

Commercial Horticulture

July 16, 2021

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Integrated Pest  
Management for  
Commercial Horticulture  
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If you work for a commercial horticultural business in the area, you can report insect, disease, weed or cultural plant problems (**include location and insect stage**) found in the landscape or nursery to  
[sgill@umd.edu](mailto:sgill@umd.edu)

**Coordinator Weekly IPM Report:**

Stanton Gill, Extension Specialist, IPM and Entomology for Nursery, Greenhouse and Managed Landscapes, [sgill@umd.edu](mailto:sgill@umd.edu). 410-868-9400 (cell)

**Regular Contributors:**

Pest and Beneficial Insect Information: Stanton Gill and Paula Shrewsbury (Extension Specialists) and Nancy Harding, Faculty Research Assistant

Disease Information: Karen Rane (Plant Pathologist) and David Clement (Extension Specialist)

Weed of the Week: Chuck Schuster (Retired Extension Educator)

Cultural Information: Ginny Rosenkranz (Extension Educator, Wicomico/Worcester/Somerset Counties)

Fertility Management: Andrew Ristvey (Extension Specialist, Wye Research & Education Center)

Design, Layout and Editing: Suzanne Klick (Technician, CMREC)

**Azalea Bark Scale**

David Freeman, Oaktree Property Care, found azalea bark scale on an azalea this week. The photos shows the scale producing waxy egg sacs. If you see these egg sacs, monitor the scale population for crawlers.

**REQUEST FOR SCALE SAMPLES**

**From Douglass Miller:**

We are trying to obtain ethanol preserved specimens of azalea bark scale (*Acanthococcus azaleae*) so that we can sequence them and compare them with crapemyrtle bark scale (*A. lagerstroemiae*) sequences. Specimens should

be sent to Matthew Moore, Molecular Diagnostics Laboratory, Doyle Conner Building, 1911 SW 34th Street, P.O. Box 147100, Gainesville, FL 32614-1201. Thank you for your help!



**Azalea bark scale on the stem of azalea (and lace bug damage on the foliage)**

**Photo: David Freeman, Oaktree Property Care**

## Sunscald Very Prevalent in Peppers This Year

Jerry Brust UME

Vegetable fruit suffering from sunscald seems to be especially bad this year, especially on peppers. Sunscald occurs when peppers or other vegetables are exposed to the direct rays of the sun during hot, clear-sky weather; the damaged areas may become papery and bleached or tan colored, and these areas often are covered with a black fungal growth (fig 1). The damaged areas are vulnerable to infection by bacteria, so that at times a pepper fruit will be found that is a soupy, smelly mess. Sunscald is most apparent on plants that have sparse foliage, but even with good foliage the plants often will lean to one side or the other because of winds blowing on them. When this occurs sunscald can be especially prevalent on previously shaded pepper fruit that are suddenly exposed to the sun, even for short periods of time. Staking and tying pepper plants will greatly decrease the leaning plants and greatly decrease sunscald. The pepper plants do not have to be tied often, usually once is all it takes and stakes do not need to be any taller than the pepper plants (so broken tomato stakes work well) (fig. 2). Peppers in tied treatments had less than 2% sunscald damaged fruit, while non-tied treatments had 21% sunscald damaged fruit.



**Fig. 1 Pepper fruit with small and large areas of sunscald and black mold growth**  
Photos: Jerry Brust, UME



**Fig. 2 Staked and tied pepper plants, 4-6 plants between stakes, one string**  
Photo: Jerry Brust, UME

## Jumping Oak Galls

Kasey Yturrarde, District Dept. of Transportation, found jumping oak galls this week. These galls are caused by activity of *Neuroterus* sp., a type of gall wasp. They may look bad, but they are harmless to the health of the tree.



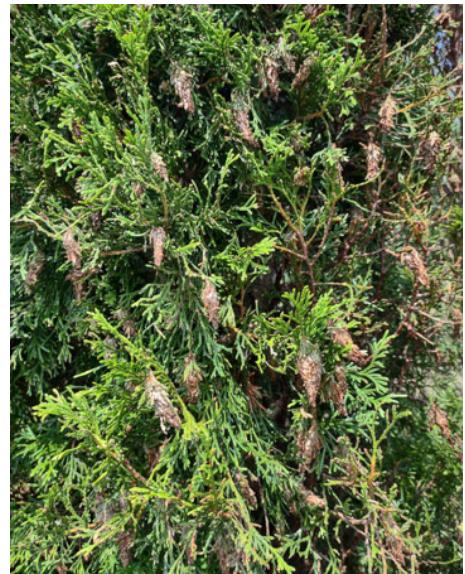
**Jumping oak galls**

Photo: Kasey Yturrarde, District Dept. of Transportation

## Bagworms

Grant Christie found bagworms this week on an *Arborvitae* 'Emerald Green' in Rapidan, VA. Grant noted that it is the worst case he has ever seen. He reported finding thousands on an 18 foot tree.

**Control:** Options include spinosad (Conserve), Acelepryn, Mainspring, Orthene, and Astro. In light infestations, hand picking off bags is an option.



**There is a heavy bagworm outbreak on this arborvitae in Rapidan, VA**

Photo: Grant Christie

## Gypsy Moths

Richard Shaw, Salisbury University, sent us a photo that one of their faculty members took of gypsy moths laying eggs in Salisbury on June 28. He noted that they usually don't see much gypsy moth activity in that area. Matthew Hirt, Douglas Lawn and Landscape, reported a gypsy moth infestation on blue spruce on Monday, July 16. Late instar caterpillars were still active. If you see egg masses within reach, you can gently scrape them off the trunk of the tree.



**A cluster of gypsy moth females were laying eggs on a tree in Salisbury on June 28th**

Photo: Faculty member, Salisbury University

## Asimina Webworm and Fall Webworms

Heather Zindash, The Soulful Gardener, reported that the Asimina webworm eggs have hatched and are currently feeding on pawpaw. She noted that they are building their communal nests within the leaves.

Kevin Nickle, Scientific Plant Service, reported that the second generation of fall webworms are active this week. Early instar fall webworms are feeding on a walnut here at the research center in Ellicott City as well. Fall webworms feed on a wide range of woody plants within webbing they produce on tips of branches. If possible, prune out webbed terminals.

**Control:** Spinosad and Bt can be used for control. Look for predators and parasites that help keep caterpillars below damaging levels.



Asimina webworm hatched this week on pawpaw.

Photo: Heather Zindash, The Soulful Gardener



The second generation of fall webworms are active in the area now  
Photo: Kevin Nickle, Scientific Plant Service



Early instar caterpillars of the second generation of fall webworms are feeding on walnut this week in Ellicott City

## Japanese Beetles

By: Stanton Gill

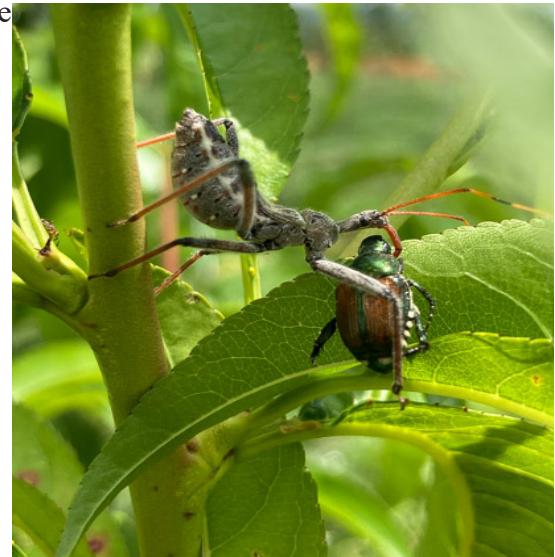
Thanks for all of the responses I received on Japanese beetle activity this week. It seems some areas are inundated and in other areas, there is absolutely no activity. We are getting reports from several locations in central Maryland, southern Maryland and the Eastern Shore of Maryland. There is very little activity in the western part of the state.

**Here are some of the areas reporting activity and plant material they are feeding on:**

- In Howard County, they are active in Lisbon/Woodbine area.
- Richard Uva reports lots of activity in Federalsburg on the Eastern Shore. Lee Carrier reports heavy Japanese beetle populations in Woodbine on cut flowers. Lynn Moore reports, yes!!! there are many, many Japanese beetles in our area. We have sprayed the new apple trees 3 times and the ground is littered with dead beetles and they're still eating the leaves."
- From Casey Bartoe from Bartlett Tree Experts: "We are seeing huge Japanese beetle outbreaks in Severna Park especially on hydrangeas and roses."
- Sharon Murray reports: "The Japanese beetles have been feasting on green pepper and eggplant here in Easton."
- From Garden Gal – "I live in southern Cecil County and we have an unusually large infestation of the beetles. Here are some pics of my vining hydrangea, which is usually hit first and heavily. I also see beetles in fewer numbers on zinnias, basil, and canna."
- Marlene Lynch, Harford County, reports: "Japanese beetles devouring my canna."
- Samantha Baile: "Here are some photos from a client of mine whose Japanese maples were infested with Japanese beetles this week-And the damage done unfortunately. Location is Baldwin, MD"
- Paula Reeder: "We had a major outbreak of Japanese Beetles in Still Pond on the Eastern Shore in the last week. They were devouring rose bushes, beech trees, Japanese maples, hazelnut trees in particular and did major leaf damage."
- Chrissy Moore: "I have TONS down in Huntingtown, MD (Calvert County). I've never seen it so bad. They're on basil, sunflowers, zinnias, peppers, Aronia, coneflower...you name it!"
- Marie Rojas: "Japanese beetles feeding on both foliage and fruit of *Malus 'Pristine'*"
- Katie Grant: "I own Green Thumb Garden Services and am on the lower Eastern Shore in the Bishopville/Berlin/Ocean City area of Worcester County. We have been seeing major Japanese beetle activity for a few weeks now. I've seen heavy damage on grapes, raspberries, hibiscus, canna, ornamental bananas, oakleaf hydrangeas, four o'clocks, roses, crape myrtles and purple leaf plums."



**Japanese beetles are causing significant damage to this Japanese maple**  
Photo: Samantha Baile



**Wheel bug nymphs are preying on Japanese beetles this month**  
Photo: Michael Moran

## Bladdernut Slug Sawfly

Marty Adams, Bartlett Tree Experts, found bladdernut slug sawfly larvae defoliating a European bladdernut in Westminster on July 15. Look on the foliage for slug sawfly larvae that are slimy, have shorter legs, and more than five pairs of prolegs. For more information and photos, see [Joe Boggs' article](#) on bladdernut slug sawflies and the similar-looking, scarlet oak slug sawfly.

**Control:** If necessary, Conserve would kill the larvae.



**Bladdernut slug sawflies feed on the undersides of leaves**

Photo: Marty Adams, Bartlett Tree Experts

## Slime Mold

Ross Fornaro, NaturaLawn of America, found slime mold in a turf area this week. They do not infect the turf, but do look unsightly. [NC State Extension](#) and [Ohio State University](#) have more information on slime mold.



**Slime mold in a turf area**

Photo: Ross Fornaro, NaturaLawn of America

## Tuliptree Scale

Marie Rojas, IPM Scout, is finding tuliptree scale on *Magnolia 'Jane'* this week. The crawler period for this scale species starts in early September. Adult females feed more heavily and produce large amounts of honeydew when they get close to laying eggs.



**Look for crawlers of tuliptree scale later in the summer**

Photo: Marie Rojas, IPM Scout

## Mites

By: Stanton Gill

On the Eastern Shore of Maryland, several nursery growers are reporting very heavy activity from spider mites. If you are seeing mite problems, please contact me at [sgill@umd.edu](mailto:sgill@umd.edu) so I can see which species is active. Two-spotted spider is the most common one, but we are also seeing a lot of activity from southern red mite.

## Weather Update

By: Stanton Gill

Last week in our report on unusual weather, we mentioned that the northeast was in a drought situation. They have been in drought conditions for the last 2 summers. In the last 10 days, it has been raining, raining, raining in New England. Many ponds are overflowing with the excess water. So, their drought is broken in New England.

## Lace Bugs

Mark Schlossberg, ProLawn Plus, Inc., found azalea lace bugs in Owings Mills on July 14. David Freeman, Oaktree Property Care, is also finding them this week. Systemic insecticides can be used for control.



**Azalea lace bug is one of the species of lace bugs that is active during the summer**

**Photo: Mark Schlossberg, ProLawn, Plus, Inc.**

## Deer in 2021

By: Stanton Gill

Deer populations are at ridiculously high numbers in Anne Arundel, Howard, Baltimore, Carroll, and Frederick Counties. The strange weather pattern this summer with super-hot periods followed up with cooler periods is making their activity near roadways very abundant. We have had several people send in pictures of deer hit by cars and trucks in July. We usually see this activity in September and October. Several landscapers are reporting heavy feeding in urban landscapes on garden plants, landscape plant material, and certain annual flower plantings.

Last week, we established test plots in Central Maryland to evaluate several of the new basil plants that are reported to be resistant to downy mildew. One morning this week, I was inspecting one of the plots and found deer pulling up individual plants. After I chased them off, I found that they had pulled up 20% of the plants and decided they did not like the taste, and dropped the plants to dry out at the site. We will be netting this area very shortly.

## Cicada Damage on Larger Branches in Nurseries

By: Stanton Gill

Steve Black requested an article on cicada damage to larger diameter branches in nurseries. He is sending me pictures, and I will publish this article in the FreeState Nursery news that will be released in late July.

## White Prunicola Scale

By: Stanton Gill

Degree days have reached (in Central Maryland) the correct number for the 2<sup>nd</sup> generation of white prunicola scale activity. The most highly susceptible plants are cherry laurel and blue holly. Distance or Talus can be applied this week for control.



Monitor plants such as cherry laurel for second generation crawlers of white prunicola scale



Marie Rojas, IPM Scout, found and photographed catalpa sphinx moth caterpillars hatching in Laytonsville on July 9



An adult male eastern hercules beetle was brought into the Extension office in Salisbury this week. This beetle is the largest found in North America.

Photo: Ginny Rosenkranz, UME

## Bacterial Blight of Geranium

By: Karen Rane

Every year around this time, I see angular brown spots on the leaves of perennial cranesbills (*Geranium* species). The lesions are more numerous on the lower leaves, and often have yellow “halos” (Figure 1). The bacterial pathogen *Xanthomonas hortorum* pv. *pelargonii* is responsible for this leaf spot disease. The pathogen overwinters in infected leaf debris, and is spread through irrigation or splashing rainfall. While the leaf spots can be unsightly, perennial *Geranium* species continue to grow and survive. Management of this disease in gardens involves avoiding overhead irrigation if possible, and removing symptomatic leaves when first noticed. Interestingly, this same pathogen can be deadly to that other “geranium” – annual florist’s geranium (*Pelargonium x hortorum*). Symptoms of bacterial blight in florist’s geranium include corky leaf spots, wedge-shaped yellow areas on leaves, wilting and eventual death of infected plants (Figure 2). In greenhouses, the disease can be introduced by using cuttings taken from infected stock plants, as well as through exposure to infected plant debris. This is the main reason growers are advised not to produce both perennial cranesbills and florist’s geraniums in the same facility. The same advice applies to gardens – keep these two “geraniums” separated to reduce spread of the pathogen from more tolerant perennials to the more susceptible annual geraniums.

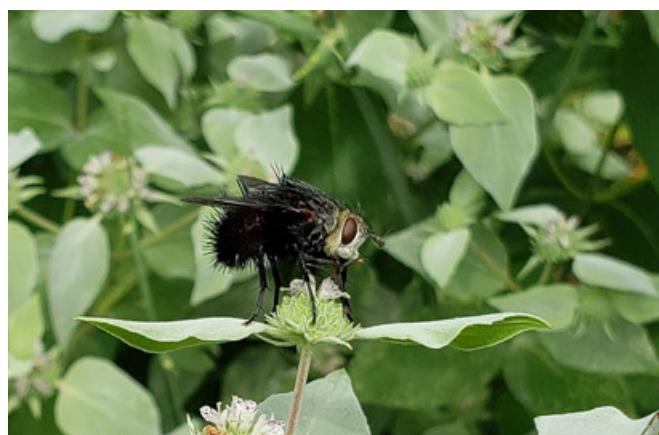


**Figure 1. Angular leaf spots with yellow “halos” caused by the bacterial blight pathogen *Xanthomonas hortorum* pv. *pelargonii*.**

Photo: K. Rane



**Figure 2. Florist’s geranium (*Pelargonium* sp.) infected with bacterial blight. Left: Tan leaf spots (photo Cornell University). Right: Wilted leaves and wedge-shaped leaf discoloration (photo R. Wick, UMass).**



Many predaceous insects are active now, including this large tachinid fly, *Hystricia abrupta*, that Marie found on mountain mint.

Photo: Marie Rojas, IPM Scout

## Beneficial of the Week

By: Alina Avanesyan and Paula Shrewsbury, UMD

### Soldier beetles are common on many flower species now

Soldier beetles in the family Cantharidae, also known as leatherwings, are important beneficial insects around the landscape and nursery, as they are both pollinators and predators. They are cousins of fireflies, but they do not have the organs which produce light. Soldier beetle adults have elongated narrow bodies, 0.5-0.75 inches in length. The color of the body ranges from yellow to red with various patterns depending on species, with brown or black marks at the end of the wings. Soldier beetles have soft, "leathery" wing covers (this is where the nickname "leatherwing" comes from), chewing mouthparts, and long straight antennae.



The goldenrod leatherwing

Photo: M. J. Raupp

The family Cantharidae consists of five subfamilies; four subfamilies which include a total of 25 genera (473 species) occur in North America north of Mexico. Several species occur in Maryland. The common species we can see around this time of year is the margined leatherwing beetle, *Chauliognathus marginatus*. In late summer and early fall, we can also often find the Pennsylvania or goldenrod leatherwing, *Chauliognathus pennsylvanicus*, which is active on the flowers of golden rod (*Solidago* spp.). Interestingly, for the goldenrod soldier beetle, researchers have found that larger male and female beetles are more likely to mate than smaller beetles.

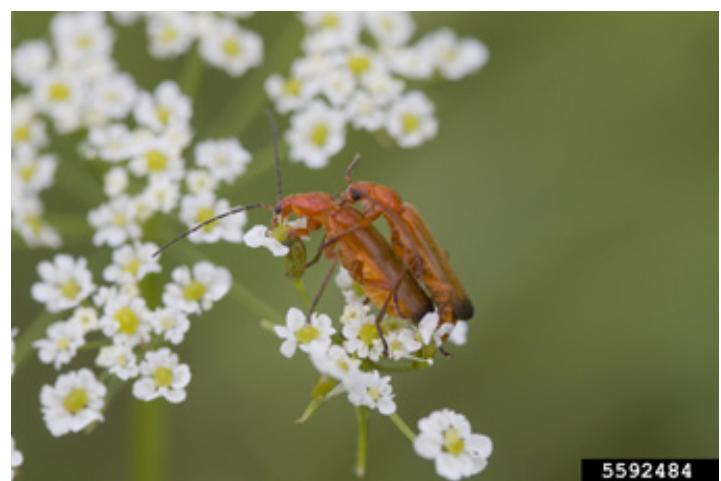


The margined leatherwing beetle

Photo: Rich Kelly, Bugguide.net

Soldier beetle adults are good fliers. They can be found on many plants that are in bloom and on plant foliage. A lot of them can be found on blossoms of perennial plants in flowerbeds. The adults do not damage plants, they swarm around flowers during daytime and feed on nectar, pollen, and insects. They are very common in riparian areas (i.e. along the river margins and banks). The adults can be important predators as they feed on caterpillars, aphids, and other soft-bodied plant pests.

Soldier beetles, like all beetles, have complete metamorphosis having egg, larval, pupal, and adult stages. They overwinter in the larval stage; the adults emerge in late spring, they mate, and female soldier beetles lay eggs in soil or in leaf litter during the summer. Larvae hatch in the summer, they live in the soil and pupate in the fall. In Maryland, during the winter larvae can be found in soil under leaf litter or under loose bark. Soldier beetle larvae are soft-bodied; the body is dark, velvety-looking, and flattened. They have 6 legs and chewing mouthparts. The larvae are mostly predators of ground dwelling insects; they live in the soil but sometimes can move up the plants to hunt



Common red soldier beetles: mating.

Photo: Mary C Legg, Bugwood.org

their prey in the flowers (please see this cool [video](#) of a soldier beetle larva searching for food). The larvae can feed on small insects, worms, slugs, and snails. They can be also found under rock and logs. A few species hunt under loose bark.

Both soldier beetle adults and larvae are highly beneficial in our gardens. They are not only important pollinators and predators, but they are also an important food source for other animals, such as birds, bats, and spiders (which feed on the adults), as well as ground beetles, and other soil-dwelling predators that feed on the soldier beetle larvae.

Soldier beetles in the family Cantharidae also have a long and interesting evolutionary history. To date, researchers have described 25 fossil species in 16 genera of Cantharidae. The earliest specimen of catharids was found in Lebanese amber from the early Cretaceous (~145-100 million years ago); and one of the new soldier beetle species belonging to the family Cantharidae has been discovered from Upper Cretaceous Burmese amber (~99 million years old).



Eggs of Colorado plains soldier beetle

Photo: Whitney Cranshaw, Colorado State University, Bugwood.org

Soldier beetle larva

Photo: Tom Murray, Bugguide.net

## Comments on Chelated Iron

From Eric Wenger, Complete Lawn Care:

Regarding Kelly Nichols response in last week's IPM report, I received some feedback from an organic grower, please see below:

{"Just in case you still had questions... none of the iron based herbicides are approved for use on USDA Certified Organic crops or production areas. Unlike what it says in IPM report I dont even think you can say chelated iron is non-synthetic. Reduced risk.... EPA blessed etc I guess is correct but not (capital 'O') Organic."}

Comments from Kelly Nichols, UME: "That is correct that iron is not on the approved organic list. Also, that is a good point about chelated iron being synthetic. Iron by itself would be organic."

## Weed of the Week

By: Chuck Schuster

Warm temperatures abounded during the last week, making many herbicide applications less than successful. In areas where irrigation is used, a greater amount of success can be obtained.

Field bindweed, *Convolvulus arvensis*, is a perennial plant which reproduces from seed or rhizomes. A native of Europe, it is now found worldwide. The plant has bell-shaped leaves and produces a white flower (on rare occasions pink flower). This weed can produce stems that can grow several feet in length, growing horizontally or climbing into and covering shrubs and trees. A new plant can produce roots that can grow downward to five feet **in the first year**, and the plant can produce roots that have a circumference of ten feet. Over time this plant, soil type dependent, can sink roots to greater than fifteen feet with some reports of up to thirty feet. Most of the horizontal roots colonize the upper two feet of soil, where it is stealing both moisture and nutrients from desired species of plant material.

It differs from morning glory, which is an annual, and does not produce rhizomes, and is much easier to control. The root system on morning glory is not as deep or problematic as bindweed. Morning glory is actually planted by some as an annual flower.

Mechanical control of field bindweed is difficult due to the rhizomes and low growth habit. In some studies, it has been shown that regular cultivation, up to 25 times in a growing season, can be helpful in stopping field bindweed development. Be prepared to do this over a 3 year period though. Less rigorous cultivation can actually help spread the plant as breaking the roots acts as one method of spread. Freezing and thawing of the soil helps to break seed dormancy. Seeds can remain viable for up to 30 years. Burying the seed to a depth of greater than 12 inches prevents germination, but only until brought to the surface later. Herbicides for **suppression** include glyphosate and 2,4-D products, depending on location. Suppression will be obtained if only using a single application, control will require several applications. The best time of year to suppress or control field bindweed is in mid to late summer early fall, when the plants are flowering and actively growing. Field bindweed is difficult to control as the texture of the leaf and stem surfaces forms an effective barrier to absorption and translocation of many chemicals applied. For real control of this persistent weed, repeated applications of a recommended herbicide is necessary, allowing the plant to regrow enough that it produces flowers before each next application. Neither chemical application is considered a single application control method. Close monitoring of the site for return growth is necessary.



Field bindweed

Photo: Chuck Schuster, Retired-UME



Morning glory

Photo: Chuck Schuster, Retired-UME

Care needs to be used with the use of these products to prevent damage to the desired species of plants in the landscape near this weed. The use of contact herbicides including Burnout, Pulverize, and Prizefighter can effectively suppress when used on a regular basis allowing the plant only enough time to produce a small amount of regrowth before the next application, but the plant will continue to regrow.

## Plant of the Week

By: Ginny Rosenkranz

*Agastache 'Blue Fortune'* is a native herbaceous perennial which also goes by the name of giant hyssop. 'Blue Fortune' thrives in full sun and well drained soils, and like many plants once established, *Agastache 'Blue Fortune'* can become drought tolerant. In heavy soils, the plant should be planted on slopes to encourage better drainage. 'Blue Fortune' can grow 2-3 feet tall and up to 2 feet wide with the long bloom time from July to September. The fragrant green foliage smells of licorice. Leaves are attached to the stiff square stem in an opposite fashion. The bright blue tiny tube-shaped fragrant flowers grow on 4-inch long terminal spikes, providing food for many colorful pollinators. Deadheading spent flowers always encourages new flowers. *Agastache 'Blue Fortune'* can be planted in a pollinator gardens, perennial borders, butterfly gardens, and cutting gardens. Because the plants have such fragrant leaves, deer and rabbits usually leave these plants alone. Pests include some leaf spot, powdery mildew and rust. Poorly drained soils can cause the plants to develop crown rot.



Agastache 'Blue Fortune' in the landscape  
Photo: Ginny Rosenkranz, UME

## Pest Predictive Calendar “Predictions”

By: Nancy Harding and Paula Shrewsbury

In the Maryland area, the accumulated growing degree days (DD) this week range from about 1581 DD (Cumberland) to 2139 DD (Reagan National Airport). The [Pest Predictive Calendar](#) tells us when susceptible stages of pest insects are active based on their DD. Therefore, this week you should be monitoring for the following pests. The estimated start degree days of the targeted life stage are in parentheses.

- Pine needle scale – egg hatch / crawlers - 2<sup>nd</sup> gen (1561 DD)
- White prunicola scale – egg hatch / crawlers - 2<sup>nd</sup> gen (1637 DD)
- Obscure scale – egg hatch / crawlers (1774 DD)
- Orangestriped oakworm – egg hatch / early instar (1917 DD)
- Maskell scale – egg hatch / crawlers - 2<sup>nd</sup> gen (2035 DD)
- Euonymus scale – egg hatch / crawlers – 2<sup>nd</sup> gen (2235 DD)
- Japanese maple scale – egg hatch / crawlers – 2<sup>nd</sup> gen (2508 DD)

See the [Pest Predictive Calendar](#) for more information on DD and plant phenological indicators (PPI) to help you better monitor and manage these pests.

## Degree Days (as of July 14)

Aberdeen (KAPG)	1612
Annapolis Naval Academy (KNAK)	1887
Baltimore, MD (KBWI)	1956
Bowie, MD	1966
College Park (KCGS)	1768
Dulles Airport (KIAD)	1839
Ft. Belvoir, VA (KDA)	1862
Frederick (KFDK)	1775
Gaithersburg (KGAI)	1760
Greater Cumberland Reg (KCBE)	1581
Martinsburg, WV (KMRB)	1591
Natl Arboretum/Reagan Natl (KDCA)	2139
Salisbury/Ocean City (KSBY)	1924
St. Mary's City (Patuxent NRB KNHK)	2043
Westminster (KDMW)	2014

Important Note: We are using the [Online Phenology and Degree-Day Models](#) site. Use the following information to calculate GDD for your site: Select your location from the map Model Category: All models Select Degree-day calculator. Thresholds in: Fahrenheit °F Lower: 50 Upper: 95 Calculation type: simple average/growing dds Start:Jan 1

## Conferences

### Diagnostic Sessions

We will be holding a plant diagnostic session for nutrient problems, diseases, and insects on July 21 at the Central Maryland Research and Education Center (11975 Homewood Road, Ellicott City, MD 21042) from 12:30 – 3:30 p.m. We encourage participants to bring samples of nutrient disorders and insect and disease problems for diagnosis by David Clement, Karen Rane, Stanton Gill, and Andrew Ristvey, University of Maryland Extension. **To register, go to <https://jul21ipm.eventbrite.com>**

### Save the dates...

#### Cut Flower Tour

September 14, 2021

#### MNLGA Field Day

September 16, 2021

### Montgomery College Course: Taught by Stanton Gill

LNTP 215 Pest Management\*, \*\* 3 semester hours

Hone your pest management skills with Stanton Gill. Explore the identification of key pests, their life cycles and control methods, with emphasis on integrated pest management strategies.

The lecture is online. Selected labs and field trips will be face to face. This format is more conducive to folks who work in the industry and those who do not live close to Germantown.

Thursday, 6:00 - 9:30 p.m.

CRN 21992, CRN 21993 Lab - On-line

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