trellising and management systems, according to Whiting's research documents.

"The ability to artificially pollinate tree fruit holds the potential to revolutionize crop load management," Whiting said in his final report to the Research Commission. "Our vision for precision pollination systems that do not include pollinizers nor pollinators appears plausible. Clearly these results should be considered promising yet preliminary." ●





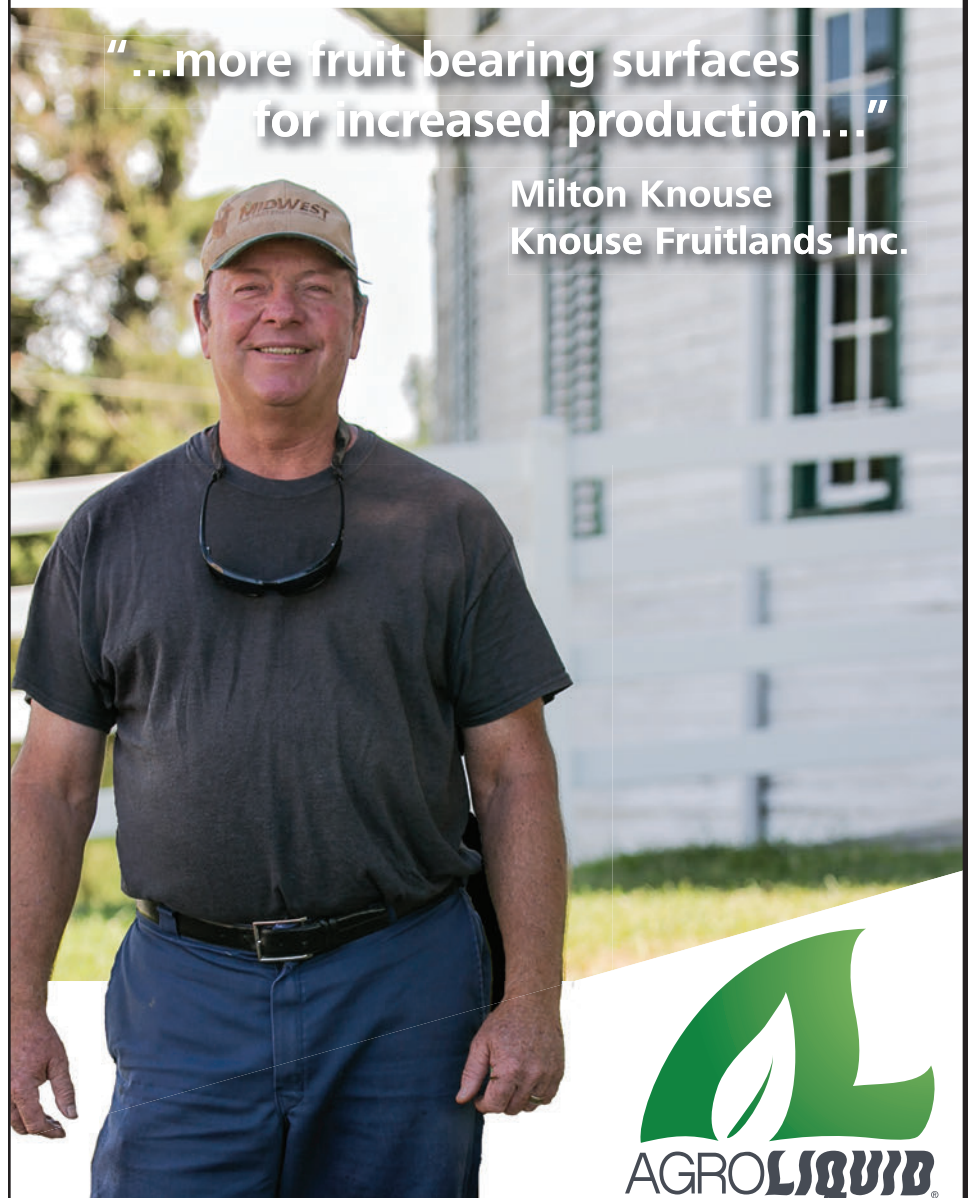
Probir Kumar Das picks cherry blossom samples for testing to determine whether they were successfully pollinated with a pollen spray rig. At top, Matt Whiting with the spray rig. In his report on the trial, Whiting said the “ability to artificially pollinate tree fruit holds the potential to revolutionize crop load management.”

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# Growers get peek at picking MACHINE

**California company shares progress on vacuum end-effector.**

*by Shannon Dininny*

**A** California company that is developing a vacuum apple picker with support from the Washington Tree Fruit Research Commission has made significant progress on a prototype and is working to raise capital for commercial development.

Abundant Robotics Inc., a spinoff of SRI International, hosted closed sessions at several Washington orchards last fall to evaluate and demonstrate the efficacy of the machinery for some growers, picking

thousands of apples in the process. The company will be in Australia in April to test newly added technologies before returning to Washington again this fall for further evaluation, according to Dr. Curt Salisbury, Abundant's chief technology officer.

The Research Commission has already appropriated \$550,000 toward the project so far, and Salisbury delivered a progress report at the Commission's Technology Research Review in Ellensburg, Washington, in February. "We're extremely passionate about this and really excited,"

he said. "We're grateful to do something that could potentially have an impact."

## **The technology**

Salisbury said he and the research team went into this project from the perspective that there were two issues to resolve. One involved perception — how does the machine differentiate fruit from leaves — and the other revolved around getting fruit off the trees without bruising it.

The researchers had already determined that a vacuum-based picker could



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TJ MULLINAX/GOOD FRUIT GROWER



## PLAY

A video showing how the vacuum-based picking machine targets apples, shown at far left, and then plucks them off the tree was shown during the Washington Tree Fruit Research Commission's Annual Technology Review. Watch the video at [bit.ly/vacuum-harvester](http://bit.ly/vacuum-harvester)

*"We're hoping the tractor driver is just putting it in low gear and he's not even looking back."*

—Curt Salisbury

avoid damaging or dislodging the target fruit, adjacent fruit or part of the tree in ways that a grasping machine might. The suction flow is intended to pull the apple to the nozzle, separate it from the tree and pass it through the nozzle to a conveyor. The nozzles are like cartridges, coming in multiple sizes to harvest varying sizes of fruit, though the size range of a single cartridge is pretty wide, and growers are unlikely to need to swap it out within a block or even an entire orchard, Salisbury said.

Currently, the system can pitch to about 45 degrees to match the angle of a trellis and has a vertical range of about 4 to 5 feet. The vision is to have one machine picking high and another picking low from the same moving platform, Salisbury said. "We're hoping the tractor driver is just putting it in low gear and he's not even looking back," he said.

Dan Steere, an SRI consultant working with Salisbury on the project, said it's clear that growers are considering trellises because it's by far the most efficient production system. In terms of mechanically automating harvest, a trellis system is going to be important for growers, but what kind of trellis remains to be seen, he said.

"As far as recommendations to growers to prepare for automation, we're not in a position to offer those yet," he told *Good Fruit Grower*. "It's important for us to learn from world-class producers, world-class experts, so Washington is the ideal place to collaborate on this research."

### Getting results

In 2015, the research centered on three areas:

—Refining the nozzle design to reduce stem and spur pulls and to minimize damage to the apple.

—Developing an ultra-compact decelerator to slow down the apples upon exiting the vacuum tube for conveyance.

—Integrating the picking vacuum on a commercial robot arm.

*Continued on page 31*

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# A gentler journey from BUCKET TO BIN

**A** little more than six years ago, *Good Fruit Grower* reported on a field test of the DBR Conveyor Concepts vacuum system apple harvester. Workers picked over-mature, Golden Delicious apples at the Pennsylvania State Fruit Research and Extension Center in Biglerville, Pennsylvania — after three days of rain — and sent the fruit through the harvester. It passed the bruised apple test “with flying colors.”

## Design improvements to vacuum system apple harvester reduce bruising, worker strain.

by Dave Weinstock

Michigan, the “B” of DBR, decided he could build even less bruising into his machine. The design changes he made include widening the head; changing the foam inside the tubes; creating a new bucket and putting a pivot on the bucket hose.

An in-house study this year showed the design improvements Brown made to the machine delivered an additional 10 percent improvement over the human crew. “The apples we looked at showed almost no machine bruising at all,” he said.

Based on data from a second bruising study performed by Michigan State University in 2013, the machine harvester bruised 10 percent fewer fruit than a two-person crew on ladders. In addition, the machine-based, two-person teams who picked the fruit filled between 25 to 50 percent more bins per day than two-person crews using ladders.

Four years later, Phil Brown of Conklin,

## How it works

The self-propelled machine features two sheltered platforms located on either side of the apparatus, upon which workers stand to pick fruit. The platforms feature hand and foot controls to allow horizontal, forward and backward adjustment of their positions.

Workers pick fruit and place it in buckets strapped to their waists and shoulders on the platform. Each bucket is connected to the machine by a single hose, which evacuates the fruit as it is picked through an elaborate array of neoprene-lined hoses to a distribution head, which gently drops the apples while evenly laying them into bins.

Once full, a set of forks mounted on the machine moves full bins to the side of the row. Then, an empty bin is selected from a trailing wagon by the same set of forks and inserted as a replacement underneath the harvester. “The removal and replacement operation takes about 45 seconds,” Brown said.

## Improvements

Brown first aimed to widen the lanes inside the machine to allow for larger fruit. “They are coming in at 12 feet per second,” he said. “Apples can’t hit anything but a soft foam pocket.”

Speaking of foam pockets, he also replaced the neoprene foam with a formulation of his own. “We tested a lot of different foam on the distribution wheels. The one we’re using now has more density than neoprene, will be gentler on the fruit and will hold up over the long haul.”

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PHOTO COURTESY PHIL BROWN WELDING

Andrew Duffy, a Phil Brown Welding employee, demonstrates the DBR Conveyor's new pivoting, plastic bucket, designed to reduce worker strain.

Distribution wheels are located inside the aluminum head. They act to slow down the apples after they leave the hoses, laying them on the distributor.

Next, Brown changed the distributor speed to be independent of wheel speed. In the first model, running speed and vehicle speed were fixed in a 2:1 ratio. "When the wheel speed would increase, so would the distribution head speed, which increased bruising because it wouldn't lay them in gently enough," he said.

Instead of metal buckets on the front end, Brown now uses plastic ones. "They are not fixed on the end of the hose," he said. "Now, they pivot so there is no strain on the workers at all."

He also replaced the harvester's 44-horsepower engine with a 60-horsepower model. More horses mean the harvester will be able to handle hills better as well as snow, extending its usage to year-round work, such as pruning, hand thinning, applying pheromones, trellising and picking. ●

The research team integrated the vacuum picker with a commercial robot arm and a 3D stereo sensor developed by Carnegie Mellon University, showing that the end-effector design is compatible with a robot arm. The team also determined that memory foam, with its preferred viscoelastic properties, was the ideal material for decelerating apples upon exiting the vacuum tube without bruising them.

The team also took the preliminary step of commissioning a formal experiment across multiple cultivars to determine the effect of pulled stems on fruit decay in storage. Those apples are currently in controlled-atmosphere (CA) storage and will be evaluated alongside traditionally harvested fruit beginning in March.

Abundant Robotics tested and evaluated the equipment at seven Washington orchards last fall, including McDougall and Sons, Chiawana Orchards, Yakima Valley Orchards and Matson Fruit. As part of those demonstrations, the Washington Tree Fruit Research Commission collected 180 of the harvested apples, all Fujis, for evaluation. Seven apples were downgraded for bruising and 26 apples were culled, mostly for unanticipated punctures or cuts, Salisbury said.

"Basically, what's causing these cuts is the vacuum system pulling in a twig or branch that then gets the apple," he said. "Even the bruises look like it's the same phenomenon, it just wasn't aggressive enough to cut it."

Salisbury said he asked growers who attended the demonstrations about it and most indicated that the problem twigs could be pruned before harvest. Of the 180 apples evaluated, 86 percent would

have packed as Washington extra fancy.

Overall, the testing activities in 2015 found that the vision system and vacuum picker are capable of recognizing, localizing and picking apples without bruising them. The two systems were able to work together to pick fruit at a picking rate of faster than one apple per second.

#### The future

In Australia, the researchers will be evaluating the system as a continuous picking machine, moving down the row and harvesting fruit, rather than parking it next to a tree to harvest fruit as they have in the past. They also aim to demonstrate whether the vision system can evaluate for ripeness based on color and are researching conveyance to determine how best the apples should travel to bins from the picker.

Salisbury, who grew up in Richland, Washington, first approached the idea of developing a robotic harvester four years ago. The company aims to have the product commercially available in the fall of 2018, though Salisbury stressed that was an extremely tentative date.

"We need to make sure that limitations are set properly, that we're prepared to deliver what we're talking about," he said.

Steere agreed. "A lot of people have made aggressive claims about what robotics can do in agriculture," he said. "We don't want to be one of the groups that claims more than we can deliver."

That rollout — whether the equipment will be available for purchase or lease to growers, offered as part of a harvest service or some other option altogether — and the cost to growers also have not yet been determined, Salisbury said. ●

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by Leslie Mertz

in Michigan, a significant portion of their peach volume is made up of Paul Friday's peaches. That's a pretty good indicator of the importance of his breeding program," said Bill Shane, senior extension tree fruit specialist at the Southwest Michigan Research and Extension Center

have come out of the Flamin' Fury breeding program has already topped three dozen, and others are in the pipeline, according to grower and breeder Paul Friday, who is entering his 55th year in the peach business.

"Of those who grow peaches commercially

in Berrien County. "His breeding program has been extremely valuable for the people in this climate and our more temperate, rainy growing conditions."

## Getting started

Friday grew peaches for three decades on his family's farm in southwestern Michigan, established in Coloma in 1846. He started the Flamin' Fury breeding program about 25 years ago when he simply wanted more selection.

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PHOTO BY LESLIE MERTZ

Paul Friday displays some of his peach varieties at his booth during the Great Lakes Fruit, Vegetable and Farm Market EXPO in Grand Rapids, Michigan. Over the years, his prolific Michigan breeding program has introduced 37 peaches, all under the series name Flamin' Fury. Each new variety can take up to two decades to develop.

*"He's really made remarkable progress, and the number of his introductions is amazing for a breeding program."*

—Bill Shane

On top of that, Friday wanted to find a peach for every harvest window from early to late season. So he wandered through his orchard, sampling fruits tree by tree. He came across some "chance mutations" with desirable characteristics and cross-bred those trees.

"From my original crosses made in that first year came seven new varieties that turned out to be commercially acceptable," he said. He shared the news with fruit experts, but they were skeptical, he recalled. "They said it would be outstanding if I had found just one new variety, and it took them a long time to realize I did have seven and that six of those original seven were particularly good."

Soon, Leno Mori of Mori Nurseries in Ontario and Phil Baugher of Adams County Nursery in Pennsylvania took interest in the new varieties, the nurseries started selling them, and Friday has never looked back.

"As I developed varieties, I'd use them as parents to continue that bloodline, so to speak, and develop newer varieties," he said.

#### Breeding success

Of the 17 nurseries in the U.S. and Canada licensed to carry Flamin' Fury varieties, two are recent additions from California. "My varieties seem to be moving both southeast and west. I have a lot of interest from California, where they're particularly interested in my flavor and bacterial spot resistance," Friday said. In addition, he noted, his varieties are currently undergoing extensive testing in parts of South Africa, which supplies Eastern and Western Europe with peaches in the off-season.



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## Flamin' Fury Grandchildren



Michael

Meghan

Friday named his Flamin' Fury series of peaches after his then 3- and 5-year-old grandchildren, shown here in a family photo. The two youngsters had flaming red hair along with energetic personalities well described by the series name.

Friday is happy about the wide distribution of the peaches, but he seems most excited about responses from individuals. "A shipper packer in California has had my varieties on test for a number of years, and he told me, 'We always eat your varieties at home and serve them to our guests.'" Friday smiles, and then he pulls out his phone and plays back a voicemail of a telephone call he got from a grower in Kentucky about his PF Paramount 24 variety, which he describes as a sweet midseason peach with bacterial spot resistance, cold-hardiness and high yield. On the recording, the grower remarks, "I just want to thank you for an amazing peach. It's really the best peach we've ever had. We've really been talking about it all day."

When asked about his own favorite Flamin' Fury variety, Friday answered, "For what season? They're all only good for 10 days, so there are lots of good peaches." He does, however, point out a few notable varieties: One is the PF 24-007, a freestone peach that ripens about 22 days after Redhaven. The other is the PF 24-007 peach, which has been listed in the Guinness Book of World Records as the world's largest peach since 2002. It was 5.5 inches in diameter and weighed almost 2 pounds, although Friday said he's actually grown some that are larger. In 2010, the talk show *Late Night With David Letterman* got wind of the record, and called Friday asking him to bring his record-holding peach to the show. "I said, 'I ate it eight years ago!'" He laughs. "You can't make this stuff up."

Other Flamin' Fury peaches he thinks especially worthy of mention are the PF Lucky 13, one of his most popular varieties; the large, midseason PF 19-007; the PF 28-007, a late-season peach that ripens 32 days after Redhaven; and the even later ripening PF Fashionably Late. He is quite fond of PF Fashionably Late, which he considers "one of the best in the series." PF Fashionably Late ripens 54 days after Redhaven and, while a semi-cling variety, is very juicy.

Shane has a few favorites in the Flamin' Fury line, too. "The PF 19-007 is a nice one for its harvest window about 16 days after Redhaven. Other ones that I like quite a bit are his PF 9A-007, which is in the Redhaven window, and one of his really early ones called PF 5 D Big, which is about 24 days before Redhaven."

Besides the merits of Friday's individual varieties, Shane asserts that the entire Flamin' Fury series has made a difference. "One of the things that his breeding program has done is it has developed peaches that ship well, that have enough red color to compete in the national peach market and have good fruit size," Shane said. "He's really made remarkable progress, and the number of his introductions is amazing for a breeding program."

Today, Friday is easing up his workload a bit. He has retired from his life as a peach grower and even moved into a retirement home — "It's like a cruise ship, but without the seasickness!" — but when asked if he'll retire from breeding, he immediately and emphatically said, "No. The goal is always to develop something better than what you already have, and I have a lot of stuff in the works."

He added, "I'm always in search of the perfect peach." ●

Leslie Mertz, Ph.D., is a freelance writer based in Gaylord, Michigan.

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PHOTOS COURTESY OF PAUL FRIDAY

Friday, in his orchard, searches for the best fruit characteristics and cross-breeds parent trees in his quest for the perfect peach.

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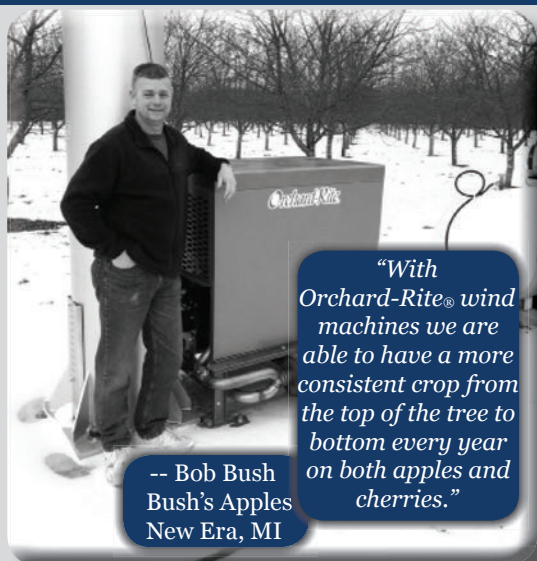
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**PRODUCT REVIEW**

# Hopes dim for demise of LANTERNFLY

**Researchers are no longer optimistic that bug first detected in 2014 can be quickly eradicated.**

by Dave Weinstock

A year ago, researchers expressed optimism about the possible eradication of the spotted lanternfly. Their optimism was not echoed at the 2016 Mid-Atlantic Fruit and Vegetable Conference.

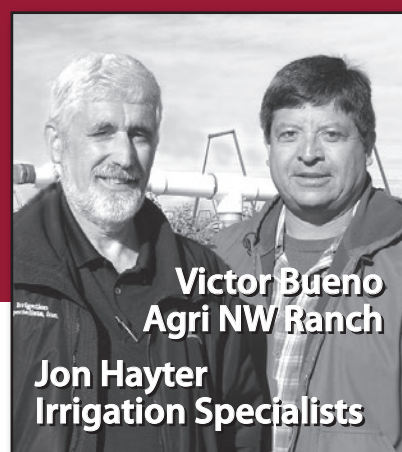
"USDA and the Pennsylvania Department of Agriculture are doing their best," Penn State University entomology professor Mike Saunders said at the February conference in Hershey, Pennsylvania. "But I don't think eradication is possible anymore."

Movement of egg masses is the determining factor. First detected in 2014 in eastern Berks County, Pennsylvania, the pest entered the United States by means of egg masses attached to landscaping stone imported from South Korea.

The gray egg masses were easy to miss on the gray-colored stone, and it's the movement of egg masses

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The spotted lanternfly adult is 1-inch long and a half-inch wide. Its mouthparts are designed to pierce bark and suck moisture from the phloem plant layer.

GREG HOOVER, PENN STATE EXTENSION

by human means that is the root of Saunders' skepticism. "That's how the gypsy moth spread throughout the Eastern United States," he said. "Families with camping trailers might have had egg masses attached to them. They'd overwinter and spread to another area where they'd hatch in the following season."

As of Nov. 15, 2015, the Pennsylvania Department of Agriculture listed four southeastern Pennsylvania counties — Berks, Bucks, Chester and Montgomery — as part of its spotted lanternfly quarantine area.

#### Fear of the unknown

Spotted lanternfly is unlike gypsy moth in one crucial way. "I don't anticipate difficulty in controlling them," Saunders said. "There are a number of systemic and contact pesticides that should do that."

Because it is a new species in this part of the world, however, it has few natural enemies. The assassin bug is one, but appears to have a limited impact. Saunders said he sees a lot of intact dead lanternfly insects on the ground months after they died.

Concern about the pest is grounded in what U.S. entomologists don't know about the insect. The first information they found came from a 2006 Korean document telling of damage to "grape orchards" there, though they have yet to determine the infestation's scale or range.

There is also no known research on how the insect impacts grapevine growth, health and yield. "We've not seen any direct statement in the literature on how they damage grapevines," he said.

Saunders and his graduate student, Erica Smyers, have supplemented the Korean data with a good deal of information gathered from the field.

The lanternfly's mouth parts are designed for piercing and sucking. It penetrates the bark, taking soluble nutrients from the phloem, the layer that moves water, sap and nutrients through plants and trees.

Another question entomologists have is whether the feeding site injury becomes a wound through which another disease or insect might enter the plant.

As the insects feed, they retain the proteins they want and rid themselves of the sugars and carbohydrates they don't want. In doing so, they excrete a thick white residue called "honeydew" in large quantities.

It is possible honeydew damages plants as much as the insects do. For example, the honeydew might act as a fungal mat, a substrate for molds to grow or form a nutrient layer for pathogens to mature and take hold of the portion of the plant it covers.

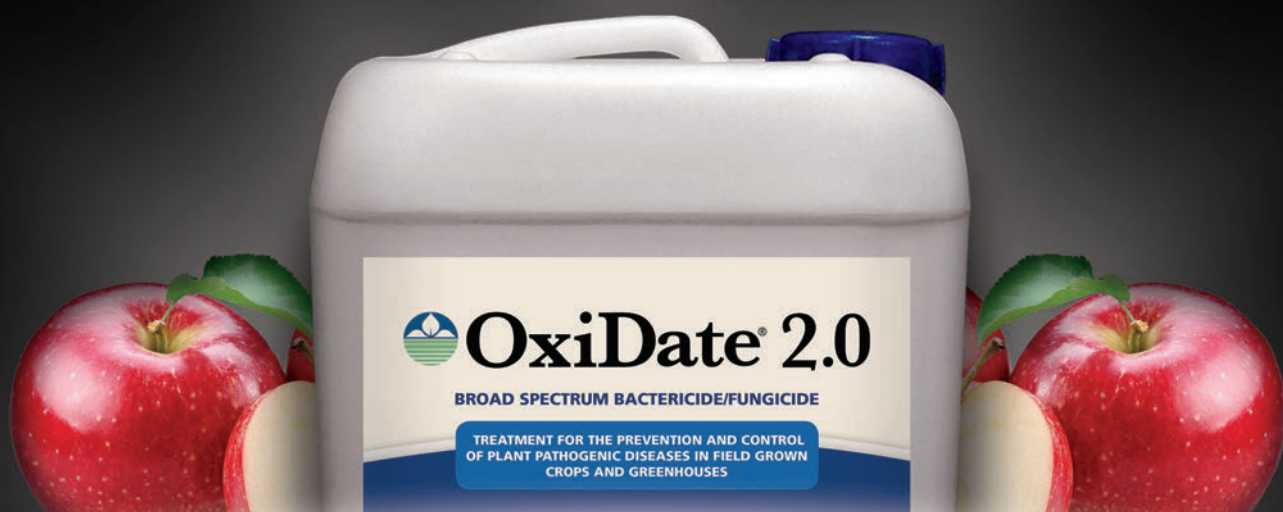
#### Life cycles

Scientists have determined from the Korean data the number of degree days it takes for larvae to hatch, what the lethal winter temperatures are for the pest and that the female spotted lanternfly deposits its egg mass on flat surfaces.

Egg masses hatch in May. Host plants include fruit trees, ornamentals and hardwoods. "Their preferred host plants appears to be tree of heaven," said Saunders.

There are four nymphal stages called instars. In stages one and two, the instar is black with white spots. In stages

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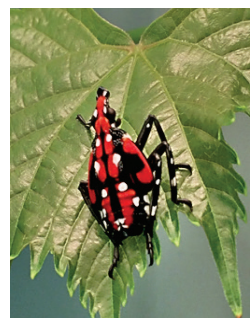
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The first instar phase of the spotted lanternfly is characterized by white patches on black bodies. At this phase, lanternfly nymphs show no interest in eating grapevines.



Immediately before molting into sexually mature adult moths, fourth instar phase nymphs develop a taste for grapevines.



PHOTOS BY ERICA SMYERS, PENN STATE

As the insects consume liquids from beneath the bark of plants they feed upon, they consume the proteins they need and excrete waste carbohydrates — called honeydew — in large quantities.

program will determine if a vineyard has an infestation, as well as the age and size of the infestation and timely applications to control it, including whether it would be profitable to control younger populations.

Saunders and Smyers are working to develop an effective integrated management program for this pest, a major emphasis of their research.

### **Two studies**

In an attempt to determine its threat to the grape industry, Saunders and Smyers collected egg masses in April and in October and November. Returning to Penn State, they put them into a quarantine room, storing them in a refrigerator with temperatures between 5° and 7° Celsius (41° and 45° Fahrenheit).

Later, the chilled egg masses were placed in rearing cages at room temperature. It took an average of 18.7 days for the masses to hatch. Once hatched, they transferred

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the nymphs to rearing cages containing live grapevine roots and recorded hatched versus unhatched numbers after emergence.

Their most interesting finding: Most nymphs did not survive past the third instar. Whether that was due to nutrition, disease, grape variety or fertilizer, they just don't know.

The second study is in progress. Saunders said they have established a small vineyard inside the quarantine zone so they might assess adult feeding impacts in terms of quantity, grapes and grapevines.

Next year, Saunders and Smyers plan to introduce spotted lanternflies onto the vines, which are enclosed in cages to prevent the insects' spread, to observe the impacts outside of laboratory conditions.

#### State of readiness

If Saunders is correct and spotted lanternfly eradication is not possible, Eastern growers should be alert for possible infestations. In addition, if human transport of egg masses is indeed a factor, this problem may not remain limited to the immediate area of southeastern Pennsylvania.

Growers who have tree of heaven stands may want to keep a watchful eye in their vineyards and on those trees for insects, honeydew or egg masses.

"If you see egg masses," said Saunders, "scrape them off the tree or smooth surface and place them in a tightly sealed container with 70 percent alcohol or hand sanitizer to kill them." ●

#### SPOTTED LANTERNFLY

If you see a spotted lanternfly infestation in vineyards located outside the quarantine area, contact Dana Rhodes, Pennsylvania Department of Agriculture plant inspection program specialist, (717) 772-5205 or via email: [danrhodes@pa.gov](mailto:danrhodes@pa.gov)

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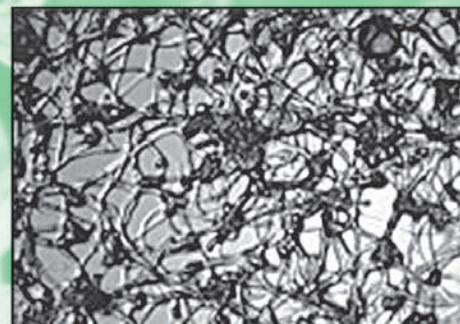
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## GOOD POINT

Jim Allen, New York Apple Association

# My thanks to growers supporting food safety research

**“One bad apple will spoil the barrel”** is almost as familiar as the saying *“an apple a day keeps the doctor away.”*

We know that the second phrase came from Wales, first noted in 1866, *“Eat an apple on going to bed, and keep your doctor from earning his bread.”* The bad apple spoils the barrel phrase dates back to colonial days when apples were shipped to England in wooden barrels.

We prefer the healthy slogan because it communicates good health, and when we hear about bad apples, it sends chills up our backs. That is because now more than ever those chills are most threatening to us all.

Last year, it only took a handful of apples to disrupt the cart nationally as well as internationally because of a *Listeria monocytogenes* outbreak. Bad news spreads faster today than ever before, thanks to social media and the Internet. We could be in the midst of a full-blown, foodborne outbreak within hours of the first detection. Consumers today may not know exactly what Shiga toxin, *E. coli* or *Listeria* are, but they do know that they are bad and people can die from them. Earthbound Farm, Dole, Chipotle Mexican Grill and Bidart Brothers, to name a

few, can all attest to the importance of food safety after being the subject of food safety investigations. Spinach, cucumbers, melons, onions, cider, and yes, apples have all been found “guilty” at one time or another.

We all remember the spinach outbreak in 2006 and the three deaths associated with that outbreak. We also know that Congress in 2011 reacted to such outbreaks by passing the Food Safety Modernization Act (FSMA). Our industry is now trying to understand and comply with the new rules. It’s no easy task.

After the 2006 crisis, the produce industry quickly realized the need for a central clearinghouse to focus exclusively on produce safety research, in order to try to proactively prevent future food safety events. Supported by both private and public partnerships, the resulting Center for Produce Safety has provided over \$18 million to fund produce safety research and, in 2015, launched a national campaign to raise \$20 million over the next five years. This aggressive objective clearly identifies the need for more research based on sound science to continue to address food safety for produce, including apples. Since 2007, the CPS has become one of the most credible sources for the Food and Drug Administration, U.S.

Department of Agriculture, and Department of Health to obtain the needed data and information as it pertains to produce safety in our country.

Recently the Washington State Tree Fruit Association announced its commitment to raise \$750,000 to help CPS reach its goals over the next five years. The association joins a select few organizations and companies that have pledged over \$500,000 toward the goal. For the apple industry, or any produce sector, this is a huge and most notable commitment. It certainly exemplifies the seriousness and the importance of the cause. Other apple-producing states are being asked to step up and contribute as well. Individual apple companies are also starting to share in the commitment, and to all of them and to Washington state, well done! All apple growers and produce associations across the country should also consider joining this effort, now. It should be a national effort, because all it takes is one bad apple to spoil the barrel.

*Jim Allen is president of the New York Apple Association, Inc. This essay originally appeared in Core Report, the official newspaper of the New York Apple Association.*

## QUICK BITES

People and industry in the news.



John Griggs

### Griggs appointed to Apple Commission

John Griggs, a grower from Orondo, Washington, will serve on the Washington Apple Commission until March 2017.

The Washington Director of Agriculture appointed Griggs in January to replace Brian Sand as a commissioner when Sand resigned after leaving Auvil Fruit Co. Griggs is the general manager of Griggs Farms, which grows apples, pears and cherries on land first homesteaded by his family in 1887. He is a member of the board of directors of Chelan Fruit, which packs his farm’s produce. He also is a commissioner for Douglas County Fire District 4.

### Seneca buys Diana Fruit Co.

Seneca Foods Corp. has purchased Diana Fruit Co., in what Seneca called “a significant commitment to the cherry industry.”

Seneca is a public company based in Marion, New York. Diana Fruit, one of the leading providers of maraschino cherries and fruit cocktail cherries, is based in Santa Clara, California. The announcement was made on Feb. 17.

Seneca Foods is one of North America’s leading providers of packaged fruits and vegetables.

Diana Fruit Company was founded in 1921 in Santa Clara, California, by Alexander Diana, an immigrant from Yugoslavia and northern Italy. After 13 years of ownership under Holly Farms and one year under Tyson Foods, a group led by John T. Stout purchased Diana Fruit in 1990.

## GOOD TO GO

For a complete listing of upcoming events, check the Calendar at [www.goodfruit.com](http://www.goodfruit.com)

### Educational winery tour in British Columbia

The Washington State University Viticulture and Enology Program is offering an educational tour of British Columbia’s Okanagan Valley, with behind-the-scenes visits with winemakers and grape growers.

The three-day tour will be held May 18-20 and begins in Penticton, British Columbia, with stops in South Okanagan and Kelowna. Wineries to be visited include Bella Wines, Black Hills Estate Winemaker, Blue Mountain Winery, Quail’s Gate, Black Market Wine Co. and Nagging Doubt.

The registration of \$400 per person includes bus transportation, technical visits and tastings from nine wineries, as well as three lunches and one dinner. It does not include hotels, other meals or transportation to Penticton. Registration is limited to 25 people.

For more information, visit [wine.wsu.edu](http://wine.wsu.edu) or email Theresa Beaver at [tbeaver@wsu.edu](mailto:tbeaver@wsu.edu).

### MAY

**May 18-20:** Washington State University Viticulture and Enology Program’s British Columbia Okanagan Valley educational tour, [wine.wsu.edu](http://wine.wsu.edu). For more information, email Theresa Beaver at [tbeaver@wsu.edu](mailto:tbeaver@wsu.edu).

### JUNE

**June 1-2:** Pear Bureau Annual Meetings, Portland, Oregon, [usapears.org](http://usapears.org). Schedule includes Processed Pear Committee, Pear Bureau Northwest and Fresh Pear Committee. For details, call the Pear Bureau at 503-652-9720.

**June 13-14:** Postharvest Technology of Horticultural Crops Short Course, Davis, California, UC Davis Campus and field tour, [postharvest.ucdavis.edu/Education/PTShortCourse](http://postharvest.ucdavis.edu/Education/PTShortCourse).



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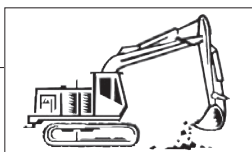
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**THE NORTHWEST HORTICULTURAL** Council (NHC) is seeking applicants for the position of vice president for scientific affairs. The NHC is a trade association, based in Yakima, Washington, that represents the tree-fruit industry of Idaho, Oregon, and Washington on federal and international policy issues. Information about the NHC may be obtained at [www.nwhort.org](http://www.nwhort.org). A candidate should possess a strong academic record and hold an advanced degree in a scientific field, such as biology, food safety, chemistry, horticulture, or plant pathology. He or she should be an able public communicator, both in terms of writing and speaking. We are looking for an active problem-solver, one who can lead and work cooperatively on commercially important projects with universities, federal and state agencies, and private industry. A candidate must have five or more years of post-university work experience. Preference will be given to candidates with deciduous tree-fruit production or handling knowledge and strong project-management expertise. Letters of application should be submitted to the NHC at 105 S 18th Street, Suite 105, Yakima, WA, 98901 or to [general@wahort.org](mailto:general@wahort.org) and will be accepted until the position is filled.

**CHIAWANA ORCHARDS,** a large apple and cherry producer in Washington State is looking for a high-energy person with strong horticultural and management skills to help develop and improve our production systems. Extensive horticultural knowledge is required. Three plus years of management experience is desired. This is a salaried, year-round position with benefits. Contact and résumé to [mireya@columbiareach.com](mailto:mireya@columbiareach.com)

**CHIAWANA ORCHARDS,** a large apple and cherry producer in Washington State is looking for a high-energy person with strong horticultural and management skills to be an orchard manager. Extensive horticultural knowledge is required. Three plus years of management experience is desired. This is a salaried, year-round

position with benefits. Contact and résumé to [mireya@columbiareach.com](mailto:mireya@columbiareach.com)

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**SCOTIAN GOLD** Co-operative Limited is a \$35 million food industry leader with an established international reputation for high-quality produce. Our operations include Eastern Canada's largest apple packing and storage operation, an agricultural, and a retail division. Scotian Gold is committed to excellence, respect for people, families and communities. Visit our Web site at [www.scotianguard.com](http://www.scotianguard.com). We are currently seeking a Tree Fruit Horticulturalist to join a small Grower Services team that supports over fifty tree fruit growers. The successful candidate will undergo a training period covering all functions of the business including farm visits, grower information and technology transfer, crop estimates, crop intake, fruit storage and packing, quality control and Food Safety. The tree fruit industry is in a phase of rapid expansion as a result of the popular Honeycrisp apple. Large new plantings and the introduction of new technology to the industry will make for a very exciting future in this industry, and more specifically with Scotian Gold Cooperative. In this role, you will become the "go to" source for growers seeking information on the tree fruit industry. The candidate will prepare and present weekly information sessions during the growing season and conduct Farm calls regarding soil prep, planting, pruning, thinning and pest control. The candidate will work with existing Managed Variety Programs and constantly seek new varieties and opportunities. The Tree Fruit Horticulturalist will be a self-starter and a team player in a fast moving workplace. The successful candidate must possess a minimum of a Bachelor's degree in Agriculture and demonstrate excellent communication, organizational and analytical skills. If interested in this exciting opportunity please apply to [alice.macdonald@scotianguard.com](mailto:alice.macdonald@scotianguard.com) stating your salary expectations and availability.

**EXECUTIVE DIRECTOR** Wanted, Columbia Gorge Fruit Growers, Hood River, Oregon. Permanent, full-time position. Resumes and cover letter due March 30, 2016, start date of May 30, 2016. Columbia gorge Fruit Growers is a non-profit organization of 440 agricultural producers and 20 fruit packers/processors, with the purpose of representing the interests of the local fruit industry. Educational requirements: Bachelor Degree in business, marketing, or public relations (or at least 5 years of experience in a similar field). Candidates should be able to write and manage grants; interface with state and federal agencies; and maintain fiscal records. Candidates should have excellent oral and written communication skills and have an interest in the legislative process. A background in agriculture is desirable. This position requires travel within the state of Oregon and Washington. You may request a full job description by emailing [cgfg@hrecn.net](mailto:cgfg@hrecn.net). Please submit your resume and cover letter to: Columbia Gorge Fruit Growers, PO Box 168, Odell, OR 97044 or by email [cgfg@hrecn.net](mailto:cgfg@hrecn.net)

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# LAST BITE

More Young Growers at [goodfruit.com/yg](http://goodfruit.com/yg)

## Mike McLaren

grower / Salem, Oregon

age / 35

crops / Wine grapes

business / Vineyard Equipment Manager, Chateau Ste. Michelle Canoe Ridge Estate Vineyard

family background / Mike is a first-generation grower who pursued a degree in winemaking before getting his start working in wine sales, distribution and learning to make wine at Corliss Estates.

### What are some of your recent goals?

“I recently took an opportunity with Ste. Michelle that would allow me to really develop my viticulture skills. All along the way I’ve obtained a ton of knowledge. Even though my path might not have been direct, I think the education I’ve gained from it is fairly significant. I’ve been working with the management team to figure out what our shortcomings are, what we can improve on in the vineyard, year-in, year-out. Also, keeping on top of what’s popular in the industry does give me an edge and understanding where we can improve quality.

### What do you see as the focus for vineyards of the future?

“If labor is an issue then we’ll plan for mechanization to reduce potential problems. I think we’ll see a significant dip in the next three to five years. We need to figure out how to balance the quality against a reduction of labor. Quality control using mechanization has been fairly inconsistent.

### What do you think Washington vineyards will be doing soon?

“I think over the next several years you’re going to see a lot of older vineyards coming across problems with plant parasitic nematodes, *Eutypa* dieback, and grapevine leafroll virus. We’re going to have to figure out a way to remove significant amounts of vineyard in a short period of time for replant. Because the second you know you’ve got a problem, you’ve got to remove it. From a technology standpoint, we’ve found a machine that can take a single plant and remove all root infrastructure out of the ground before replant.

### What would you tell younger growers?

“My dad had a strong work ethic, and I was able to take from that and apply it to my career in the wine industry. It is extremely hard work that involves a lot of hard hours, but the payoff is being able to say that I grow wine grapes. How cool is that?

“You can’t make good wine with bad fruit. It all starts in the vineyard.”

by TJ Mullinax  
More from this interview  
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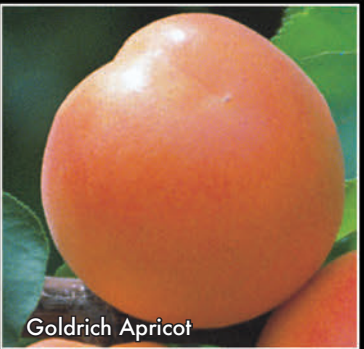
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