DURHAM MASTER GARDENER NEWSLETTER
January 2011

Michelle Wallace, Consumer Horticulture Agent—Durham County and EMGV Coordinator,
North Carolina Cooperative Extension Service

This month we continue to look at the American chestnut. CM entertains us with another "Ramblings." tells us what it's like giving apresentation and ST tells us about mistletoe.

Durham County Center
721 Foster Street
Durham, NC 27701
MGV Desk: (919) 560-0528
Hort. Agent: (929) 560-0526
Fax: (919) 560-0530

GC

CM: RAMBLINGS

It's time to relax around the garden for a while. So, what to do outdoors in the winter? Well, sunsets can be spectacular, with gorgeous rose-colored skies on the western horizon. Other things suited to the long nights of January include bundling up to go outside and watch the world turn. The latter is fun and educational for the whole family, and requires only a clear space from which to view the sky, preferably without too much ambient artificial light, and a willingness to sit out in the cold for a while. A star map and binoculars can add to the fun, but aren't required.

The winter solstice occurred in late December, and marks the point when the sun appears to stop its southward slide. It hangs about for a few days, then clearly begins to show a move back toward the north. To see this, pick out a spot where you can see sunrise (or, for some of us, about an hour after sunrise), choose a landmark, e.g., tall tree, and note the position of the sun in the sky relative to it, then check it for the next week or so at the same time. You should be able to tell that the sun's position shifts slightly northward over a few days.

This was considered propitious by early people, since the sun had long been recognized as the giver of all life, and to know that it was going to come back, year after year, after threatening to disappear, was cause for celebration. It's no accident that two of the year's biggest holidays, Christmas and New Year's Day, occur right around this time. Everyone doesn't celebrate Christmas, of course, but the whole world celebrates the arrival of the New Year.

While you're outside shivering, look for some predictable things in the sky. Venus reappeared as the "morning star" in November, and is easily visible in the east shortly before sunrise. Mars puts on its best showing early in the year, when it shines like a brilliant orange "star." Late January will probably give the best views. Jupiter is not in a position for viewing from here until late March, when it shows up as a morning star just before sunrise. Planets can be distinguished from stars by noticing the light coming from them. Stars "twinkle," planets don't; in addition, planets shift position from day to day more noticeably than stars.

Three constellations that are easy to see from our area are Orion, the hunter; Canis Major, Orion's companion dog; and Ursa Major, the Big Dipper. Orion is easily identifiable by the three stars in line from west to east that outline his belt. Once you spot them, you can fill out the main rectangle of the constellation and, with a little imagination, see the hunter. Canis Major follows Orion from the east, and is marked by Sirius, the brightest star in our sky. Both "rise" in the east-southeast about nine o' clock. Now, here's where watching the world turn comes in. As you watch, the constellations appear to move across the sky. This apparent motion is really the result of the earth's rotation on it axis from west to east. The same movement accounts for the sun's apparent motion in the sky, but it's most impressive, I think, when with the naked eye you can view thousands upon thousands of stars performing this seemingly coordinated movement.

Ursa Major, a.k.a. the Big Dipper, doesn't "move" across the sky like the other stars we see; instead it revolves around a fixed point, Polaris, the North Star. You should be able to spot Ursa Major in the northern sky anytime after complete dark. Its stars don't appear as bright to us as some others, so too much ambient light tends to wash them out. The two stars that form the edge of the dipper bowl furthest from the handle are markers for locating Polaris. Draw an imaginary line straight outward from them for about five times the distance between them to find Polaris. It seems to be somewhat isolated from other stars, and isn't very bright, but it's there and it sits right over the center of Earth's rotation. If you measure its altitude (angle above a level horizon), that gives your latitude. So, if you're standing at the geographic North Pole, Polaris

would be straight overhead (90 degrees); if you're on the Equator, you can just spot Polaris right on your northern horizon (0 degrees).

So, January may be quiet month in the garden, but there's a lot to see after dark. And, the darker, the better. Best viewing around here, outside of a planetarium, would be from the middle of Jordan Lake. Check out **www.moreheadplanetarium.org** for information about Jordan Lake viewings, planetarium shows and other interesting sky phenomena.

Happy viewing.

MINIATURE HOSTAS

One of the most informative gardening newsletters is "The Green Hill Gossip Jr.," written by Bob Solberg of Green Hill Farm in Chapel Hill.[1] The latest issue discusses miniature hostas, which today constitute a gardening fad. Miniature hostas fall into two groups: (1) those that are genetically miniature; and (2) those that simply aren't good growers. All miniature hostas, as compared to larger hostas, have some shortcomings for the gardener. Their shorter roots demand frequent watering since they are unable to delve as deeply for water as those roots of the larger hostas. The shorter-rooted miniature hostas can also heave out of the soil during the winter, as they are not anchored as sufficiently as their larger kin. To protect the sensitive buds, Solberg recommends extra mulch and compost.

Extra watering in the summer must be accompanied by extra fertilization: "Little hostas need fertilizer every few weeks during the growing season" [5]; along with the extra water and fertilizer they will also profit from having a bit more light—not direct sun as the hot summer sun will cook them. Finally, study up on miniature hostas before purchasing them as some cultivars are poor growers. "The smallest and prettiest are not always the most vigorous" [6]. An example of this is 'Pandora's Box', which is a popular miniature hosta but a poor grower; it might be best to avoid this one. Bob suggests instead of 'Pandora's Box', you might try 'Crumb Cake', 'Tongue Twister', 'Coconut Custard', or 'Baby Blue Eyes' instead.

THE AMERICAN CHESTNUT, PART 11

Starting in 1904 the American chestnut began its long decline. By 1950 it was estimated that only 50-100 American chestnuts remained. Today scientists are concentrating upon the promise of biotechnology in hopes of reviving this American tree. But time is running out as with each passing year fewer and fewer sprouts are appearing. Can this species hang in long enough for deliverance?

How did the blight spread so quickly in the US? Scientists realized early on that the origin of the chestnut blight must be either China or Japan since their chestnuts demonstrated some resistance to the fungus. However, scientists didn't have a clue as to how it spread. Originally they thought the fungus probably spread via the wind. As early as 1914, however, scientists suspected that the blight spread via insects, with the most im-

[1] If you are interested in receiving the newsletter, go to www.Hosta-Hosta.com.

portant insect carriers being the chestnut bast-miner. Birds who inspected the chestnut cankers were also instrumental in spreading the fungus, as were mammals.[2]

Farmers and agricultural scientists have refined the hybridization process for flowers and plants but "breeding trees, especially forest trees is a newer science and…a much more complicated one."[3] The tree hybridizer must wait years to ascertain the results of the union whereas plant hybridizers know in a season or two whether the cross worked out.

Arthur Graves, a Yale-trained botanist, became interested in the American chestnut; starting in 1931 he began to cross breed the American chestnut with Japanese chestnuts in Hamden, CT. Fortunately, the species in the *Castanea* genus will interbreed. Chestnuts produce both male and female flowers but these flowers will not readily self-pollinate while clones and grafted chestnuts will not mate with the parent tree. In order to achieve his cross pollination, Graves wrapped the female flowers from the selected mother tree until they were fertile, whereupon he unwrapped them and drew the male flowers from the father tree across the female flowers. Then he rebagged the female flowers until the time of all possible fertilization had passed, and then rebagged yet again in an effort to protect the nuts from squirrels. For his first mating he chose an American chestnut father tree and a Japanese chestnut mother tree. The results were disappointing as the hybrids lacked the resistance of their mother. Over the next thirty years, Graves cross bred the American chestnut with Japanese and Chinese chestnuts along with native and Asian chinquapins in more than 250 different combinations, at one point even trying to breed the American chestnut with the chestnut oak—all to no avail [1095-1105].

Japanese and Chinese chestnuts are quite different from their American cousins in that they are shorter and less cold resistant: "Blight resistance required Asian genes, yet Asian genes also led to a chestnut that was far removed from the tough, tall classic timber tree that people wanted to bring back. To get the former meant losing the latter, as Graves kept finding over and over again" [1105-16]. Genetics was in its infancy and it would be decades before scientists distinguished the two genes that provided blight resistance.

Alongside the efforts of Arthur Graves was the USDA's encouragement to plant Chinese chestnuts in hopes of finding a few varieties that might fill the vacuum left by the American chestnut—remnants of this program can still be seen in parts of Appalachia. Meanwhile USDA scientists were collaborating with Graves in hopes of finding an Asian-American hybrid, eventually producing 10,000 hybrids in Glendale, MD. At first these hybrids grew quickly—and then they abruptly stopped at 50-60 feet, too short to compete with the oaks and poplars for sunlight. Some showed some blight resistance but when they were bred back to Chinese chestnuts, their offspring displayed less vigorous growth. What the breeders needed was a tree that had the straight-arrow form, the fast growth of the American chestnut combined with blight resistance. While they could produce hybrids that had one or two of these characteristics, none of them had all three—except for one, tagged as B26 and ultimately known as the Clapper tree, named after R.B. Clapper of the USDA who had worked so hard and so long for a perfect American chestnut replacement.

The B26 seedling, a result of a Chinese-American hybrid and an American chestnut, grew in an Illinois test site in 1946; by 1959 the tree was generating much excitement as it was over thirty feet in height—and healthy. By 1963 there were great hopes for this tree that now was seventy feet tall and a foot wide. And then it suc-

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[2] Anagnostakis, Sandra. "The Classical Problem of an Introduced Pathogen, *Mycologia* (Vo. 79, No. 1, Jan-Feb., 1987, pp.26-7.

[3] Freinkel, Susan. *American Chestnut: The Life, Death, and Rebirth of a Perfect Tree* (University of California Press, Berkeley, 2007), 1065-73. Please note that the location numbers refer to the Kindle. Future references will be in brackets [ ].

cumbed to the blight—and by 1976 the main stem was dead, breaking hearts everywhere. By this time, "there was no longer anyone at the USDA chasing the chestnut dream" [1157-69].

The Federal Government was now officially out of the chestnut breeding program but other scientists picked up the dream. Some irradiated chestnut seeds, resulting in "odd-looking" plants. Others continued working on the breeding program started by Arthur Graves in Hamden, CT, extending the program in the Lesesne Forest in the Blue Ridge mountains in Virginia. Scientists now began thinking that a successful outcome could only be achieved through breeding many generations of chestnut hybrids, although many began to think that "breeding for blight resistance was probably a dead end" [1109-1210].

Hope came from a poem written by Robert Frost, entitled "Evil Tendencies Cancelled."[4] Previously scientists had worked on trying to produce a better tree; now they turned their attention on attempting to make the fungus *Cryphonectria parasitica* less lethal. The blight had appeared in Europe in Genoa in the 1930s and many feared that the European chestnuts[5] were following their American cousins towards extinction. But in the 1950s there were signs that the sprouts from dying trees were showing signs of recovery: the trees hadn't changed but the fungus had. The fungal strands were no longer orange but were white and grew far more slowly. It appeared that a virus was attacking the blight. When scientists injected strains of the ailing fungus into the blight cankers on the trees, "the parasite infiltrated the uninfected fungus and the overall infection on the trees slowed down" [1237-48]. This gave the infected tree time to grow tissue around the canker, thereby preventing the fungus from spreading. By inoculating the European chestnuts with the new "hypovirulent" fungus[6], scientists managed to foil *C. parasitica* before it destroyed all the chestnuts.

In 1972 an American scientist, Sandra Anagnostakis, acquired some of the hypovirulent cultures from a French scientist, in hopes that it would help to save the American chestnut. When she injected the hypovirulent fungus into the infected cankers she found that the two strains had joined and that the new growth was hypovirulent [1281-92]. Excitement to save the American chestnut once again arose—with money suddenly becoming available for American chestnut research.

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[4] Will the blight end the chestnut?
The farmers rather guess not.
It keeps smouldering at the roots
And sending up new shoots
Till another parasite
Shall come to end the blight." [1210-15].

[5] The European chestnut, *Castanea sativa*, is not really a native of Europe. The Romans found them growing around the Black Sea and became so enamored of them that they planted them throughout their colonized territories. The blight first hit the European chestnut in Italy near Genoa in 1938. By 1946 it had reached France, followed by Switzerland in 1951 and Turkey in 1967. The blight spread more slowly in Europe than it did in the US because European chestnuts demonstrated slightly more resistance than did the American chestnut, *C. dentata.* Anagnostakis, p. 26.

[6] "Hypovirulence is a disease, or a group of diseases of the fungus *C. parasitica*, that reduces its ability to kill susceptible chestnut tree hosts." Anagnostakis, p. 28.

There were many questions about this virus, which presumably had arisen in Asia where the blight came from. Why had it appeared in Europe but not in America? Could there possibly be a hypovirulent virus

Picture courtesy of Rick Fisher

in America that had gone unnoticed?

In Rockford, MI, a cross country skier found a small patch of chestnuts that had unusual blight cankers. She sent samples to Anagnostakis who found that they were hypovirulent, but this was not the same hypovirus that existed in Europe. Further discovery showed that there were between 600-800 American chestnuts in the Lower Peninsula that appeared to be surviving in spite of the blight. For various reasons these chestnuts had never been cut down at the time Michigan was urging that all chestnut trees be cut in an effort to stop the spread of the blight.

A recovering canker is not an object of beauty—in fact they look ugly with their swollen and broken bark. Michigan is the only site where hypovirulence has occurred naturally. Alas, many of these Michigan American chestnuts exist no longer as developers have covered the land with houses. The state of Michigan did not appreciate what it had.

There is a downside to the hypovirulent virus. Chestnuts planted in 1978 and inoculated with the virus are still alive but "they are a far cry from the thick, imposing towers of wood that fans of the tree have in mind when they talk about chestnut restoration. Many of them look more like bushes than trees; their main stems have died back and been replaced by multiple prongs of skinny sprouts. The best of the bunch are scraggly, limby specimens, averaging no more than thirty-five feet tall" [1329-40]. However, these trees flower and produce nuts. On the negative side, hypovirulence has failed to spread on its own from tree to tree as it did in Europe so we can save an orchard but can do nothing for the millions of forest acres with their sprouting American chestnuts.

Today we know that there are four hypoviruses: (1) CHV_1, which shuts the fungus down; (2) CHV_1-$Euro_7$, which, while slowing the fungus, does not stop it; (3) CHV_3, the Michigan strain, which falls somewhere in be-

tween CHV$_1$ and CHV$_1$-Euro$_7$ in effectiveness; and (4) CHV$_4$, a hypovirus found in Appalachia, which has no effect on the fungus. Complicating the picture is the nature of *Cryphonectria parasitica* itself as there are almost 200 strains of this fungus. The hypovirus can only spread if strains of the fungus and virus are compatible. If two distantly related strains come together nothing happens.

Slowly there was now a recognition that hypoviruses work—but only to a point. The tree has to help and some American chestnuts benefit more from this treatment than do others. Anagnostakis and Dennis Fullbright, a plant pathologist at Michigan State University, reached the same conclusion independently: some American chestnuts demonstrate more genetic resistance to the blight than do others. So far no American chestnut has shown resistance without hypovirulent help but there is no question that there is fungal resistance in some trees. Scientists were divided as to whether hypovirulence was the answer to saving the American chestnut. Sandra Anagnostakis felt that it could work if coupled with an effort to breed blight-resistant trees [1432-40].

To be continued.

TIDBITS

LL: In response to the article on the difficulties of gardening with dogs:

With a little ingenuity and an invisible fence, it is easy to have both dogs and gardens. Whether or not you use the invisible fencing as your perimeter fencing to keep the dog in, the wire can be used to keep the dog out of the gardens. Twisting the wires, which cancels the signal, allows you to loop off islands within your dog's area. Laying the wire on the surface, hidden only by mulch, allows for easy configuration changes, and also simplifies locating and repairing breaks if the wire is inadvertently cut. You do need to use flags to let Fido know which areas are off-limits, but once the training is complete the flags can be removed, and you can have your dog and garden too.

KF: Invisible fencing works beautifully for a lot of breeds but many terriers will brave the shock in order to get freedom. An invisible fence will NOT contain Border Terriers, for example, but it works beautifully for Labrador Retrievers. You just have to do research and know your breed.

LN: The garden I left behind fifteen years ago in Michigan is asleep under a blanket of snow. That is not to say gardening was put aside till spring, not so. January's nursery catalogues with endless possibilities followed December's Christmas cards. Over the next few months I'd settle on the year's selections culled from dog-eared catalogue pages, after revising lists and diagrams many times. Winter rewarded me with a break from actual gardening chores. In their place was the chance to rest and dream in color and smell the scent of the flowers yet to come.

GC: "Trees in the Urban Landscape" Presentation

Editor: I asked GC to write up what it was like to give a presentation at Duke Gardens for the Extension Garden Seminar Series. These are fun to do and hopefully this article will encourage other EMGVs to volunteer.

Collaborating with LMD and Michelle Wallace on both developing and presenting "Trees in the Urban Landscape" at the Doris Duke Center last November was a rewarding learning experience, one I would like to share with my fellow EMGVs.

Having retired from corporate life several years ago, the thought of preparing and giving a presentation offered me little appeal. Giving presentation at all levels at Texas Instruments was part of our communication fabric within the organization, so after thirty-seven TI years I was looking forward to a life without presentations—that is until the Speakers Bureau knocked.

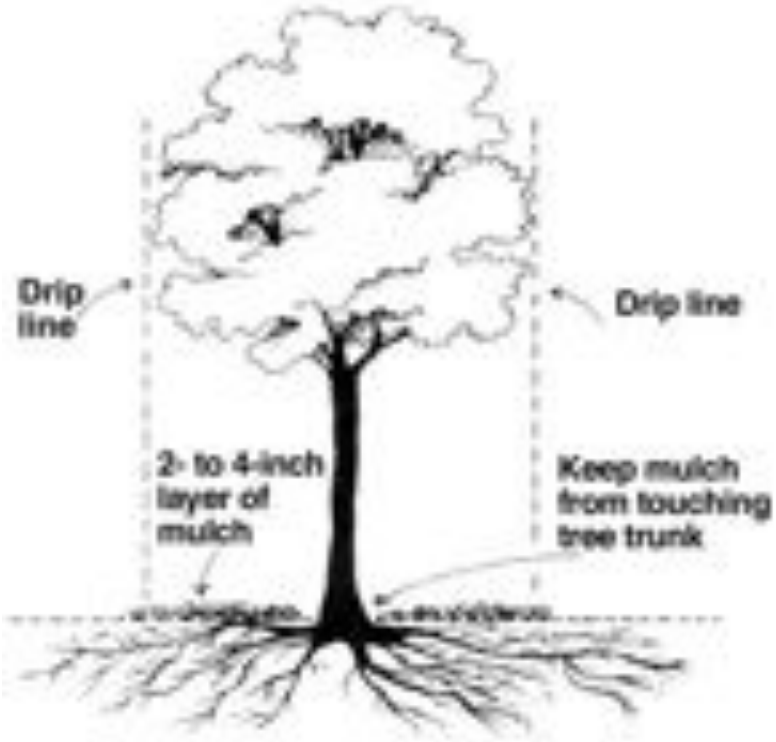
I figured what the heck, it's a different topic, there is less time pressure, and my career isn't on the line so I'll agree to do one. Consequently I accepted LMD's request to collaborate with her on putting together a new presentation the EMGVs' Extension Gardener Series for November 21, 2010. Michelle identified "Trees in the Urban Landscape" as a new topic that would be good both for Extension Gardener Series and for our Speakers Bureau library. This was in March and while I was a bit apprehensive since I was neither a tree nor a PowerPoint expert, I felt we had plenty of time to pull it together.

Because I am not a procrastinator and was still fresh with corporate technique on putting presentations together, I asked Michelle to give us an "objective statement" on what she would like us to accomplish with this presentation in mid-March. The next day she gave us several sentences that clearly and concisely provided the framework for the talk, which was exactly what we needed to get started. An outline came next—and now it was time to gather some information on trees.

Working ten shifts in the EMGV office from March to November, I utilized the available time to work on the presentation. There are several advantages to melding office time and a presentation project: (1) there is the availability of information in the EMGV office; (2) this is a good use of office downtime; and (3) there is access to Michelle for consultation.

Our field trip to Elon gave me ideas as to which trees to include while Michelle identified additional trees she felt would be good to include. And this is where some of the fun of making a presentation occurs for I gained insight from Michelle as to which trees in the landscape were overused, which trees were underutilized, accompanied by landscape design tips on how to use trees. Michelle also gave me some PowerPoint tips that were beneficial.

The Internet is a remarkable tool. With a few keystrokes and clicks of the mouse, we can easily obtain an abundance of research-based information and photographs. The EMGV office resources provided additional information selecting, planting, and locating trees properly in the landscape. Gradually the talk was coming together.



In early September LMD and I scheduled a meeting to review our progress and it was then that we made a deal to divide and conquer. She agreed to focus on the part of the presentation that dealt with location, selection, planting, and the watch-outs, while I decided to concentrate on the trees to consider in the large, small, understory, specimen, screen, and multi-season categories. This ingredient of collaboration—the division of responsibility with knowledge that the work will be done—is what makes this fun and not a burden.

Throughout October I finalized the tree list, developed the slides, inserted photographs onto slides, and included the notes on each slide that we would use during the talk. The insertion of notes is important because it captures the presenter's talking points, enabling others to give the talk in the future.

Now it was time for Michelle to have a look. I gave her the tree file along with the freedom to edit and "jazz it up" as she saw fit. Michelle worked her magic by adding a beautiful color background to the slides while ensuring that my scientific names were correct. At the same time she used the JC Raulston Arboretum online photographic library to improve many of the pictures on my slides. Again, this was collaboration at its best.

Meanwhile LMD was working on her part while traveling halfway around the world: China in October and London in November. She is good, very, very good. She e-mailed a file to both Michelle and me indicating where we should insert my part. We agreed through e-mail exchange that I would bring copies of the presentation and handouts, the "thumb drive" with the presentation file, while she would bring the visual aids. We met thirty minutes before the presentation on Sunday, November 21. At 2:00 PM we were ready.

LMD's visual aids were outstanding. She got the audience immediately engaged with the question, "Why plant trees?" She included beautiful photographs and thought provoking quotes. With Michelle's help, my tree slides hopefully provided the audience with some new ideas. We finished our presentation within our two-hour schedule, which is remarkable considering the talk consisted of two parts by three people in different loca-

tions—and without a dry run.

For me personally, this was a most enjoyable experience, both from the standpoint of learning the material and the positive results the collaboration achieved. You can see the entire presentation on the Intranet.

ST: MISTLETOE MAGIC

Long, long ago in a faraway land, a festive holiday ball called "Mistletoe Magic" was held. Somewhere inside a dust-covered trunk, my souvenir ticket from "Mistletoe Magic," now dog-eared and very faded, is saved with various other memorabilia. What does this have to do with being an Extension Master Gardener Volunteer, you might ask? Sometimes you come across a plant that is so interesting you just have to learn more about it. While decking the halls in preparation for "Mistletoe Magic," I became intrigued with the unique little plant known as mistletoe. This fascination has continued and now, as an EMGV, I can certainly justify learning more. Who knows—someone may call the office and ask questions like "If this is a plant, then why is growing on another plant instead of in soil?" or "Why is it still green up in the tree branches when the tree's leaves have fallen off?" Not inconceivable since we EMGVs have been given the heads-up early on in our training about such anomalies as that flaky, grey-green stuff growing on trees (read lichens) or unattractive globs sprouting on mulch (read slime molds).

Anyway, back to mistletoe or, more properly, mistletoes. There is a wealth of interesting folklore about mistletoes and a fair amount of botanical information as well. The latter requires a little navigating, however. There are references to "Christmas mistletoe," "true mistletoe," "broadleaf mistletoe," "dwarf mistletoe," "Old World mistletoe," "New World mistletoe," etc. But it doesn't take too long to figure out that the leathery-leaved, white-berried plant we associate with Yuletide cheer is most likely *Viscum album* in Great Britain ("Old World") or *Phoradendron serotinum* here in the eastern US ("New World"). These broadleaf, evergreen, true Christmas mistletoes are a small subset of the 200 recognized mistletoe genera that are classified in four different plant families in the Sandalwood order (*Santalales*). Mistletoes are a diverse group of parasitic flowering plants that are predominately found in tropical and subtropical regions. Common to all mistletoes is the ability to exploit the aerial portions of woody plants as substrates for growth as well as for other essential functions. Mistletoes have developed specialized root-like structures called *haustoria*, which allow them to penetrate the tissues of host shrubs or trees to extract water and nutrients.

Mistletoes have other useful adaptations, too. Although the flowers on mistletoes are inconspicuous, the globular berries appearing in late fall or early winter are noteworthy and very attractive to a number of bird species. The berries of *Viscum, Phoradendron* and other members of the Christmas mistletoe family (*Viscaceae*) contain a sticky substance, viscin. Viscin is important in the dispersal of seeds to new woody surfaces since it helps adhere seeds to bird beaks and wings. Additionally, the seeds in ingested berries are still sticky when voided and these may ultimately develop into new plants not far from the parent location. The relationship between birds and mistletoe is well-recognized and has been depicted in numerous artistic renderings. For example, years ago *P. serotinum*, then the state floral emblem for Oklahoma, appeared on the US commemorative stamp with the scissor-tailed flycatcher.

There are documented examples of host specificity in the literature as well as information on the distribution of mistletoe in the US. *Phoradendron* species are found in our country's central and southern tiers, but do not extend into the northern reaches. *P. serotinum* is common in the southeast and has been reported to grow on over 100 species of hardwoods, although it may be locally restricted to a particular host species. That doesn't seem to be the case in my yard and immediate environs as mistletoe clusters inhabit shagbark hickory, white

ash and honey locust (admittedly, it is difficult to see how similar these specimens are at 30-50 feet above the ground!). There are also *Phoradendron* species, which infect conifers, growing exclusively on types of juniper, cypress, cedar and fir, but only in the western states.

Returning to the parasitic nature of mistletoes, how much damage is typically done to the host? With the genus *Phoradendron*, for example, it may be inconsequential depending upon the species, the extent of infestation and the health of the host tree or shrub. Mistletoes are slow-growing so it takes many infections and years to injure a healthy tree. Drought conditions, however, may accelerate the process because mistletoe plants draw a fair amount of water from their hosts. *Phoradendron* contains chlorophyll and is actively photosynthetic once the vegetative parts have developed; it does not necessarily depend on its host for organic nutrients. In fact, it has been suggested that this mistletoe plant may be supplying deciduous hosts with photosynthetic products during winter months. What about controlling unwanted outgrowths? In a forest situation, eradicating *Phoradendron* may be difficult, but the homeowner with only a few impacted trees has some options. Suggestions include pruning of infected limbs and planting replacement trees that are resistant to colonization. Although chemical control through the use of herbicides is practiced, it has had limited success and is expensive.

Some researchers, however, consider mistletoe infestations to be not merely parasitic, but actually pathogenic in nature, particularly if there is a negative impact to a host plant cultivated by humans. This contention is clearly supported with regard to another member of *Viscaceae*, the dwarf mistletoe genus *Arceuthobium*, which parasitizes conifers. In the western US, *Arceuthobium* species are responsible for severe and widespread infestations of members of the Pine family (*Pinaceae*) resulting in the destruction of commercially valuable timber crops. Consequently, dwarf mistletoes have been extensively studied and remain a key area of research conducted at Forest Service field stations in the west. Dwarf mistletoes do not resemble their leafy relatives. They are diminutive in size and are among the smallest dicotyledonous plants. Leaves are reduced to scales and these plants may appear red, yellow, brown or even black in color. As adult plants, they produce very little of their own food. Generally, their seeds are not dispersed by birds, but by an internal hydrostatic mechanism that may propel seeds several meters.

Parasitism and pathogenicity are strong terms. These create an impression that mistletoe infestations may contribute to the decline of natural habitats. However, there has been a recent shift in perspective to reevaluate the ecological significance of selected mistletoes and to acknowledge their positive contributions as sources of food and habitat for wildlife. There is much information about these understated plants that we have left to learn and to consider regarding how they fit into nature's overall balance sheet.

As they holidays approach, I will continue thinking about mistletoe and making observations of nearby specimens. Even though I now understand some of the science, the unknowns coupled with traditions and folklore will still keep mistletoe magical to me.

SOURCES of INFORMATION

www.aspnet.org/education/IntroPlantPath/PathogenGroups/Parasiticplants/Viscaceae
www.hiltonpond.org/Thisweek051208.html
www.ipm.ucdavis.edu/pestnotes7437/mistletoe
www.parasiticplants.siu.edu/Viscaceae/mistletoe.control.html
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