



Drive around an average suburban neighborhood. Most likely, you will see a similar assortment of landscape plants. With few exceptions, these plants would be selected

from species that occur naturally in other parts of the world. Because these species are relatively easy to propagate, they are cheap to mass produce, making it easy for new-home builders provide at least one for every yard.

Having just moved from a large landscaped property with 14 years' worth of my own blood, sweat and tears, I can safely say that my yard was the most unique on that side of Harford County, Md. I had some "foreign" plants in my landscape, but a larger number of species were native to North America.

The townhouse property I just bought in Cecil County is practically a clean slate, except for the standard contractor's mix of foundation shrubs: a tall arborvitae, a spreading juniper and a short, round Japanese holly. A neighbor told me that everyone originally got either a flowering dogwood (a native) or a flowering cherry in the

front yard. Needless to say, most of the dogwoods are dead now.

What's all the fuss about native plants? Native, or indigenous, plants are those species which have evolved over thousands or millions of years in parts of the world that provide a unique combination of climate, sun exposure, soils, terrain and other chemical and physical features. The plants adapted to these conditions, as did other living things, and were interdependent on such things as shade from other plants, earthworms aerating the soil and insects pollinating their flowers. Part of a community of living things, are just as dependent upon the plants for food, shelter, nesting and breeding.

Native versus non-native plants?

Non-native plants are brought to a place in which they did not evolve, typically introduced by people, sometimes intentionally, sometimes by accident. All of our local lawn grasses and most of the plants we disparage as weeds are introductions

from other places. Some of those weeds were once actively cultivated and valued as medicinal herbs and foods. When tastes and health care practices changed, the plants lived on without human assistance.

Not all of the non-natives survived, but the ones

(continued on page 2)



Return of the Natives:

• SELECTING WHAT GROWS NATURALLY

THINGS TO DO THIS MONTH...

- Plant annuals in mid-May.
- Plant snap beans, sweet corn, tomatoes, cucumbers, cantaloupes and lima beans.
- Plant asparagus.
- Remove the flowers from bulbs as they fade, but don't remove foliage until it is yellow/brown and pulls up easily. The foliage must store nutrients in the bulb for next year's flowers.
- Plant annuals around bulbs to hide their dying foliage.
- Plant summer-flowering bulbs.
- To spread out the flowering period, make successive plantings of gladiolus.
- Spray iris for borers.
- Move houseplants outdoors to protected, shady locations.
- Spray roses every 10 days with a fungicide and insecticide.
- Rake existing mulch to break the hard crust.
- Spread mulch on beds to help conserve water and reduce weeds.
- Prune spring-flowering shrubs after bloom by removing 1/3 of the older branches at or near ground level.
- Set your lawn mower at a cutting height of about 2 1/2 inches.
- Do not fertilize your lawn after mid-April.
- Cut your lawn frequently enough to return clippings to the lawn.



RETURN OF THE NATIVES (continued from page 1)

that did had certain advantages: their new environment offered enough of the good things to thrive, and fewer predators and diseases. Growing unhindered while the native plants around them struggled against natural pests and diseases, non-natives took over.

Once people introduced non-native plants to their gardens, a protected area surrounded by wilderness, the plants "jumped" the boundaries into natural expanses, taking over these reserves, including parks, arboreta and wildlife, competing unfairly with the original flora and fauna of the region.

In recent years, however, higher-than-usual summer heat and lack of precipitation have plagued Delmarva. Because the dry, hot times are a natural part of climate ups and downs, native plants and animals are able to withstand these periods, at least the fittest can, surviving to produce offspring even better adapted to the local conditions.

Why use natives?

Selecting native plants for the landscape is a trend that lately has become more than a plant collector's whim. Let me give you four reasons that using native plants in the landscape is a natural:

• **Natives save time and money.** Established native plants can significantly reduce the need for fertilizer, pesticides, water, and garden maintenance equipment.

• **Natives protect water quality.** Native plants require little fertilizer when placed in a suitably prepared environment that includes other appropriate species of plants. An established native plant community can capture rainfall much more efficiently, thus preventing runoff, reducing flooding, recharging the groundwater supply, and inhibiting soil erosion. Lawns as we expect them to look today require lots of water

and fertilizer. In urban areas, lawns suck up 30 to 40 percent of the water supply on the East Coast.

• **Natives improve air quality.** Natural landscapes that replace lawns do not require mowing. The power source of choice is currently a highly inefficient gasoline engine. Gas-powered garden tools contribute 5 percent of the nation's air pollution. The nation's 40 million lawnmowers consume 200 million gallons of gasoline each year. One gas-powered lawnmower emits 11 times the air pollution of a new car running for the same amount of time. Carbon from fuel combustion contributes to global warming. Native plants (and others) remove carbon from the air and store it in their stems and roots as sugars, starches, cellulose and the other organic compounds that make up wood, leaves, and fruits.

• **Feed and shelter wildlife.** Native plants attract native birds, mammals, insects, and other creatures with which they evolved.

Building a native plant community

Like most projects, when establishing native plants, it is best to start small. Plan to do one part of the yard at a time. Sketch your ideas on paper first, and make lists of the roles each part of the yard will play. Identify the characteristics of each site, such as sun/shade or wet/dry. The old saw of "right plant, right place" is critical.

It may not be possible to build a plant community for a particular site in every situation without some modifications. You may have subsoil with extremely low pH and nutrient levels as the "topsoil" in the yard of your new home. Only the plants that evolved as colonizers of disturbed sites, say a mudslide or hurricane,

might be able to tolerate such conditions. Those species are often short-lived or may not be able to provide functionality, aesthetics, or longevity to your landscape. Soil testing will help you determine the challenges you face there.

Many people are unfamiliar with native trees, shrubs and herbaceous plants. A walk in the woods or fields with a naturalist is a great way to see how things grow in the wild. But you may have a hard time visualizing just how the plants might fit into the tamer environs around your home.

Selections are available of native species that have more compact growth, larger flowers, shinier leaves or other features that make them more appealing as home landscape plants.

Serious about going native? Extension can help

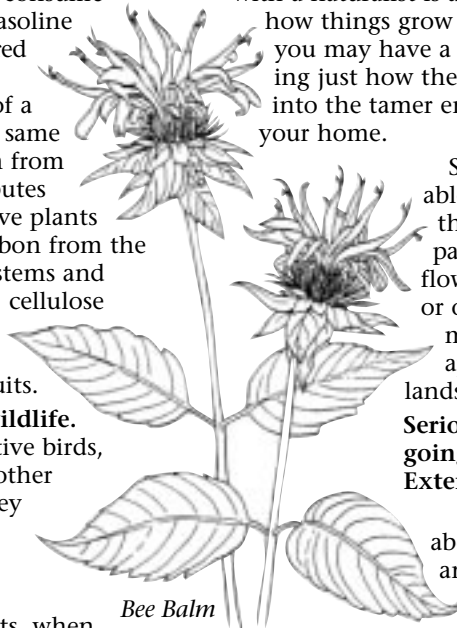
To learn more about these plants and to see them in action, you can visit the New

Castle County Master Gardener Native Plant Teaching Garden. Volunteer educators have started native planting on the land surrounding the Cooperative Extension office at 910 S. Chapel Street in Newark. Each of the plants in the garden is labeled with common and scientific names.

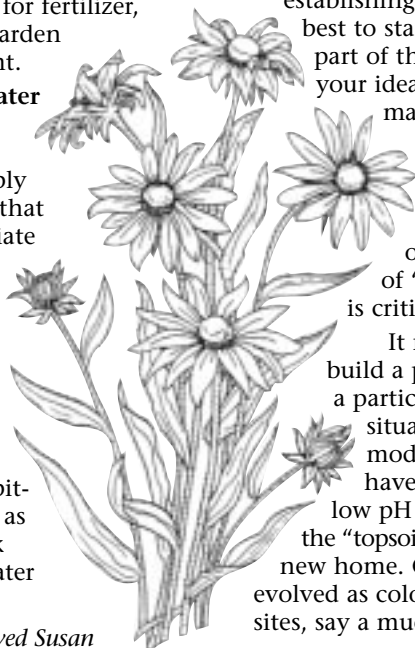
In addition, Master Gardeners periodically offer a workshop called "Go Native," that provides more information on using native plants in your landscape. For information check out the Web site at <http://ag.udel.edu/ncc/mg/mg-workshop-comm-workshop02s.html> or call 302-831-COOP.

I have a big challenge ahead of me in converting my own new wasteland into a wildlife haven. You better bet I'll be out in the Teaching Garden for ideas and inspiration!

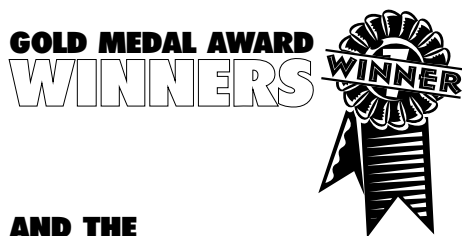
-Jo Mercer



Bee Balm



Black-eyed Susan



AND THE WINNERS ARE... PENNSYLVANIA HORTICULTURAL SOCIETY

The Pennsylvania Horticultural Society has been awarding the Gold Medal Plant Award to little known and underused woody plants since 1988. Here is a description of one of the 2002 award winners.

Malus 'Adirondak' (crabapple)

As cold and opinionated as this may sound, there are too many crabapples in this world. Indeed, if you go to a good bookstore and browse through some gardening books, you'll find a staggering number of crabapples. Now, it wouldn't be so bad if there were real differences between the cultivars, or if they actually were disease-resistant or flowered consistently every year. The real problem is that there are too many bad ones in nurseries, and it's hard to separate the wheat from the chaff, so to speak. *Malus 'Adirondak'*, however, is the real deal.

Bred and introduced by the late Dr. Donal Egolf of the United States National Arboretum, *Malus 'Adirondak'* quite simply has it all. Dr. Egolf noted one day, as he walked through the National Arboretum, what a remarkable tree *'Adirondak'* was. He said it was the best selection in his breeding program. He was right!

Malus 'Adirondak' has a narrow, upright form with leathery, dark green leaves. The flowers are carmine red in bud, changing to a lighter red, and finally opening up to white with traces of red in the flower. The flowers have a heavy texture and a slight fragrance. The tree's hard, orange-red fruit, classified as a "pome," is produced in great quantities. It persists into early winter and, when softened by a hard freeze, provides food for birds.

Now, on to the topic of disease resistance, to breed *'Adirondak'*, 500 open-pollinated seedling of *Malus halliana* were artificially inoculated with the disease known as fire-blight under controlled conditions. Sixty open-pollinated seedlings (i.e., their pollination was not controlled) survived and showed further resistance to natural occurrences of scab, cedar apple rust and powdery mildew for a period of 11 years. *Malus 'Adirondak'* was then chosen from the remaining seedling populations. Now that's highly disease-resistant!

In all, *Malus 'Adirondak'* makes a fantastic specimen small tree for small yards or at the edge of a foundation planting. It adapts to poor soil and prefers full sun.

—Susan Barton

The preceding description was written by Joe Gray, general manager of Hines Nurseries, located in Vacaville and Winters, CA. He is also a member of the Gold Medal Committee.

2002 PERENNIAL PLANT OF THE YEAR HAS LOCAL CONNECTION

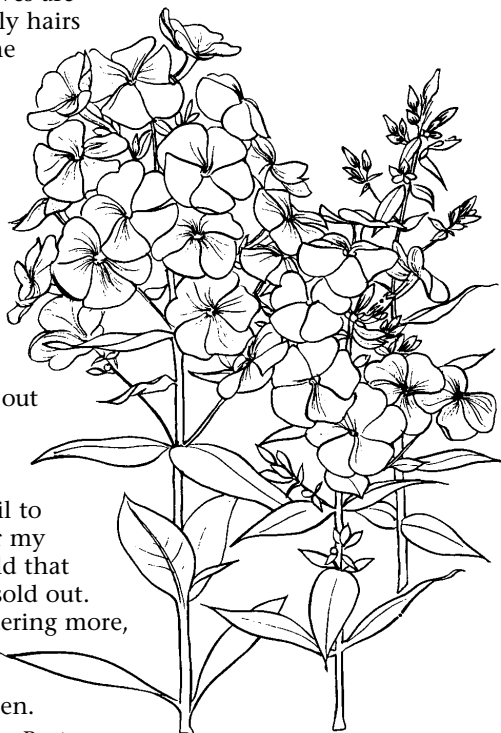
Phlox 'David' has been named the 2002 Perennial Plant of the Year. This phlox, which will flower from mid-July to September, is praised for its bright white clusters of delightfully fragrant flowers. When I visited the Scott Arboretum for a conference last summer, I found clusters of *Phlox 'David'* cheerily greeting me from many of the landscape beds around campus. I went right home and bought several plants to add to my own garden. The real benefit of *Phlox 'David'*, in addition to its sturdy tall stems of white flowers, is its powdery mildew-resistance. My plants were mildew-free until the very end of the season. Even then, the little bit of mildew I found did not detract from the beauty of the plants.

While *Phlox paniculata* is native from New York to Georgia and west to Arkansas and Illinois, the cultivar *'David'* is a local success story. FM Mooberry (local native plant expert) was working at Brandywine River Museum. She needed to cover a large area with a good native plant so she tried some phlox. Later, Mooberry noticed a beautiful white, mildew-free specimen in her phlox meadow. She named the plant *'David'* after her husband and worked with a local propagation nursery, North Creek Nurseries in Landenberg, Pa., to build up enough plants for commercial sale.

Phlox 'David' is an erect perennial, 36 to 40 inches tall. The thin glossy leaves are opposite with bristly hairs on the margins. The strong stems prove sturdy in even the toughest summer wind and thunderstorms. Fragrant white flower panicles are 6 to 9 inches long and 6 to 8 inches wide with 1-inch in diameter florets.

You better hurry out and buy your *Phlox 'David'* now. I went to a local garden center in early April to purchase plants for my church and was told that they were already sold out. The center was ordering more, so hopefully you will be able to find some for your garden.

—Susan Barton





2002 IVY OF THE YEAR

Hedera helix 'Teardrop' has been selected by the American Ivy Society as the Ivy of the year for 2002. It isn't hard to guess how 'Teardrop' got its name. It looks like a teardrop with shiny dark green leaves that are unlobed and longer than they are wide. Conspicuous green veins radiate out from the base of the leaf, producing an attractive pattern.

'Teardrop' is self-branching and easy to grow in pot or basket. On occasion you may even see multiple branches arising from a single node. In the garden it is not invasive and has been tested for hardiness. It has survived temperatures as low as minus 15 degrees Fahrenheit in Ohio.

—Susan Barton

Information provided by Suzanne Warner Peirot at The American Ivy Society (www.ivy.org).

GET YOUR LANDSCAPE THROUGH A DROUGHT UNPARCHED

As I write this issue of Garden Check, we are having a typical cold and rainy spring day and I say, "Yeah, we need the rain!" Actually, so far we have had a normal spring season with sufficient rain for plant growth. But unfortunately, our streams, ponds and reservoirs are at very low levels due to the dry fall of 2001 and lack of snow during the winter. That means our drought warning could turn into a drought emergency if we have a dry summer.

Yet this is no reason to not plant this spring. Ornamental plants provide many benefits for the environment from their cooling effect to the oxygen they provide in exchange for carbon dioxide. Plants also are known to reduce stress because they create pleasing landscapes. In fact, the sooner you plant perennials this spring, the better, because you will be taking advantage of natural spring rains to get plants established. But most perennials require at least one growing season before they are fully established in the landscape. If we get rain at least once a week this summer, there is no need to provide additional water. However, if we encounter dry weather (as we often do in Delaware summers), you may need to water newly planted specimens.

You can still water responsibly if you follow these guidelines:

- Stimulate deep, extensive root systems by loosening soil with organic matter.

- Water deeply but infrequently. In an average loam soil, it takes about two to four hours of slow watering to infiltrate the soil to a depth of one foot. In heavy clay soil it may take as long as five to 10 hours to infiltrate to a depth of one foot.
- Apply water very slowly or it will simply run off and be wasted.
- It is best to water in the early morning or late afternoon when it is cool and less windy because loss of water by evaporation or drift will be less than occurs at mid-day.
- Avoid overhead sprinklers, because they can lose as much as 50 percent water to evaporation before the water even reaches the soil.
- Apply water with soaker hoses or regular hoses set to a trickle. For large trees, you can purchase bags that allow water to drip slowly into the root zone area. Or at the base of the tree place a plastic bucket with small holes drilled in the bottom full of water. Then fill with water. The water will gently and drip into the root zone with no water wasted.
- Cover any exposed soil with organic mulch to reduce evaporation, insulate the soil from temperature extremes and reduce weed growth that competes with desirable plants for limited water. So rain can permeate the root-zone area, rake old mulch first to break up the crust that can form a barrier to moisture.
- Lawns are usually identified as water guzzlers. In fact, there is no need to water a lawn in Delaware unless it has been newly seeded or sodded.

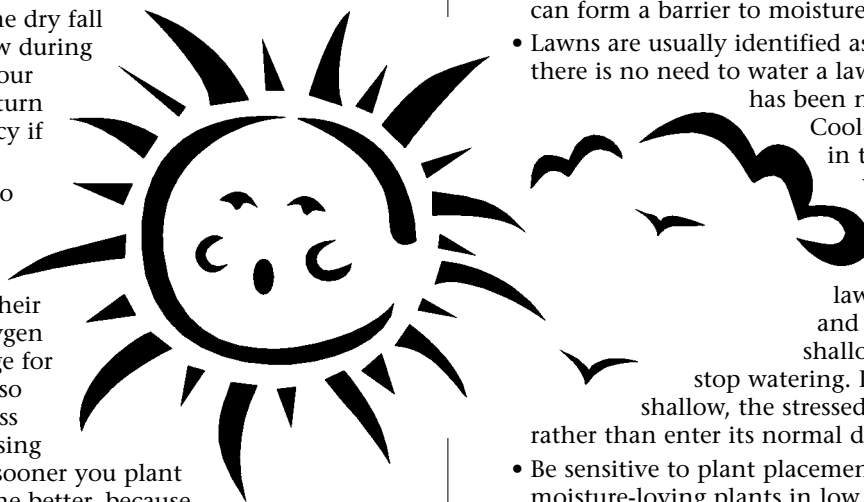
Cool-season grass goes dormant in the summer when the weather is dry. It will green back up in the fall when regular rainfall returns.

The only way to kill a lawn is to water it frequently and shallowly, encouraging a shallow root system, and then stop watering. If the root system is too shallow, the stressed turf may actually die rather than enter its normal dormancy period.

- Be sensitive to plant placement in your landscape. Put moisture-loving plants in low, wet areas and use drought tolerant species in dry, sloped locations.

For a list of drought-tolerant plants and general watering guidelines, call the Plant and Soil Sciences office (302-831-2531) to request a free copy of "Dealing with Drought in the Landscape," an Extension publication written by local experts and funded by the Delaware Nursery and Landscape Association.

—Susan Barton





BLACK AND YELLOW BEES (continued from page 6)

(carpenter bees are numerous around tunnel sites but are not social—each female digs and provisions her own individual tunnels). Bumble bees establish nests in the ground in abandoned mouse nests, holes around structures, landscaping features, etc.

All bumble bees are females so they can sting if handled. They are usually too busy to bother us even when we closely observe them foraging or working at the nest. Later the workers are a bit more protective of the nest site and accidental encounters may lead to stings. Nests are never very large (up to 75 workers) so we usually never disturb these beneficial flower visitors.

The other black and yellow spring insect is the queen **yellow jacket**. Like the bumble bee queen, she overwinters in a sheltered location and is now going about her work establishing her nest. She also is social—her first batch of workers will take over nest and foraging work from the queen if the nest is successfully established. We might observe her looking for a ground cavity by flying just above ground covers or along the margin of the yard. Soon she will appear around vegetation looking for insects to capture to feed to her larvae and some of the plant sucking insects for their sweet sugary secretions as her energy source.

Early-season yellow jackets are beneficial: they feed on insects from the yard. If you see consistent activity in one site, mark it and consider midsummer removal with an insecticide, because toward the end of summer and into the fall, yellow jackets become pestiferous.

—Dewey Caron

CULTIVATE SOUND IN YOUR GARDEN

As any gardener knows, a garden delights the senses, primarily those of sight, touch and smell. Incorporating a fourth sense—namely, sound—adds yet another dimension to the gardening experience. While sound in the garden tends to be more subtle, it can be equally as significant. And the ways in which you can bring sound to the garden are many.

One of the easiest ways to invite sound into your garden is by attracting birds. What gardener doesn't love the soft coo of mourning doves, the chirp of chickadees or the flute-like vocalizing of warblers accompanying them during simple garden tasks? The strategic placement of bird feeders will ensure regular visits from melodic friends. Also certain plants can attract birds, including sunflowers, coreopsis, wildflowers, and annuals such as zinnias and marigolds. Plants that bear fruit such as blackberry vines encourage avian visits as well, although you may prefer to keep these fruits for yourself.

Birds also are attracted to certain plants for other than sources of seed and berries. Catching the attention of birds is made easier if your garden contains a wide variety of native plants. In addition to providing perching, cover for protection from predators and nesting possibilities, native plants attract native insects, which birds require to raise their young. This

was confirmed in a local study last year by UD entomologist Doung Tallamy. Native plants can invite a virtual orchestra of bird music, so go native and get ready for Nature's symphony!

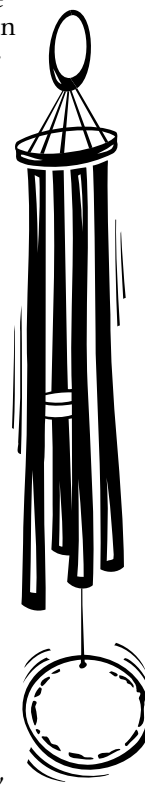
Wind chimes are another way to bring sound into the garden. Even a slight breeze will promote the tinkling of chimes. Wind chimes are musical instruments, delivering an array of scales and pitches in alto, soprano, mezzo, tenor or bass. Some chimes replicate the sound of coastal and harbor bells, allowing you to bring a bit of the sea into the garden. Not only are wind chimes calming, they can be decorative as well. Often personalized and hand-crafted chimes are available to reflect a gardener's personal style.

Plants can also create sound in the garden. Ornamental grasses gently rustling in the wind is soothing. Air flowing through bamboo creates a rich, rhythmic tone. Seedpods on Baptisia rattle against each other, reminiscent of maracas. *Populus tremuloides*, Quaking Aspen, has leaves that flutter in the wind, producing a peaceful background music to any garden task. Many plants with large dry seedpods or large leaves close together will provide sound in the garden.

One of the most peaceful sounds in a garden is moving water. Establishing a pond in the garden, complete with a small rock-guided waterfall, is relatively easy. The sound of flowing water whether from a pond or fountain creates a tranquil atmosphere.

Bringing sound into the garden by incorporating any or all of these ideas will engage all the senses, thus heightening the gardening experience. Gardeners living in the country have limited outside intrusions while city dwellers may want to muffle obtrusive noises that surround an urban home. No matter where your patch of land, however, sound is a welcome addition to any garden space.

—Marcia Stephenson, UD Undergraduate



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MAY PEST ALERT

- **Aphids & plant sucking relatives:** look for colonies, honeydew or symptoms of curled leaves and off-color foliage; treat large populations early for best control
- **Azalea lace bug, leafminer, & whitefly:** scout for these common pests and control pest populations early for best results.
- **Caterpillars (tent, gypsy moth, cankerworm, fall web-worm):** look for caterpillars or their defoliation; control is easier with Bt when caterpillars are less than inch; older caterpillars only need control if defoliation is extensive.
- **Leafminers (holly, boxwood, azalea, birch):** control adults before mining starts; damage is mostly cosmetic but heavy defoliation may occur.
- **Leaf feeding beetles on elm, willows, locust, & oaks:** control only if populations are high or hosts are small and vulnerable; sampling is difficult on large trees.
- **Mites on boxwood, spruce, shrubs, holly, viburnum, & azalea:** use biorationals such as insecticide soap to save natural enemies so you don't have to repeatedly apply insecticides.
- **Sawflies on pine, ash, & shrubs: prevent extensive defoliation:** scout first and then spot spray.
- **Scale insects (pine needle, armored, cottony maple, & white perch):** spray is effective only when crawlers are present.

—Dewey Caron

HONEYLOCUST PLANT BUG

Honeylocust plant bugs hatch from over-wintered eggs as pinhead-sized dull green insects that, when disturbed, can be seen actively running across leaves and along the small branches of honey locusts. Hatching occurs shortly after leaves start to emerge, which this year was during the warm spell in mid-April. They will feed for several weeks on the expanding leaves enlarging with several molts. Their feeding may cause leaflets to curl and show brown areas. On very heavily attacked trees, leaflets will fall off. Trees replace this loss with new leaves in June but this may weaken them. Less heavily attacked trees will retain their misshapen leaflets through the summer.

By late May, honeylocust plant bugs turn into adults that are about one-eighth inch long. They have wings and fly readily when disturbed. Male and female mate, and females lay eggs in the still soft, green stems at the branch tips. These eggs will remain as eggs through the remainder of summer and fall, emerging as nymphs next spring.

Preventing damage involves scouting (shake foliage onto a white sheet of paper and count the number of bugs to determine level of infestation. Even one bug per compound leaf can cause aesthetic damage. Because field scouting is not likely to detect all the bugs present, finding three or four bugs per compound leaf cluster probably justifies an insecticide application.

—Dewey Caron

CLOVER MITES

Clover mites are tiny, reddish-brown creatures that appear only as moving dark spots to the naked eye; they leave a red-brown stain when crushed. The red stains, however, are body pigments not blood. Clover mites will not harm people or pets, nor will they infest household products. Once inside a home or building, they soon die.

Lawn mites feed on turf grasses or weeds. They can be especially abundant in the heavy, succulent growth of well-fertilized lawns. They usually enter a home around windows or doors so they are seen often crawling along window sills or thresholds. The mites may even crawl up outside walls and enter buildings at upper levels. A temporary nuisance, they appear suddenly, then are gone. They have been especially noticeable this spring.

Because the potential for clover mites to invade structures when grass extends up to the foundation, a plant bed or open area provides a barrier that will stop mites and provide a long-term solution to persistent problems. Also. Do not overfertilize lawns since this creates ideal situations for mites to increase to tremendous numbers.

Kill mites on the outside of buildings with a direct spray of an insecticidal soap. This treatment will not provide any residual control. A spray of Diazinon, Dursban or Tempo along the outside walls and extending about 10 feet out from the foundation will provide relief. There is no spray for the mites that get inside. Just clean up those with a household cleaner.

—Dewey Caron

PROMINENT BLACK AND YELLOW BEES/WASPS

Prominently colorful black and yellow bees and wasps is a feature of the April/May landscape. Large yellow and black carpenter bees made their annual appearance during the warm spell of mid-April. Males come out of the tunnels first and begin to establish territories. If you come too close, they may fly in your face in an attempt to scare you off. The males cannot sting nor are they capable of drilling in the wood. Their role is to intimidate.

Males are soon followed by females. We observe females less as they drill nickel-sized tunnels into wood and then provision them with food. They place one egg on a food ball and begun another cell in front of it.

When we see new tunnels it is time to start control procedures. It is necessary to apply insecticide into the individual nickel-sized holes. Area-wide control is not effective. Liquid or dusts can be used. Caulk over the tunnels only after application of the insecticide. Painting or covering the wood with a finish after treatment and filling of holes will help prevent reduce current infestation and limit expansion. Do not worry about the males.

Bumble bees closely resemble carpenter bees, especially the large, overwintered queens we see in the spring landscape. They will not appear around wood but will be prominent foragers at azalea, lilac and other larger flowers in the landscape. Bumble bees are social *(continued on page 5)*



POWDERY MILDEW DOGS AREA DOGWOOD TREES

The flowering dogwood (*Cornus florida*) is a popular native tree in the landscape and in wooded areas. The flowering dogwood has few equals when it comes to providing a spectacular show of spring color. However, this wonderful tree is not without its problems. Dogwood borers, errant lawnmowers, and the dreaded *Discula* anthracnose disease have limited the life of many a dogwood in the region.

Now a new emerging fungal disease is disfiguring this tree. Powdery mildew, caused by the fungus *Microsphaera pulchra*, is widespread in the region and has been increasing in occurrence and severity over the past five or more years. In my opinion, powdery mildew is replacing *Discula* anthracnose as the most significant fungus disease of flowering dogwood in the landscape.

In the wooded environment, where dogwood is an understory tree, anthracnose still has the potential to be a tree killer. But, unless a dogwood is placed in a favorable environment for anthracnose infection (e.g., near a water feature or enclosed shaded area), this disease will be no more than an occasional minor leaf-spotting fungus. Powdery mildew, on the other hand, is disfiguring dogwoods in many environments.

Symptoms

Powdery mildew infections occur as early as mid-May depending on the season. Identified by the patches of white powdery fungal growth on the upper surface of newly emerging leaves, this infection often will cause the new growth to be twisted or deformed. Older infected leaves have green-brown or green-purple blotches that progress into dark brown to tan dead patches as the summer progresses. The white fungal growth is not as noticeable on the older leaves. Symptoms may appear on the new growth throughout the summer and fall.

From fungicide evaluations conducted the past three years at the University of Delaware Botanic Gardens, it was clearly demonstrated that powdery mildew is responsible for most of the premature red coloration of infected trees in the fall. Fungicide treated plants with no powdery mildew turned their normal beautiful red color almost three to four weeks later. Premature red coloration of leaves in the fall appears to be another symptom of powdery mildew infection.

In the past, most plant pathologists and horticulturists considered powdery mildew mostly an aesthetic, not detrimental. This is the mindset, at least, of powdery mildew infections of lilac, London plane and English oak.

Why, then, is powdery mildew on dogwood different? It occurs early in the season most years, so more leaves are infected for a longer period of time, resulting in reduced photosynthesis. Powdery mildew-infected foliage from spring infections often shows more scorch symptoms during dry periods in summer. Powdery mildew infections disrupt the cuticle, resulting in more water loss from the leaves. Research conducted in Tennessee also has shown that powdery mildew has resulted in a reduction of root mass and stem caliper on container-grown trees.

Recent observations from southern areas with nursery production indicate that the disease is capable of reducing growth of very small trees that are used for rootstock and budwood.

Reduction of photosynthesis and increased water loss can weaken trees and predispose infected trees to other pests such

as dogwood borers or *Botryosphaeria* canker disease. It is difficult to evaluate the health effects of powdery mildew infections on landscape trees but the aesthetic effects are obvious: the disease definitely reduces the attractiveness of the trees.

Control

Gardeners and landscapers can prevent powdery mildew:

- Discourage the disease on existing trees by avoiding heavy nitrogen fertilizer use, heavy overhead watering and excessive pruning. These practices produce succulent growth that is more easily infected by the fungus.

- Provide a thin layer of mulch over the root system, prune out dead branches, and provide good air movement so the foliage dries quickly.

- Plant disease resistant cultivars, which is the best long-term solution to powdery mildew control. Currently the only resistant cultivar of *Cornus florida* that is readily available is 'Cherokee Brave' which has flowers that are burgundy with white centers. I would be remiss not to mention the introduction of three new powdery mildew resistant cultivars that should be available to the nursery trade in the next 3–4 years. 'Kay's Appalachian Mist', 'Jean's Appalachian Snow', and 'Karen's Appalachian Blush' were newly introduced by the University of Tennessee. Check them out on the Web at <http://dogwood.ag.utk.edu/>. This site has good information and pictures of dogwoods.

Disease-Resistant Cultivars

Plant pathologists and horticulturists have identified a number of disease resistant and moderately resistant cultivars of flowering dogwood. Resistance ratings are also available for Kousa dogwood and the new dogwood hybrids, *Cornus x rutgeri*ensis. Neither Kousa or the Rutgers hybrids would require fungicide controls in this area. The following list was gleaned from a number of sources including our own dogwood collection at the University of Delaware Botanic Gardens in Newark and the Research and Education Center in Georgetown, DE.

In fungicide trials conducted at the UDBG all the fungicides tested provided excellent control of powdery mildew when used according to the label. Banner MAXX, Cleary's 3336, Compass, Heritage, Spectro (Cleary's 3336 plus chlorothalonil), Strike, and myclobutanil (Eagle, Systhane, Immunox) are labeled and can be used when the first signs of powdery mildew are seen. Fungicides applied after infection has occurred will protect new growth from being infected but will not "cure" old infections. Sprays can be applied at 2- to 3-week intervals beginning once mildew is first seen and repeated during the spring and early summer. Homeowners can readily purchase Immunox (myclobutanil) and Cleary's 3336 (thiophanate-methyl).

As mentioned before, spray when symptoms are first seen and repeat at three week intervals until early August. Last year I evaluated the biorational fungicides containing potassium bicarbonate (First Step and Kaligreen), the neem oil product Triact, and Sunspray UltraFine Oil (paraffinic oil) for powdery mildew control and all three provided satisfactory control and are good alternatives to the other fungicides mentioned. My only comment is that horticultural oil would be better applied every two weeks and that these products would only control powdery mildew, while the fungicides would also control anthracnose and other leaf spotting fungi.

The tools to control powdery mildew are available, it's up to landscape managers and homeowners to decide if and when controls should be implemented.

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COMPLEX LANDSCAPES BOOST NATURAL CONTROLS

Paula Shrewsbury, a University of Maryland ornamental plant insect specialist, visited UD this spring to discuss her research. She has found the structural complexity of the landscape to be the best indicator of azalea lace bug outbreak. Plants in more complex environments (those with more trees, shrubs, flowers, and groundcovers) experience fewer and less severe outbreaks.

Complex landscapes with more vegetational variety and layers have greater numbers of natural enemies, especially spiders. Azaleas located on simple sites are warmer, thus providing a thermal refuge. This environment enables the major Azalea pest lace bugs to develop faster and more quickly reach reproductive age, resulting in higher populations. In her research plots, Shrewsbury found that azaleas arranged so flowers (Shasta daisy and coriander) were nearby resulted in greater numbers of alternate prey (leafhoppers mainly in addition to lace bugs) so predator numbers were higher and azalea plants had fewer lace bug pests.

In more recent studies both outside and in the greenhouse, augmentative release of green lace wings (another common predator in addition to spiders) were found to be more abundant in the complex environment as compared to the simpler environment. A better microclimate, alternate prey and, perhaps, nectar and pollen contributed to the abundance of predators. What still is confusing is that few green lace wings are recovered after release and the research has not yet determined where they go (do they eat each other? die? leave the study plots?).

These and other studies support our recommendations that simple habitats, in which there are fewer alternate food sources (prey, nectar, and pollen) to retain predators, allow azalea lace bug populations to expand more rapidly and exhibit more population outbreaks. Natural communities benefit by increasing the structural complexity of the habitat by incorporating plants (such as flowers, trees, and shrubs) into the habitat. In situations in which increasing structural complexity is unlikely, such as in nurseries, augmentative release of natural enemies, including the green lacewing, may help in suppressing pest populations but more studies are needed to find the best conditions to do so.

–Dewey Caron