Cornell Cooperative Extension
Ontario County

THE INSIDE DIRT

For Fingerlakes Gardeners

Volume 18 Issue 9 October 2020

Inside this Issue

The Inside Dirt
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October Events and Shorts

The **North American Fall Maple Tour** was created to afford the community a touch of what they may have missed this past spring. Check in with your favorite **sugar houses** to see if they are participating in the **tour** and mark out your own path of **maple adventure**!

According to the NY Maple Maple Weekend website the following Ontario County Maple Producers are participating in the Fall Maple Weekends:

Kettle Ridge
515 Log Cabin Road, Victor, 14564
October 10 11, 17, and 18, 2020
Email for more information:
joe@kettleridgefarm.com

Schoff's Sugar Shack
1064 Willis Hill Road, Victor 14564
October 10, 11, 17, 18, 2020
For complete information:
Website: www.schoffssugarshack.com

Syrup A'LaRue
927 LaRue Road, Clifton Springs 14432
October 10 and 11, 2020
10:00 am-3:00 pm
See information flyers:
Fall in Love with Maple - Flyer
Carved Pumpkin Contest
Photo Contest

- **Make a compost pile:** Make a compost pile to provide organic matter for the garden. Practically any plant material can be composted for garden use—leaves, old sod, lawn clippings, straw and plant refuse from vegetable or flower gardens.
- **Roses:** In mid-November mound 10 to 12 inches of soil or compost around the base of each plant. Bring the soil in, don't hoe it up from the base. Long canes which may be whipped by the wind can be pruned back or tied together and staked. Climbing roses are best protected by bending the canes to the ground and covering with soil.
- **Winter Care of Summer Flowering Bulbs:** One important task at this time is proper care of summer flowering plants such as begonia, canna, caladium, dahlia and gladiolus. Unlike the hardier spring flowering bulbs, such as tulips, daffodils and crocus, which are left in the ground over winter, these plants need to be removed from the ground and protected from winter weather. To store begonia, canna, caladium and dahlia bulbs, wait until the foliage has yellowed and then carefully dig them up, removing the foliage. Store the bulbs in a slightly moistened peat moss or sawdust in a cool location away from frost. Do not pack or inhibit ventilation. Wash, inspect and divide these just before planting in the spring.
- **Cutting your grass:** Grass left too long over the winter encourages fungus diseases, such as snow mold. Continue to mow your lawn as needed.

Herbicide Injury in the Summer

In the early summer, it is not uncommon to encounter injury from 'growth-regulating' herbicides like 2,4-D applied to grass turf. Injury of this type is manifested by misshapen leaves and curled petioles with upward or downward leaf 'cupping'. In most cases, the injury is a result of vapor or particle drift from the turf site to the 'downwind' susceptible ornamental. In some cases, the downwind site can be a great distance away (hundreds of feet) from the target site. It is generally well known that these herbicides can volatilize and especially so in hot weather, and so they are not usually applied to homeowner lawns in the middle of the summer. This is not necessarily true of golf courses though, where weed control expectations can be high. But the volatile drift does not respect property lines and therein lies a problem. The problem can be easily avoided with heightened applicator/manager awareness of the weather conditions at and after application. Volatile fumes and drift particles readily move on light winds to new areas if the air temperatures are high.

Herbicide injury on trees downwind from a large golf course © Dan Gilrein

Every so often, and lately it seems to be too often, an ornamental shrub or tree branch sample is brought into the diagnostic lab that strongly suggests herbicide injury. Usually it is difficult or impossible to track down what the cause is because the applicator either doesn't remember or denies that an herbicide was used. I have long had a strong suspicion that many of these injuries are caused by inadvertent misuse of certain products available to homeowners. Even a casual observation of the pesticide section in a local box store or garden center will be reveal a number of ready-to-use (RTU) products that offer postemergence weed control and additional 'extended control'. It is the herbicides in these pre-mixes that provide the extended control that can be easily misused, sometimes with disastrous results.

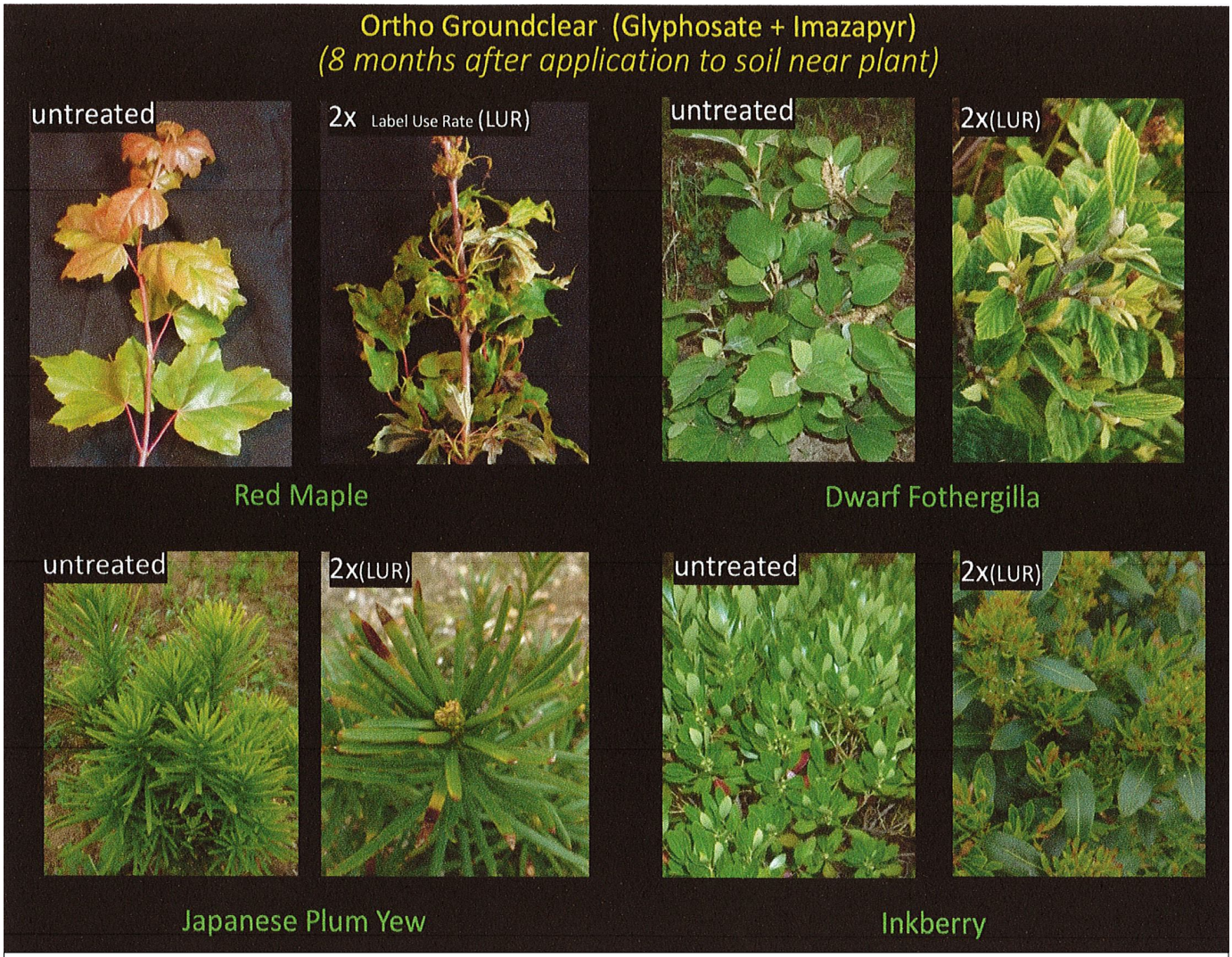
Hydrangea with suspect herbicide injury from drift of Tenacity, a crabgrass pre-emergent © Margery Daughtrey

'Corky' bark sessions on beech from exposure to a broadleaf turf herbicide © A. Senesac

I recently had an opportunity to evaluate four of the extended control products on several established ornamental shrubs and trees. The study evaluated the products applied directed to the base of four tree and shrub species established for three years in the field. The treatments consisted of an application at the suggested labeled rate and at twice that rate. Care was taken to make the applications so that minimal foliage was contacted. The application was made at the end of the summer. The ornamental species were red maple (Acer rubrum), Japanese plum yew (Cephalotaxus harringtonia 'Fastigiata'), dwarf fothergilla (Fothergilla gardenia) and inkberry, (Ilex glabra 'Densa'). The plots were irrigated within four days of treatment after which the plants were left alone until the treatments were evaluated the following spring.

The results of the treatments were very interesting. Only one of the four products caused serious injury to the ornamentals the spring following the application. That product contained imazapyr. There are several commercial and homeowner products with this ingredient either as the sole ingredient or combined with others. The most dramatic injury was to the red maple. The leaves were greatly miniaturized, and the growing points were dead in many cases. It should be emphasized the label instructions for the product very clearly stated that no applications should be made within twice the distance from the drip line of any tree or shrub. These results dramatically illustrate the need for that precaution. Imazapyr is a potent member of the imidazoline herbicide family. Once the injury is observed in the plant, it is unlikely that there will be significant recovery. Usually plant removal and replacement are necessary. These results indicate how easy it is to cause severe damage by not reading and following the product label instructions.

The label instructions for the product very clearly stated that no applications should be made within twice the distance from the drip line of any tree or shrub.



Injury symptoms from root uptake of Imazapyr © Andy Senesac

Source: Andy Senesac, Weed Science Specialist, CCE of Suffolk County. Branching Out, Volume 27 No. 10-Supplement

Spotted Lanternfly: The Newest Invasive and Its Impact To The Ornamental Landscape Industry

New Invasive Spotted lanternfly (SLF), Lycorma delicatula, an invasive planthopper native to Asia, was first detected in 2014 in southeastern Pennsylvania. As of August 2020, SLF is now found in Pennsylvania, New Jersey, Virginia, West Virginia, Maryland, Delaware, and Staten Island, NY. Detections of SLF have been reported in Connecticut, Massachusetts, and North Carolina, although established populations are not yet known in these states. Prior to the Staten Island finding, SLF was found in over 15 NY counties associated with vehicles, commodities, or other modes of introduction. SLF feeds on many plants, including economically important crops like fruit trees, grapevines, hops, hardwood forest trees, and landscape ornamentals. While SLF can cause significant damage to plants, it is mostly considered a nuisance pest in the ornamental nursery and landscape industries. Alone, SLF is currently thought unlikely to kill its plant hosts, with a few exceptions, but appears to be a significant plant stressor. In addition to feeding damage, however, there is high public awareness of and interaction with this pest which creates additional management considerations.

High numbers of SLF adults can be an annoyance © Heather Leach

The Biology

There is one generation of SLF per year. Egg masses, laid in fall on many surfaces (trees, decks, houses, outdoor equipment, rocks, etc.) and protected with a mud-like covering, hatch the following spring. Nymphs, small and generally less observed by the public, go through 4 stages (instars) and frequently move from host to host in a given landscape before reaching adulthood. Early nymphs (1st–3rd instars) are the most polyphagous stages, feeding on soft tissue of new growth of many landscape and agricultural plants (e.g. roses, peonies, cucumbers, basil, maple trees, etc.) 4th instars are often found on black walnut, tree-of-heaven, or staghorn sumac.

SLF instars 1-3 are black with white spots © Eric Day

SLF adults begin to emerge in July and remain active until killed by the first hard freeze in late fall. The most obvious and easily detectable (due to large size, about 1" long) stage, they are highly mobile and strong jumpers, distinct from most other insects in the landscape with bright red hindwings exposed when jumping, flying, or startled. In the first weeks after emerging, they are initially more sedentary within a given landscape. In August, they become much more mobile, thought to be linked to mating and finding new plant resources. This mobile period continues through September and can result in significantly high populations of these insects on trees, houses, gas stations, parking lots, etc. In the late part of the season (September–frost), they are most often found on hardwood trees (particularly maples, birches, willows) and in vineyards.

Egg masses, covered in a waxy gray deposit and hard to detect, can be laid on bark, stones, rusty metal and other surfaces. © Mark Sutphin.

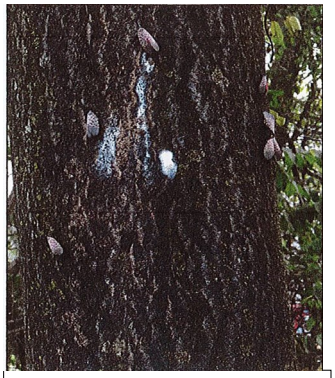
SLF 4th instar nymphs © Eric Day

SLF adult © Eric Day

Host	Nymphs			Adults		
	May	June	July	Aug	Sep	Oct
Rose (cultivated, multiflora, etc.)						
Grape (wild and cultivated)						
Tree-of-heaven						
Black walnut, butternut						
River birch						
Willow						
Sumac						
Silver/red maple						

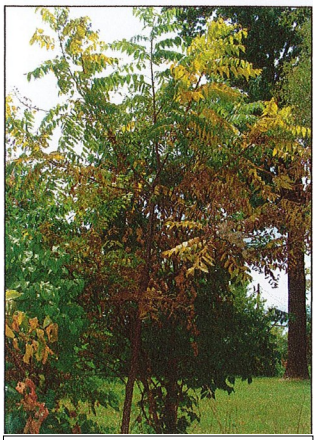
Feeding Damage and Nuisance Concerns

SLF feeds on plant sap (phloem tissue) using piercing-sucking mouthparts to acquire nutrients, relying upon associated gut bacteria to support nutritional requirements. Sap contains high amounts of carbohydrate-rich (sugar) liquid, which is not completely digested by the insect. They excrete the excess (honeydew), which builds up on areas below. Honeydew is also attractive to ants, wasps, bees, and other sugarloving insects, adding to the annoyance. As the honeydew accumulates, it is often colonized by sooty mold (fungi). Sooty mold doesn't directly harm plants, but it does act as a photosynthetic block. In dense populations of SLF, understory plants may die as a result. In landscaped areas, honeydew and sooty mold on plants under trees and on patio furniture, decks, etc. is objectionable.



SLF adults and sooty mold on trunk © Eric Day

Consequences of direct feeding damage to host trees are currently being quantified by researchers. To date, we have recorded a reduction in photosynthetic rate and sap flow as a result of SLF feeding. Following high infestation levels, death of some tree-of-heaven, and dieback on black walnut and maples has been reported. Additionally, increased levels of pathogens in maples (e.g. Botryospheria, Phomopsis) have been observed in 2019 and 2020, which may or may not be associated with SLF. It is possible that after heavy feeding, multiple years of sustained damage, or particularly dry years, SLF may cause significant damage to ornamental and shade trees. However, experience in PA suggests SLF is predominantly a nuisance pest for homeowners. To date, complete death from SLF feeding has only been noted in grapevines, tree-of-heaven, sumac, mimosa, and sapling ornamental trees.



Walnut showing symptoms of stress from SLF feeding © Eric Day

SLF has an extremely broad host range, recorded feeding on over 65 different plant species. Despite this, some plants appear to be more susceptible to SLF than others. Numerous variables appear to determine the attractiveness of a particular plant, including other plant species available nearby, the health of the plant, the time of year, the SLF population size, and how long SLF has been present in the area. The table below lists the key plant hosts of SLF and the time when they are most likely to be found on them. The patterns of host use may change with varying weather conditions, region, and other factors as yet undetermined. Dr. Kelli Hoover and her lab at Penn State University have recently established, counter to original thinking, that SLF does not require tree-of-heaven to complete development and produce viable eggs. However, though highly attractive, the importance of tree-of-heaven in developmental rate and spread is still not well understood.

Management

It is important to understand that once in the area, SLF cannot be prevented from coming onto any one property. SLF adults tend to fly to new trees to feed in the late summer. Properties adjacent to land with high populations of SLF will likely experience higher populations of SLF when the adults begin to move around. Biological control of SLF is currently being researched. While some resident generalist predators in the U.S. will consume SLF (spiders, praying mantids, some birds), impact is low and unlikely to influence the overall population. Research on parasitoid wasps from the native range of SLF is ongoing. There are some cultural methods of management such as destroying egg masses by crushing or submerging in alcohol, or capturing nymphs and adults using traps (sticky bands, circle traps) on trees. Chemical management for SLF can be targeted at specific "trap trees", which includes using systemic insecticides on favored hosts. Most often, tree-of-heaven is targeted for these "trap trees", but maples, black walnut, and select other hosts might be used. The most effective systemic insecticide to date is dinotefuran, only permitted as a basal bark application for tree-of-heaven in NY. Contact insecticides can also be effective in killing SLF, including active ingredients like carbaryl, zeta-cypermethrin, bifenthrin, and organic options including insecticidal soaps and neem oil. Insecticides should never be applied preventively or where only low populations are present. Contact your local Extension office for information on products currently permitted for control of SLF — some are only allowed under 2(ee) or SLN labeling.

The Future SLF populations are expected to continue building and expanding to new areas, including New York. SLF may be restricted in its range due to the high growing degree-days needed to complete its life cycle. This could exclude SLF establishment in some northern areas of New York, however this has yet to be determined. Research is ongoing to assess the long-term effects of feeding on trees and to improve management and monitoring for SLF. If you see or suspect SLF in New York, it should be killed, photographed, and reported to spottedlanternfly@agriculture.ny.gov

Source: Heather Leach, Extension Associate, Penn State Entomology and Brian Walsh, Extension Educator, Penn State Extension.

Crunchy, Complex: Cornell Releases Three New Apples

This fall, apple lovers can look forward to three new varieties from the oldest apple breeding program in the U.S. — located at Cornell AgriTech in Geneva, New York, part of the College of Agriculture and Life Sciences (CALS).

On Sept. 2, Susan Brown, the Herman M. Cohn Professor of Agriculture and Life Science, and research specialist Kevin Maloney announced the release of NY56, NY73 and NY109 – marketed as Cordera, Pink Luster and Firecracker, respectively.

Susan Brown, left, and Kevin Maloney look at Pink Luster in a Cornell AgriTech orchard in Geneva, NY. Photo: Jason Koski/Cornell University

As an open-release, orchards in New York State and across the U.S. will be able to grow the new varieties without licensing exclusivity. Brown said this gives growers a competitive edge by allowing them to replace older apples with what today's consumers want — crunch, complexity and a new twist on an American classic.

With Cordera, Brown accomplished a challenging task: breeding an apple that retains both its flavor and texture while also staying scab resistant. Apple scab is a fungal disease that significantly reduces fruit yield and quality, and poses a major threat for New England growers because it's common in wet springs.

In addition to test plots in orchards across New York state, Wegmans has also been testing Cordera in Canandaigua, New York, for five years.

"Having access to the varieties that Susan Brown and Cornell are working on allows us to look into the future in way that will hopefully expose our customers to new and unique food experiences," said Mark Bowker, orchard crop expert at Wegmans Organic Farm. "For us, disease resistance makes the performance of NY 56 stand out in our orchard. Of course, it always comes down to flavor, and we think it has that too."

Cordera shown freshly picked in a Cornell AgriTech orchard. Photo: Kevin Mahoney.

Spanish for "lamb," Cordera was named after Brown's predecessor, Robert Lamb, and his family. Lamb, who died in 1997, was an apple breeder at Cornell from 1948-88, and met his wife Barbara at Cornell AgriTech (formerly the New York State Agricultural Experiment Station). Now their daughter, Betsy Lamb, M.S. '81, is an ornamentals coordinator at Cornell's New York State Integrated Pest Management program.

Brown said it's fitting that this apple be named in Lamb's honor since it's related to the variety Liberty, which he named in 1978 along with Herb Aldwinckle, professor emeritus of plant pathology and plant-microbe biology at CALS.

"Bob would have been thrilled to know this apple variety was named after him and our family," said Barbara Lamb. "He was passionate about breeding apples and would be thrilled at how successful the apple breeding program is today at AgriTech."

Brown spent 23 years working with the best attributes of Honeycrisp and Gala apples to perfect Pink Luster. Its bright pink-red skin, crisp texture and juiciness make this new variety shine. Pink Luster also matures in mid-September, which makes it well-suited for on-farm sales and U-pick operations.

"NY73 has generated substantial interest at our orchard given how pleasingly different it is from the routine common list of apples," said John Halsey, owner of the Milk Pail in Southampton, New York. "Some of the visitor comments we have heard are that it has beautiful color, medium to large size making it fun and easy to pick, wonderful mild tart flavor and very smooth enjoyable skin texture."

Firecracker is being dubbed a "triple threat" – it's one of few varieties that works well for eating, baking and hard cider production.

"Firecracker has a partial russet skin, and it has a unique combination of acidity and sweetness that produces really complex and evolving flavors," Brown said. "It's ideal for anyone who wants to go on a culinary adventure."

Firecracker shown in a Cornell AgriTech orchard Photo: Kevin Maloney

With the addition of Cordera, Pink Luster and Firecracker, CALS will have released more than 69 apple varieties since 1880. The most recent varieties from Brown's breeding program, SnapDragon and RubyFrost, have been highly successful with growers across the state and are also exported to markets in Canada, Israel and Asia.

"Research and thorough testing are crucial in making a really good apple, but that takes a whole team," Brown said. "Research specialist Kevin Maloney, the Cornell AgriTech Field crew, researchers at Cornell AgriTech and the School of Integrative Plant Science, Cornell Cooperative Extension and the New York apple industry all deserve credit in collaborating to help deliver varieties that support the apple industry."

Source: Cornell Chronicle. Erin Rodger is the senior manager of marketing and communication at Cornell AgriTech.

Suitability of Native Milkweed Species Versus Cultivars For Supporting Monarch Butterflies and Bees In Urban Gardens

Abstract:
Public interest in ecological landscaping and gardening is fueling a robust market for native plants. Most plants available to consumers through the horticulture trade are cultivated forms that have been selected for modified flowers or foliage, compactness, or other ornamental characteristics. Depending on their traits, some native plant cultivars seem to support pollinators, specialist insect folivores, and insect-based vertebrate food webs as effectively as native plant species, whereas others do not.

There is particular need for information on whether native cultivars can be as effective as true or "wild-type" native species for supporting specialist native insects of conservation concern. Herein we compared the suitability of native milkweed species and their cultivars for attracting and supporting one such insect, the iconic monarch butterfly (*Danaus plexippus* L.), as well as native bees in urban pollinator gardens. Wild-type *Asclepias incarnata* L. (swamp milkweed) and *Asclepias tuberosa* L. (butterfly milkweed) and three additional cultivars of each that vary in stature, floral display, and foliage color were grown in a replicated common garden experiment at a public arboretum.

We monitored the plants for colonization by wild monarchs, assessed their suitability for supporting monarch larvae in greenhouse trials, measured their defensive characteristics (leaf trichome density, latex, and cardenolide levels), and compared the proportionate abundance and diversity of bee families and genera visiting their blooms. Significantly more monarch eggs and larvae were found on *A. incarnata* than *A. tuberosa* in both years, but within each milkweed group, cultivars were colonized to the same extent as wild types. Despite some differences in defense allocation, all cultivars were as suitable as wild-type milkweeds in supporting monarch larval growth.

Five bee families and 17 genera were represented amongst the 2,436 total bees sampled from blooms of wild-type milkweeds and their cultivars in the replicated gardens. Bee assemblages of *A. incarnate* were dominated by Apidae (*Bombus, Xylocopa* spp., and *Apis mellifera*), whereas *A. tuberosa* attracted relatively more Halictidae (especially *Lasioglossum* spp.) and Megachilidae. Proportionate abundance of bee families and genera was generally similar for cultivars and their respective wild types. This study suggests that, at least in small urban gardens, milkweed cultivars can be as suitable as their parental species for supporting monarch butterflies and native bees.

*Source: **Cite this as:** Baker AM, Redmond CT, Malcolm SB, Potter DA. 2020. Suitability of native milkweed (Asclepias) species versus cultivars for supporting monarch butterflies and bees in urban gardens. PeerJ 8:e9823 https://doi.org/10.7717/peerj.9823*

New York Nut Growers Association 2020 Fall Meeting

October 17, 2020
Seneca Lake Duck Hunters Club Pavilion
2188 State Route 14, Penn Yan, NY 14527
9:00 am—4:00 pm

Speakers will include: **Jeff Zarnowski** (new hazelnut cultivars from Rutgers and the NY Tree Crops Alliance), **Zach Elfers** (Native Americans and nut trees), **Lawrie Nickerson** (hazelnut and chestnut planting), **Laura Bailey** (impact of invasive species on forest health and yields), **Daniela Dana** (processing acorns as food), and **Klaas Martens** (soil health observations for annual crops vs. tree crops).

Afternoon field trip options: 1. **Martens Farm,** 1443 Ridge Rd, Penn Yan to see the direct descendent of a Persian walnut tree that survived the killer frost in 1935 **or**
2. **Black Squirrel Farms,** 590 State Route 14, Penn Yan to tour the site, see a black walnut stratification demo using nuts from a local black walnut tree more than 250 years old and participate in a walking tour/guided discussion on options for responding to invasive species damage with a focus on emerald ash borer.

It's not necessary to be a member of the New York Nut Growers Association (NYNGA) to attend this meeting. The New York Nut Growers Association is an all volunteer, non-profit organization that promotes nut tree growing in New York state.

Cost: $20 covers lunch, snacks, and drinks. **Pre-registration is required** because the maximum number of attendees is capped at 50. **Pre-register at:** https://www.tickettailor.com/events/newyorknutgrowersassociation/420292

To let us know you'd prefer a vegan lunch or for other questions, contact Jerry Henkin, NYNGA President, (914) 282–1371, sproutnut@aol.com. The building is not heated so dress for comfort. No alcohol may be brought onto Seneca Lake Duck Hunters Club premises.

Masks are required and social distancing will be maintained.

NATIVE TREES

For Gardening and Landscaping

NEW YORK STATE | Department of Environmental Conservation

White Spruce (*Picea glauca*)


Classic conical Christmas tree shape. Short stiff needles are bluish green. Most adaptable native spruce for landscape planting. Many cultivars.

Light	Soil	Height/Spread (ft)	Zone
Full sun - partial shade	Moist, well drained	50'/20'	2-6

Alternate-leaved Dogwood (*Cornus alternifolia*)


Also known as "Pagoda Dogwood" because of unusual horizontal branch structure. Excellent small tree for partial shade. Clusters of small white flowers, good fall color. Shade tolerant.

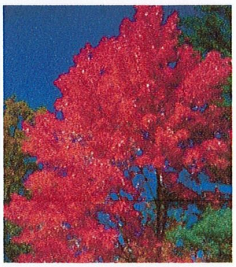
Light	Soil	Height/Spread (ft)	Zone
Full sun - full shade	Moist, well drained	20'/10'	3-7

Bur Oak (*Quercus macrocarpa*)


Rangy oak with shaggy-capped acorns and big dark glossy leaves, often with distinctive deep lobe in middle. Very adaptable and tough, will grow on both acidic and alkaline soils. Flood tolerant and somewhat drought tolerant.

Light	Soil	Height/Spread (ft)	Zone
Full sun - partial shade	Dry - wet	80'/60'	3-8

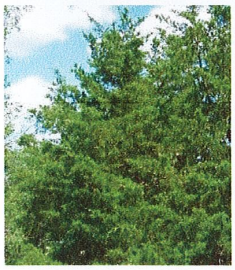
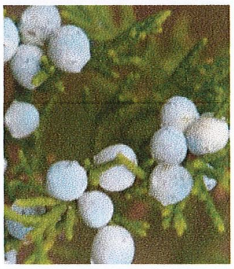
Red Maple (*Acer rubrum*)

Red flowers followed by red seeds in spring. Red-stemmed leaves with whitish undersides in summer. Red and yellow leaves in fall. Well-known as a swamp tree, but also grows well on upland sites. Most versatile native maple for landscapes. Many cultivars. Flood tolerant.

Light	Soil	Height/Spread (ft)	Zone
Full sun - light shade	Dry - wet	50'/30'	3-9

Eastern Red Cedar (*Juniperus virginiana*)

Young trees narrow, columnar. Older trees more conical form. Small, blue, berry-like cones on female trees are eaten by many birds. Tough tree which thrives on dry, harsh, rocky sites. Grows well on limestone, and also on more acidic sites. Very drought tolerant. Must have full sun.

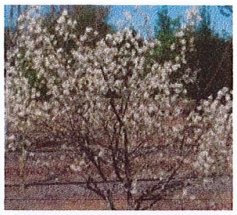
Light	Soil	Height/Spread (ft)	Zone
Full sun	Dry - moist, well drained	40'/15'	3-9

For more information, or to sign up for email updates from NYSDEC, visit our website: www.dec.ny.gov

Serviceberry, Shadbush (*Amelanchier arborea*)

Graceful small tree. Has delicate white flowers in early spring. Flowers followed by oval leaves and edible berries in summer. Vivid fall colors.

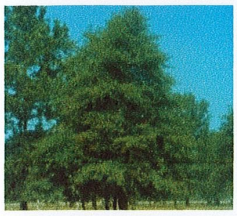
Light	Soil	Height/Spread (ft)	Zone
Full sun - partial shade	Moist, well drained	20'/15'	4-9

Black Gum (*Nyssa sylvatica*)

Great fall color. Fruit attracts many birds and mammals, good nectar source for honey bees. Salt and shade tolerant.

Light	Soil	Height/Spread (ft)	Zone
Full sun - full shade	Dry - wet	50'/30'	4-9




Swamp White Oak (*Quercus bicolor*)

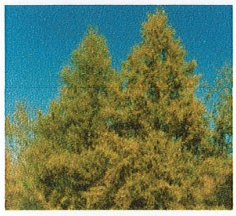
Dark green leaves with white undersides. Tolerates compacted soils and drought. Also good for wet areas, flood tolerant.

Light	Soil	Height/Spread (ft)	Zone
Full sun - full shade	Dry - wet	80'/50'	4-8


Tamarack (*Larix laricina*)

Deciduous conifer with soft bluish-green needles, small round cones. A northern species which does well on cool, wet sites. Bright yellow fall color.

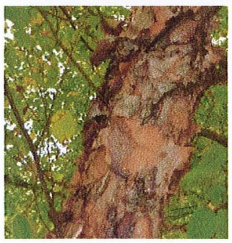
Light	Soil	Height/Spread (ft)	Zone
Full sun	Moist - wet	50'/15'	2-4




River Birch (*Betula nigra*)

Young trees have spectacular, multi-colored, peeling bark in warm shades of tan, brown, pink and cream. Popular birch for landscape use because of heat tolerance and disease resistance. Flood tolerant.

Light	Soil	Height/Spread (ft)	Zone
Full sun - partial shade	Moist - wet	60'/30'	3-9




CONTACT INFORMATION

Division of Lands and Forests

New York State Department of Environmental Conservation
625 Broadway, Albany, NY 12233
P: 1-866-640-0652 | F: 518-402-9028 | landsforests@dec.ny.gov
www.dec.ny.gov

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Dr. James Simon: A Breakthrough in War Against Basil Downy Mildew

Sweet basil is among the most popular and economically important culinary herbs, but by 2010, US production began to feel the impact of a newly emerging destructive disease: basil downy mildew. At that time, no sweet basil varieties were resistant to basil downy mildew and growers began relying heavily on fungicide application to avoid devastating crop losses. **Dr. James Simon** at Rutgers University had been researching basil for 25 years and was eager to tackle this problem. Eight years later, Dr. Simon's team is proud to have successfully developed 12 new downy mildew resistant varieties of sweet basil and two varieties resistant to fusarium wilt disease.

A Devastating New Disease

Basil, belonging to the genus *Ocimum*, is the most popular herb purchased in the US. It is used primarily as a culinary flavouring, but is also an ornamental plant and a scent additive for household products and cosmetics. The most familiar variety, sweet basil (*Ocimum basilicum*), is extremely important, generating over $300 million in annual sales in the US alone, while providing numerous jobs for growers, farm labourers, packers, shippers, distributors and retailers. Cultivating basil was a relatively straightforward and profitable process until the newly emergent disease, basil downy mildew, was reported for the first time in the US in 2009.

The devastating fungus-like pathogen emerged in Europe in 2001 and then spread to the US, where it obliterates crops and causes tens of millions of dollars in economic losses. As injured basil leaves are unmarketable, some growers' entire crops were destroyed and many opted out of growing basil altogether.

Basil downy mildew (BDM) is dispersed by air-borne spores from infected leaves and seeds. Efforts to reduce its spread and severity had been thwarted by the absence of an effective seed treatment or chemical control method. Finding a viable, long-term, and economically sustainable solution to BDM has been a matter of great urgency for basil cultivators worldwide.

In 2010, Rutgers' Dr. James Simon was ideally positioned to tackle this devastating pathogen, having dedicated a large portion of his distinguished research career to studying basil genetics and breeding. Dr. Simon knew that the key to fighting this intensely damaging blight was to develop genetic resistance to the disease. So, his research team began the hunt for a variety of sweet basil with natural genetic resistance to BDM. This approach formed the pillar of their plant breeding strategy, which was ultimately incorporated into their integrated pest management plan.

'Integration of downy mildew-resistant sweet basil cultivars into pest management strategies represents a more sustainable control strategy that is advantageous to environmental, public health, and economic interests,' says Dr. Simon.

Plant infected with basil downy mildew (BDM)

Searching for BDM Resistance

Earlier work by Dr. Simon and his colleague, Dr. Andy Wyenandt, the state's vegetable crops extension specialist in plant pathology, had shown that all commercial sweet basil cultivars were highly susceptible to BDM. They also found that some exotic and ornamental basils appeared to be entirely immune to the disease. Several of these exotic basil varieties, different species from sweet basils, exhibited a range of tolerance levels and what appeared to be immunity to BDM. Unfortunately, the exotic species have a different number of chromosomes to sweet basil, making cross-breeding very difficult.

Dr. Simon's team spent several years manually cross-breeding hundreds of basil varieties from numerous species, with the goal of introducing only the BDM-resistant genes from the exotic basils into sweet basils. In doing so, they faced a significant challenge. The hybrid plants were sterile, and while they each had many of the visual characteristics of a sweet basil variety, they lacked the aroma and taste that consumers enjoy.

To facilitate a swift search for BDM-resistant basils, Dr. Simon and his team developed a technique to rapidly screen plants for their response to the pathogen under controlled conditions, as well as larger field screens to confirm purported resistance. They discovered that plants respond to BDM at their earliest growth stage when their first seed leaves appear, thus indicating the plant's susceptibility to the disease throughout its growth. Dr. Simon's team knew that they needed to establish extensive, multi-year testing, in order to identify new varieties of BDM-resistant basil and to develop a series of families and advanced breeding lines upon which to build.

The BDM pathogen develops particularly well in humid conditions when leaves are wet for an extended period. Dr. Simon's plan was to recreate the conditions that allow BDM to flourish, so as to accurately identify resistance. 'In the absence of adequate disease pressure, susceptible plants could be mistakenly selected as resistant, substantially reducing the effectiveness of breeding strategies,' Dr. Simon explains.

This work was carried out in parallel with research examining the genetics of the plants, and screening of a global collection of over 100 basils. While Dr Simon, Dr. Wyenandt and their PhD student Robert Pyne were conducting this genetic analysis and screening, another breakthrough occurred. The team's reliable, fast screening method culminated in the identification of a resistant exotic variety from Zanzibar called 'Mrihani'. Their results showed that this strange exotic basil, assumed to be of another species, actually turned out to be a variety of *Ocimum basilicum*, indicating that it could be a great candidate for traditional breeding.

Dr. Simon and his team were surprised, as Mrihani neither looks nor tastes like sweet basil. With highly serrated leaves and a distinct liquorice flavour, Mrihani is not even close to being considered a sweet basil. However, as it is the same species as sweet basils, the team found that it readily reproduces with other sweet basil varieties to produce viable offspring. Thus, Mrihani was identified as a potential parent that could help the researchers develop BDM-resistant sweet basil varieties with a commercially acceptable flavour profile.

Characterizing Resistance Inheritance

Over a period of two years, Dry Simon and his team crossed Mrihani plants with plants of another sweet basil variety, Rutgers University's breeding line 'SB22', which had shown high susceptibility to BDM but resistance to fusarium wilt – a fungal disease that can negatively impact growers. The concept was to develop plants with high resistance to both BDM and fusarium wilt at the same time.

BDM resistance in *Brassica* – the family including broccoli, cabbage and turnips – had previously been attributed to a single gene, but it was still unknown whether the inheritance of BDM resistance in sweet basils would follow a similar pattern. Where multiple genes determine disease resistance, developing disease-resistant varieties becomes more complicated.

The team's breakthrough of identifying a BDM-resistant variety of sweet basil was only the beginning. With repeated crossings over six successive generations, they tested the gene action and inheritance of BDM resistance. The researchers discovered that resistance is controlled by dominant genes – meaning that plants with one non-resistant gene and one resistant gene would still exhibit BDM resistance. However, this is complicated by resistance being influenced by two separate and interacting gene pairs. Plants with one copy of a resistant gene at each of the two gene sites exhibited resistance, but plants with two copies of the non-resistant gene at either of the gene sites exhibited reduced overall resistance to BDM.

Dr. Simon notes that this does not indicate that breeding reliably resistant sweet basil varieties is impossible, but rather that meticulous efforts are required to eliminate non-resistant genes and thus 'fix' the resistant trait in the plant. He suggests that simultaneously selectively breeding for desirable appearance and flavour traits will yield commercially acceptable sweet basil cultivars with BDM resistance.

The ability of basil breeders and researchers to respond rapidly to the emerging threat of BDM was significantly hindered by the lack of information about the genome structure and genetic diversity of sweet basils. Without this information, breeding efforts are more difficult and less effective. Understanding the genome of a species accelerates the development of new varieties as well as the utilization of new gene-editing technologies.

To enhance the breeding of their BDM-resistant lineages of sweet basil and to facilitate efficient responses to future diseases, Dr. Simon and his team took advantage of newer, more cost-effective genetic methods. They produced a genetic 'map' for sweet basil, which confirmed their results on BDM resistance inheritance from their earlier breeding studies. They also observed a high level of genetic diversity amongst sweet basil varieties, which accounts for their wide range of flavours and appearances. This work was spearheaded by Robert Pyne who conducted this basic research as part of his dissertation studies.

Parent plants of the team's fusarium wilt-resistant and BDM-resistant sweet basil: SB22 sweet basil on the left (resistant to fusarium wilt) and Mrihani (BDM-resistant) on the right

Towards Full BDM Control

Back in 2011, the Rutgers researchers and their collaborators at Cornell University, the University of Massachusetts and the University of Florida began intensive efforts to provide a solution to BDM in sweet basil. Building on Dr. Simon's previous work on Mrihani and SB22, the team's breeding

program faced significant challenges in producing a BDM-resistant variety with a flavour and appearance suitable for commercialization. However, Dr. Simon's extensive experience in developing new basil cultivars with unique aroma profiles provided a solid foundation for success.

In eight years, the breeding program produced and created 12 new sweet basil cultivars with BDM resistance. Of these, four have been commercialized by VDF Specialty Seeds, and provide growers with a substantial increase in BDM resistance. 'These new BDM-resistant sweet basils offer high yielding varieties, even when BDM is present, and protect growers from the threat of complete crop loss under high disease pressure,' says Dry Simon. Importantly, consumer taste tests of their new varieties have proven successful.

Dr. Simon notes, however, that resistance is not equivalent to immunity. At high levels of disease pressure, BDM-resistant varieties can still exhibit symptoms. Commercial use of BDM-resistant basil varieties still requires growers to adhere to best management practices including the application of fungicides, but at a much lower rate. Growers who switched to BDM-resistant cultivars have been able to harvest later into the season than was previously possible, enhancing their yields and improving cost-effectiveness. Organic growers are reporting that they are now able to grow basil at long last without BDM issues.

Embracing Creativity and Diversity

Dr. Simon believes that his team's success was due in large part to their creativity and diversity – combining expertise from many scientific disciplines with the shared vision of finding a solution to the devastation caused by BDM. The team included lab scientists, farmers, growers, distributors, food processors and PhD students who were all dedicated, creative problem solvers. While their battle has been won, their war against BDM continues. Only this time, the team is better armed.

Source: https://www.scientia.global/dr-james-simon-a-breakthrough-in-the-war-against-basil-downy-mildew/

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Ontario County Recycles sorta simple

What is spruce decline and what should you do about it?

Frequently asked questions about spruce decline

Photo 1. Declining spruce trees. Photo by Bert Cregg, MSU

What's wrong with the blue spruce in my neighborhood?
Colorado blue spruce trees have long been among the most popular conifers for landscaping in Michigan and the upper Midwest. Blue spruce trees are widely planted due to their good growth rate, stately form and, of course, their blue foliage. Unfortunately, blue spruce trees are subject to a wide range of insect and disease problems that can impact their growth and aesthetic appeal.

The prevalence of diseases on blue spruce trees has intensified in recent years and trees are declining rapidly in many areas (Photo 1). The key symptom of spruce decline is branch dieback, which progresses over two to four years and renders the plant's appearance unacceptable for most homeowners (Photo 2). The rapid decline of many spruce trees in Michigan and surrounding states appears to be related to an increase of canker diseases coupled with other disease and insect problems that plague the species.

Photo 2. Decline usually starts on lower branches.
Photo by Dennis Fulbright, MS

What kind of diseases affect blue spruce trees?
There are three principle types of diseases that affect blue spruce trees: needlecasts, tip blights and canker diseases. All of these diseases are caused by fungal pathogens and each produce specific symptoms that can be useful in diagnosing the problem.

1. Needlecasts. As the name implies, trees with needlecast diseases shed needles. Needlecast fungi often infect needles on the current year's shoots. As the disease progresses, the needles die, usually the year following the infection. As a result, trees affected by needlecasts often have an outer "shell" of live needles on current shoots and dead needles on older shoots (Photo 3). The two most common needlecasts we find in spruce are caused by the fungal pathogens *Rhizosphaera* and *Stigmina/Mycosphaerella*.

2. Tip blights. Tip blights are fungal diseases that typically cause dieback to new, emerging shoots (Photo 4). Tip blights are most common on pines, especially Austrian pines, but can also occur on spruces.

3. Canker diseases. Canker diseases are caused by fungi that infect branches or the main stem of trees. Typical symptoms of cankers are sunken areas along a stem that may ooze resin (Photo 5). Trees may produce ridges of wound tissue around older canker infections as the tree attempts to restrict the fungus' growth. As cankers develop, they can interfere with the branch's ability to transport water and nutrients, resulting in the death of individual branches often referred to as "flagging."

Photos 3-5. **Left,** Needlecasts kill older (inner) needles, but leave newer needles unaffected. **Middle:** New shoot tips killed by Phomopsis tip blight. **Right,** Resin oozing from a branch canker caused by Cytospora. Photo credits: Left and middle: Dennis Fulbright, MSU (Michigan State University); right photo, Michael Kangas, NDSU, Bugwood.org

What kinds of insects affect blue spruce trees?
Numerous insect pests can impact spruces in Michigan's landscape, but the two most common are gall adelgids and spruce spider mites. In both cases, the insect pests are tiny and you may need a hand lens to see them. Often times, people are more likely to see the damage as opposed to the insect pests themselves.

1. Gall adelgids. Adelgids are small insects that feed on shoots by sucking plant sap. As they do so, they cause the shoots to deform and produce galls that resemble cones (Photo 6). Damage from gall adelgids is mainly aesthetic.

2. Spruce spider mites. Spruce spider mites cause needle discoloration and eventually kill needles, which can be mistaken for a needlecast disease (Photo 7). Technically, mites are not insects, but are related to spiders. This distinction is important since not all insecticides will control mites.

Photos 6-7. **Left,** Gall caused by Cooley spruce adelgid.
Right, Needle damage caused by mites. Photo credits: Jill O'Donnell, MSU (Michigan State University)

Why are we seeing increased decline in blue spruce trees?
There are a number of factors contributing to the decline we see in blue spruce trees, including environmental changes, poor site conditions and new pathogens. Colorado blue spruce is native to arid regions in the Rocky Mountains. Michigan's climate is generally more humid, especially in the summer, which is ideal for fungal pathogens to thrive. In landscapes, Colorado blue spruces have been planted on some sites that are marginal for their success. As a result, they are stressed and more susceptible to fungal pathogens.

Finally, for decades the default diagnosis for most problems with blue spruce has been Rhizosphaera needlecast or Cytospora branch canker. However, a recent survey by Michigan State University researchers suggests two other fungal pathogens, *Diplodia* and *Phomopsis*, were much more commonly associated with branch death and tree decline than Cytospora (Photos 8-9). *Diplodia* and *Phomopsis* are both considered weak or secondary pathogens, so it is unclear at this point why they appear to cause major disease problems for spruce. Also, in many cases there may be more than one issue that is affecting your tree's health.

Photo 8-9. Left, Decline symptoms moving upward. **Right,** Wood staining on branch with Phomopsis canker.
Photo credits: Left photo, Christine McTavish, MSU (Michigan State University); right photo, Dennis Fulbright, MSU (Michigan State University)

Can I do anything about these spruce problems?
As with any tree health problem, the first step in dealing with declining spruce trees is to diagnose the problem and identify the cause. For large or important landscape trees, homeowners should contact a professional arborist or tree care company.

For some disease issues, such as needlecasts, fungicides may be effective in preventing or controlling the disease. It is important to note that fungicide treatments for needlecasts only protect new growth. For control to be fully successful, it may take two to three years of yearly fungicide applications. For canker diseases, the effectiveness of fungicides is usually limited. Removing affected branches is usually the best action to improve the tree's appearance and slow the spread of disease within the tree.

For insect or mite issues, insecticides or miticides can be effective, however selection of the proper product and timing are critical.

Should we continue to plant blue spruce trees?
This is a difficult question. Although spruce decline is widespread and appears to be increasing, it is not a certainty that all trees will be affected. In fact, it is not uncommon to see healthy, thriving spruce trees near or adjacent to trees that are in severe decline. Another complicating factor is that trees may be healthy for a number of years and then begin to decline as they mature and are more difficult and costly to remove.

The likelihood of having success can be improved by planting blue spruce trees on sites with conditions they favor. Key site factors for blue spruce trees are full sunlight, good air movement and excellent soil drainage. Michigan State University Extension recommends homeowners diversify their landscapes to help make their landscapes more resilient to pest and environmental changes, and seek to plant a variety of species wherever possible.

Blue spruce does best on exposed sites with good soil drainage.
Photo credit: Bert Cregg, MSU

Source: Bert Cregg, Christine McTavish, Andrew Jarosz, Jill O'Donnell, and Dennis Fulbright. Michigan State University-June 28, 2019.
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https://www.canr.msu.edu/news/what_is_spruce_decline_and_what_should_you_do_about_it

2021 Inside Dirt Subscription

Dear Subscribers,

Wow! What a growing year. Covid-19 hit and people returned to growing a vegetable garden at a level never before seen in our history. Seed packets were flying off the shelves and seed companies were having to backorder and often sold out of many of their seed offerings. Most businesses were closed in March. Some have struggled along while others will never reopen. As people struggled to find some normalcy, they found it by reconnecting with Mother earth.

The spring flowers put on a show that lasted for weeks because of the cold temperatures throughout April and into the early part of May. I was using my wood stove to heat the house on a daily basis until around the 10th of May. These cold temperatures kept the soil from warming up and delayed the planting of many crops. By early June we were getting dry and watering the plants became a weekly event. For plants in containers it was a daily activity to keep them watered. The lawns went dormant by mid-July and some even died out.

The event of the year began in mid-June, but had started months before. I'm talking about the gypsy moth invasion that occurred for the most part on the Western half of Ontario County. Trees were stripped bare of leaves and caterpillars were everywhere. Now it is the endless number of egg masses posed to start the event again next year. The good news is that most deciduous trees that are in good health can withstand two or even three years of defoliation and survive. I wish I could say the same for our ash trees. Everywhere you go/look are dead and dying ash trees as a result of the Emerald ash borer. Here in the Finger Lakes ash trees make up 20-25% of our trees. Keep in mind that ash trees once they die do not keep standing up like most other trees. In as little as 2-3 years they become weak at ground level and fall over. So take the necessary removal actions now to prevent a disaster later, especially those around your home or near the power lines.

Back to the vegetable garden all in all it was a great year as long as you could keep up with the watering. Because of dry conditions disease were rather minimal. No late blight on potato or tomato, but sadly septoria leaf spot remained a major threat to most gardeners. Folks reported having great yields of cucumbers, squash and melons, snap beans, peppers and tomatoes. Be sure to write down those crops that did well for you and make note of the variety so you can order your seeds in the coming months.

Be sure to fill out your enrollment for the 2021 Inside Dirt gardening newsletter.

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Last issue of *Inside Dirt* for 2020. It has been quite a year!
We look forward to sharing with you in 2021 the latest and greatest in gardening.
Your renewal is on page 15. Take care and stay safe!

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