

In the shade



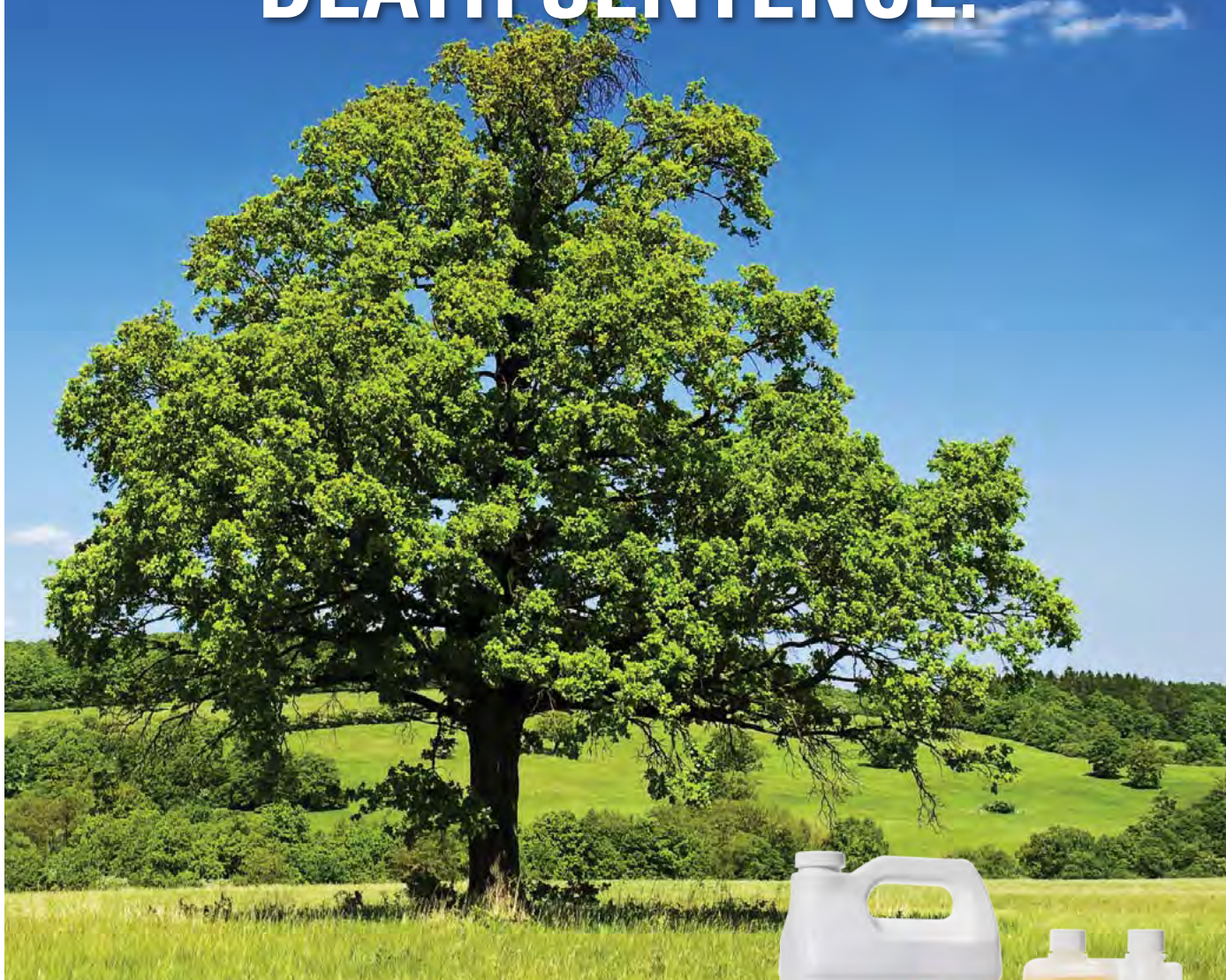
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P.3

NEWSLETTER OF THE ISA TEXAS CHAPTER

Vol. 39, No. 3

September, 2015

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In the Shade

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Podcasts: Trees Are Key from Paul Johnson

Easy on the ears, good for your brain



Trees are Key with our own Texas A&M forester Paul Johnson will help listeners take better care of their trees. This weekly podcast features a short lesson, a weekly tree highlight and upcoming tree-related events around the state.

Like ISAT on Facebook (<https://www.facebook.com/ISATexas>) to get your weekly *Trees are Key* update. Or find it on the TFS website: <https://tfsweb.tamu.edu/podcasts/treesarekey/>

Texas Chapter ISA Wins Award

ISA Texas was recognized with the Urban and Community Forestry Partnership Award by the U&CF Committee of the Southern Group of State Foresters in San Antonio. ISAT is proud of over 30 years of partnering with the Texas A&M Forest Service to serve the people and trees of Texas. Thanks!

Texas Tree License Plate Contest

Show what drives you!

Send us a picture of you with your Texas tree license plate to be entered into a drawing for a prize at the Texas Tree Conference in October. Send your pic to John Giedraitis at jpg@isatexas.com

More information at isatexas.com/Members/Tree_License_Plate.htm



ON THE COVER

Sometimes the urban forest isn't very urban. When collecting data at predetermined sampling points, Urban FIA crews walk where they must, and don't necessarily know if they will end up in a swamp or an HEB parking lot.

In this month's cover photo TFS forester Trevor Dobell-Carlsson (l) and TFS resource specialist Aaron Mcneil are heading to their sampling point at Houston's Barker Reservoir, as part of an Urban Forest Inventory Analysis conducted by the Texas A&M Forest Service.

The collected data will allow TFS to describe the condition of the trees within the city, as well as their contribution to air quality, pollution absorption and storage of carbon, contribution to privacy, reductions in energy use, and added property value.

Photo by Mickey Merritt

SAVE THE DATE

2015 Texas Tree Pest Seminars

September 9, Dallas, and September 10, Houston

What's bugging the trees in your area? Join ArborJet for a free seminar and hear from experts in the field. Lunch will be provided and CEU opportunities are available. For links to more information on both seminars go to isatexas.com Please RSVP by **September 4** to emuennink@arborjet.com

Deadline to Register Posters for 36th Annual Texas Tree Conference

September 11

Register now to display your poster at ISAT's first-ever poster session. No need to submit a physical poster at this time. **Poster setup will be September 30 at the TTC in Waco.** For poster session hours, recommended formatting instructions, and other details, go to http://www.isatexas.com/Members/Conference/2015/2015_Texas_Tree_Conference.htm and click on the poster session link. Or contact Matt Churches at Matthew.Churches@centerpointenergy.com



North American Tree Climbing Championship/Educational Workshops

September 18-20, Longmont, CO

NATCC will be held September 19–20. Climbing and safety workshops will be hosted by Society of Commercial Arborists September 18–20. Friday: understanding the Z133 safety standard with Dr. John Ball and Tim Walsh, \$45 registration fee. Saturday: chipper inspection, free. Sunday: advanced climber clinic, free. Visit <http://www.itcc-isa.com/events/regional/natcc/scheduleofevents.aspx> for updated information.

Certification Exams

October 2, Waco, October 16, San Antonio

Certified Arborist, Municipal, and Utility exams. For details contact Misti (Beirne) Perez, 512-965-1076.

51st Annual SMA/PCF Conference

November 17-19, Denver, CO

The Society of Municipal Arborists and the Partners in Community Forestry join forces again this year for a shared conference in Denver. SMA will hold its conference November 17, immediately preceding the PCF conference November 18-19. Register at: <http://www.arborday.org/programs/pcf/partnering-event-sma.cfm>

The Arbor Day Foundation is happy to once again support two registration scholarships to attend the 2015 Partners in Community Forestry Conference. For more information, contact our state U&CF coordinator Paul Johnson, pjohnson@tfs.tamu.edu



2016 International Tree Climbing Competition

April 2-3, 2016, San Antonio

In addition to the competition, next year's ITCC will offer educational opportunities with demonstrations of safety and best practices, industry vendors, and many activities to engage the public, creating an exciting event for everyone who will participate. More information: <http://www.itcc-isa.com/home.aspx>



2016 International Tree Conference and Trade Show

August 13-17, 2016, Fort Worth

ISA's Annual International Conference and Trade Show is the world's premier gathering of arboricultural professionals, and it's coming to Texas next year. Thanks to all the Texas Chapter members who voted in the 2016 logo design survey! See the centerfold announcement from the August *Arborist News*:

http://www.isatexas.com/Members/Conference/2016/2016_Fort_Worth_ITC.htm

Deadline for submitting proposals for presentations: December 4, 2015.

See http://www.isa-arbor.com/events/resources/events_Conference_2016Call-for-presentations.pdf

And see article on page 13.

YOU CAN HELP OUT AT THE TEXAS TREE CONFERENCE

Call for TTC Volunteers

Please go to the Tree-nectivity signup sheet at <https://www.volunteersignup.org/HYRQR> and just follow the instructions. It only takes a few seconds to do. Thank you for volunteering. *– Kelly Eby*

Call for TTC Auction Items

ISAT is seeking large and small items of interest to tree professionals—anything from a gift certificate for your services to artwork, maybe a tree from your operation or a round of golf at your home course. Perhaps your spouse, friend or relative owns a business that would donate a prize. Does your city tourism board have a gift package that spotlights your city or the local college? Do you have any awesome things laying around your house that a fellow tree person would love to bid on—like rare tree books, tree knick knacks, or tree art? Small items are OK; we can put them together with other items to make a great package.

The conference is September 30 through October 2 and we would like to have confirmation of items by the week of September 24. Please contact ISAT board member Terry Kirkland at 432-685-5512 or TKirkland@midland.edu if you have ideas or items available for the auction.

Call for Photos for TTC Tree Geek Slideshow

What's the weirdest tree related thing you've seen this year? Did you get a photo of it? Share your interesting images and offbeat pics with your fellow tree geeks at this year's Texas Tree Conference. A slideshow will be put together for all to enjoy during the conference.

Photo quality should be at least 300 dpi. Size: 3–4 MB. Include photo credits and a short description.

Email images directly to isatphotos@gmail.com
OR upload to Flickr at
<https://www.flickr.com/groups/2815857@N21/>

Deadline for slideshow: September 22. For more information on how to submit photos go to isatexas.com

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Fort Davis Historic Cottonwood Grove

About 13 years ago, ISA Texas, at the suggestion of Oscar Mestas and James Tuttle, sent Pat Wentworth and Kevin Bassett to Fort Davis to do a site analysis and hazard evaluation of what was left of a historic grove of cottonwood trees that pre-dated the fort. At one time, the large trees numbered in excess of 150 trees. Over the years, many have been lost to drought and neglect.

A year later the National Park Service put out to bid the pruning and removal portion of the work. Tree Loving Care was awarded the contract and has been caring for the trees in the grove as well as other trees on the fort for eight years. Cables were installed in some of the trees, although the National Park Service has not had lightning protection installed, as was recommended. Tree Loving Care was allowed to prune some of the smaller trees—ones that someday may rival or replace the older, larger trees.

The largest of these older trees is the reigning Texas Champion Rio Grande Cottonwood. It achieved this status after the National Champion (about 5 miles down Limpia Creek) was lost in the Rock House fire about four years ago. This specimen is about 250+ years old and in decline. In March, 2013, a 6-foot co-dominant limb fell. This exposed what was long expected: that the tree was hollow.

Arborists from Tree Loving Care cut a slice of the fallen limb. This slab has been sanded, sealed, and will be hung on display with a plaque explaining the history of the grove.

A few months ago, representatives for the National Park Service home office visited Fort Davis to be briefed on their tree preservation program. They may use this program as a model for the entire system.

—James Tuttle

FASCINATING ARTICLE ON THE VALUE OF TREES

See the *New Yorker* article, “How Trees Calm Us Down” by Alex Hutchinson at <http://www.newyorker.com/tech/elements/what-is-a-tree-worth>



Growing Furniture

Full Grown, an unusual company based in the UK, grows living trees directly into the shape of chairs, tables, lamps, and mirrors. When grown, the furniture is harvested and only needs some seasoning and finishing.

Video at <https://www.youtube.com/watch?v=1vq4FKyQhSk>



More information at the company's website: <http://fullgrown.co.uk>

A Trip to Wayne's Chainsaw Museum

An article by David Frane at *Tools of the Trade* describes a trip to Wayne's Chainsaw Museum, a place chock full of rare, unusual and weird machines. See the article—and a slideshow of chainsaw nostalgia—at: http://www.toolsofthetrade.net/outdoor-power-equipment/a-trip-to-the-chainsaw-museum_o.aspx?



Meet the ISAT Board: **Jim Carse**



ISAT board member and past president Jim Carse is an urban forester at the University of Texas at Austin. A forest management graduate of Colorado State University, Jim has worked in private tree care and consulting, and also served as an urban forester for the Texas A&M Forest Service and the City of Round Rock.

"I've worked from the bottom up in the tree care industry," says Jim. "My experience with state and local government has given me a wealth of knowledge about community forestry and collaboration on various projects."

Jim's most important professional priorities are:

1. Soil remediation and root zone improvement for urban trees.
2. Urban wood repurposing.
3. Geosystem services regarding urban trees.
4. Public education.

Looking ahead, he is concerned about uncertainty regarding tree preservation ordinances, especially in Texas. He'd like to see an increase in professionalism and a better understanding of the ecosystem services from trees. He'd also like to see ISAT do more public outreach on tree care and collaborate more with the landscape design industry.

"... and let's throw a great 2016 conference in Fort Worth."



What's
bugging
you?

Take a short survey to help the Texas A&M Forest Service

We need your help! Please take a minute to answer seven questions that can help the Texas A&M Forest Service expand its research and technology transfer efforts to urban trees. TFS needs Texas arborists to identify current and future threats to our trees. The results of this survey will be used to establish research priorities. Link to survey:

<http://survey.constantcontact.com/survey/a07eb8s82dyibs0hdcb/a00qid64s9hz/questions>



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The Black Twig Borer

Poses a Threat in East Texas Trees

by Ronald Billings and John Warner, Texas A&M Forest Service

The forests of East Texas are attracting a variety of invasive pests. Laurel wilt, carried by the redbay ambrosia beetle, was recently detected in Hardin and Jasper counties. And the emerald ash borer, discovered last year in northern Louisiana, is knocking on the door, if not already here. Another pest from Asia, the black twig borer, has been here since at least the mid-1980s, but the damage it causes is just now becoming noticeable.

The black twig borer, with the scientific name *Xylosandrus compactus*, is a tiny ambrosia beetle barely 1/16 inch long. It bores into the thin twigs of over 220 trees and shrubs, including southern magnolia, grape, sweetgum, pecan, dogwood, water oak, red maple, redbud, grape and many other plants. Seemingly healthy trees are attacked. The first evidence of an infestation is a condition known as “flagging,” where scattered twigs throughout the tree’s crown wilt and die (see photos). Close examination of the dead twigs will reveal minute, circular

holes (1/32 inch in diameter), usually on the underside of the dead twig. The adult beetles introduce a fungus which causes a black staining of the sapwood. Females begin laying eggs within the infested twig from spring through fall. The larvae or grubs hatching from the eggs feed on the white fungal “ambrosia” and also on the pith (center) of the twig. Pupation and mating of brood adults occurs within the infested twigs. The insects overwinter as adults, emerging through the entrance

Adult male (left) and female black twig borers. (Photo courtesy North Carolina State University)



holes of the parent beetles and attacking trees most commonly in the spring when dogwoods bloom.

Curiously, males are unable to fly; they mate with females in the twig in which they were reared. Unmated females produce only male offspring. Studies at North Carolina State University have revealed that branches up to 7/8 inch may be infested with as many as 20 females. Fortunately, infestations of the black twig borer do not kill large, established trees, but cause unsightly damage to the crowns, of concern particularly on ornamental trees. Borer infestations may cause more serious damage or death to young or

Photo at top:
Tiny entrance holes
(1/32 inch in diameter)
of black twig borer and
associated staining of
magnolia twig.
(Photo by Ron Billings)



Dead twigs on a southern magnolia infested by black twig borers, Jones State Forest. (Photo by Ron Billings)



Wilting of southern magnolia leaves, usually the first symptom of black twig borer attacks. (Photo taken by John Warner in northern Montgomery County)

◀ recently transplanted trees and shrubs. Light infestations in forest situations often go unnoticed and require no control. Wilting usually occurs just weeks after initial attack.

The black twig borer was first introduced into Florida from Asia in 1941. The beetle has been collected in traps in East Texas since at least 1987, as far south as Rockport. A current infestation on the

Jones State Forest near Conroe has been observed in magnolia, red maple, black and sweetgum, red bay, white oak, water oak and other species. Symptoms of black twig borer infestations also have been noted this year near Orange, Beaumont, and Lufkin.

The preferred control on high-value ornamental trees is to prune out and

destroy infested twigs. Flagged branches should be severed three to four inches above the pinhole (beetle entrance hole). Mulching, avoiding over-fertilization, watering during dry spells, and other practices to enhance tree health will make the trees less likely to be attacked. Chemical control using topical insecticide sprays is not recommended nor usually very effective. ■



It's a buggy year all over the state...

Elm leaf beetles are feasting on trees in Dumas *by Steve Ramos*

This article originally appeared July 29 in the Moore County Journal.

Some Dumas sidewalks and lawns look like fall is already here with the number of elm leaves covering them. But it's not the onset of an early autumn that's causing the trees to lose their leaves, it's an insect, and they're attacking trees all over the city.

"The elm leaf beetle has been here ever since the elm trees were planted, but all the rain we've had has made their population explode," said Brian Scott, Staff Forester II with Texas A&M Forest Service. "They're taking full advantage of all this new growth."

Scott said the beetles don't carry or transmit any known tree diseases, but Dumas' elm trees are at risk because many of them, especially the older ones, have been weakened and stressed by the drought. The beetles select those trees because they aren't as equipped to fend off the beetle attack like younger, healthier ones can.

"It is hitting the older trees harder, and if people value their trees, they need to be treated," Scott said. "The older trees especially need a little TLC."

The trees losing their leaves aren't diseased, Scott said; they're suffering from an insect attack, and owners can treat it with a solution that contains imidicloprid, a systemic insecticide, which acts as an insect neurotoxin. The local farm stores sell the product, and it's easy to apply. "You use a basal drench, which is a fancy word for soaking the base of the tree,"

Scott said. "You build a small berm around the base of the tree and then pour the solution."

Left untreated, the beetles will continue to feast on the leaves, depriving the trees of the ability to create the nutrients they need to get through the winter. Added to the stress from the drought, the beetles could shorten the lives of the stricken trees. The beetles will hibernate through the winter and then emerge when the trees put out leaves in the spring, continuing their feeding cycle.

"With all this rain, the elm trees are putting out second and third flushes, giving the insects more to eat," Scott said. "If you value your elm trees, I wouldn't wait to treat them."

Care must be taken to protect pets when applying the solution because it's toxic to them, Scott said.



The larva phase of the elm leaf beetle is shown in proportion to a little finger. Photo Courtesy Brian Scott, Staff Forester II with Texas A&M Forest Service.

Here's a link to the original article, where you can view a video to see how to apply the solution to eradicate the beetles:

<http://www.moorecountyjournal.com/beetles-feasting-on-dumas-elm-trees/> ■

Ambrosia Beetles May Attack Plastic Gas Cans

Reprinted with permission from the June 2015 issue of P.E.S.T. Newsletter, published by the Forest Pest Management Cooperative.

When gasoline is diluted with ethanol, the product may be attractive to certain species of ambrosia beetles. If the gasoline-ethanol mix is stored in plastic containers, the beetles may bore holes through the containers in response to the ethanol volatiles.

In recent years, two Asian ambrosia beetles have been identified having this curious habit. In 2011, LSU entomologists Chris Carlton and Victoria Bayless reported that females of the introduced camphor shothole borer (*Cnestus mutilates*) were found boring into plastic gasoline containers in Louisiana. This beetle also has been detected in traps deployed in Mississippi (2004), Texas and Georgia (2009). Another Asian ambrosia beetle, *Xylosandrus crassiusculus*, has been observed causing similar damage.

Accordingly, if your plastic gasoline containers begin to leak fluids through 1/16-inch round holes, exotic ambrosia beetles responding to ethanol vapors contained within the gas may be responsible. ■



...and yes, here are some more bugs.

Laurel wilt detected in Southeast Texas

Reprinted with permission from the June 2015 issue of P.E.S.T. Newsletter, published by the Forest Pest Management Cooperative.

Laurel wilt is a vascular disease caused by the fungus *Raffaelea lauricola*, which is transmitted by the invasive redbay ambrosia beetle, *Xyleborus glabratus*. The disease affects and kills members of the laurel family, including principally redbay, but also sassafras and avocado. The redbay ambrosia beetle was detected for the first time in Savannah, GA in spring 2002. The beetle likely entered the country in solid wood packing material with cargo that was imported at Port Wentworth. Laurel wilt has been found since then in South Carolina, North Carolina, Mississippi, Alabama, Georgia, and notably in Florida, where commercial avocado groves are threatened. Large numbers of redbay, and to a lesser extent sassafras trees, of all diameters have been killed as the insect and disease complex has spread.

This spring, dying redbay trees, infected

with laurel wilt fungus, were detected by a U. S. Forest Service pathologist in Hardin County, Texas and the red bay ambrosia beetle was trapped in the same vicinity shortly thereafter. Currently, the disease has been found in southeast Texas only in Hardin and Jasper counties, but it may well be more widely spread.

Signs and symptoms of laurel wilt are easy to recognize and include discolored foliage and staining of the sapwood (see photos). Often, noodle-like exudations of sawdust are visible where the small ambrosia beetles penetrate the wood. Anyone observing dying or dead redbay or sassafras trees with these characteristics should notify the nearest Texas A&M Forest Service office or Regional Forest Health Specialist Allen Smith (lasmith@tfs.tamu.edu).

Avoid transporting the disease over long distances by not moving redbay firewood that may be infected. The fungicide propiconazole has shown some efficacy as a preventive measure for laurel wilt in redbay trees. ■

Walnut caterpillars

by Boone Holladay, Texas A&M AgriLife Extension. Reprinted with permission from the June 2015 issue of P.E.S.T. Newsletter.

The record rains received this spring in East Texas have led to outbreaks of various defoliating insects. One common pest, particularly in commercial pecan orchards, is the walnut caterpillar, *Datana integerrima*. The larvae of this insect feed only on trees in the walnut family, which includes the pecans, hickories, and walnuts. Egg masses containing several hundred eggs are laid on the undersides of leaflets (Fig. 1).

Resembling bicycle reflectors, the white, dime-sized egg clusters are free of any covering and can be detected at night by growers using a spotlight. When the reddish larvae (Fig.

2) hatch, they feed on leaves, starting at the top of the canopy. As the caterpillars mature, they move down to the trunk to molt in clusters. These aggregations can be easily detected and treated if

necessary. The safest product for full canopy spray are products containing the bacterium *Bacillus thuringiensis* (Bt or Btk), sold as Foray®, Dipel® or Thuricide®. For control of clusters of caterpillars found on trunks, wettable Sevin™ (carbaryl), oil sprays or soapy water can be used to completely saturate and kill the caterpillars. As with most defoliated trees, the loss of foliage is usually temporary and defoliating insects seldom warrant control on shade or forest trees. ■



Figure 1: Egg mass of walnut caterpillar on underside of leaf.

US Forest Service photo



Figure 2: Cluster of walnut caterpillars.

Texas A&M Extension Service photo



Red foliage and epicormic shoots on redbay, coupled with stained sapwood, are characteristic symptoms of infection by laurel wilt. (Photos by Ron Billings)

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Locating Where to Plant Trees in Austin

by Alan Halter, Forester, City of Austin

The City of Austin plants thousands of trees annually through annual park planting events and various tree planting programs such as the NeighborWoods program. For many years, tree planting in Austin occurred in response to citizen requests and local knowledge of low canopied areas. This approach landed trees in the ground, but it was never a comprehensive planning effort.

In 2014, the City of Austin created a plan to prioritize tree planting such that citizens reaped the most benefits in areas where those benefits were most needed. The plan uses Geographic Information Systems (GIS) and local datasets to identify and prioritize which census tracts are in highest need of tree plantings.

Prioritization is based on the following eight categories:

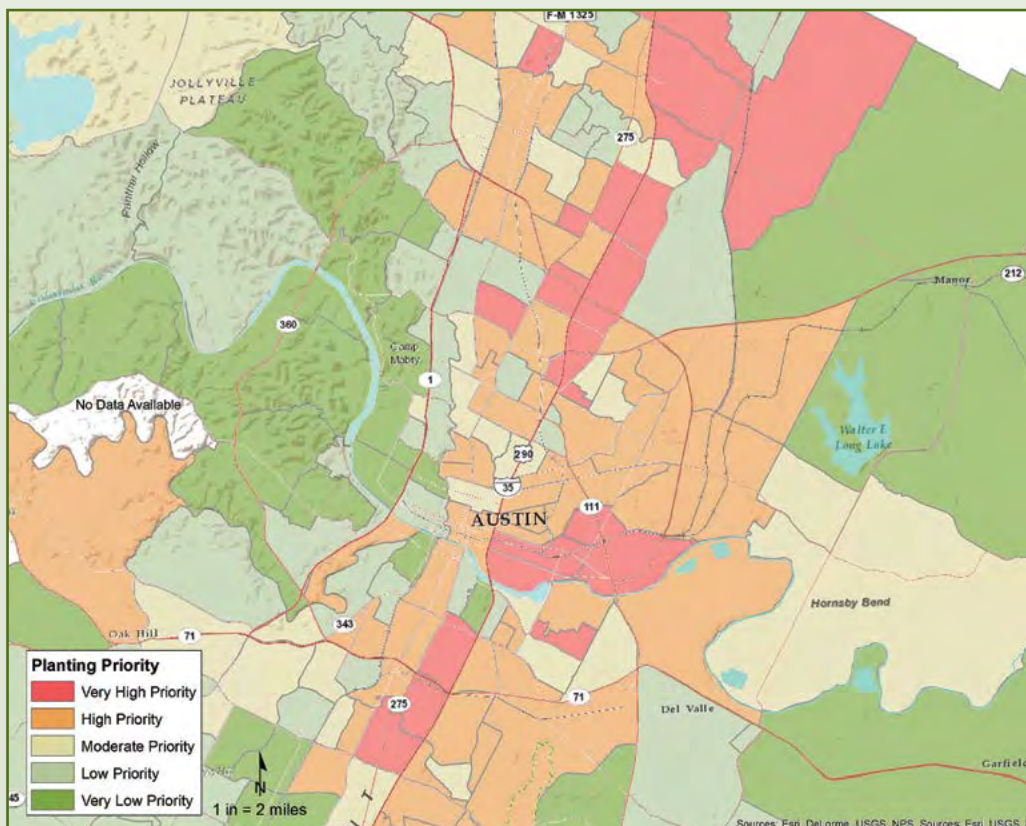
- public health and safety
- air quality
- environmental justice
- water quality
- critical places
- forest replenishment
- forest preservation and development impacts
- urban heat island

Within these categories, 31 different “planting factors” were determined, based on support from academic research. Planting factors include things like:

- existing tree canopy cover
- crime rates
- population density
- surface temperature
- proximity to schools

Planting factors were assigned values, and were used to determine a priority score for each census tract. Parks and other public spaces were then chosen for planting based on their priority score, public demand, city council districts, and local knowledge of the area—recognizing that the decision to plant trees is ultimately a human decision.

Next, site visits were conducted and a planting plan created for each park to identify specific areas where trees were needed. Once trees are in the ground, their locations and information—like species name and diameter—will be inventoried in GIS where maintenance crews may schedule tree care and irrigation for the next three years. Eventually the inventoried trees will feed back into the planting prioritization map with an update for next year’s planting season.



City of Austin Tree Planting Prioritization Map

Following completion of the 2015-2016 planting season, forestry staff is anticipating a positive change in areas where planting prioritization scores are low. The map has already led to the identification of new planting sites, like Austin’s public school campuses, where the addition of trees is sure to provide a positive impact for years to come.

As Austin continues to grow, the City of Austin is determined to ensure trees continue providing valuable benefits to its citizens through the planting prioritization plan and annual planting events. To view an interactive webmap of the plan, visit <https://www.austintexas.gov/page/resources-and-reporting-tree-issues> ■

HELLO TEXAS MEMBERS!

We are very excited about the 2016 ISA Annual Conference and Trade Show coming to Fort Worth next year. Your local committee has met several times to work on the logo, theme, and various logistics of the show. We also attended the recent conference in Orlando to promote next year's event.

It would be great to see some Texas presentations at the conference, so we need your input!

See http://www.isa-arbor.com/events/resources/events_Conference_2016Call-for-presentations.pdf for information on submitting proposals.

Proposals will be accepted through Friday, December 4, for:

- Tree Academy workshops (3 hours)
- Climbers' Corner demonstrations (45 minutes)
- Panel Discussions (90 minutes)
- General Education (40 minutes approximately)
- Arboriculture Research and Education Academy (AREA) - Research based (30 minutes)
- Utility and Municipal themes (30-40 minutes)
- Spanish-Language, Climbers' Corner or General Education sessions (30-45 minutes) Sesiones en español en la Esquina de los Trepadores de Árboles (Climbers' Corner) o las sesiones educativas generales (30-45 minutos)

No late submissions for the above categories will be accepted.

Hope to see you all in Fort Worth next August!

Jim Carse, 2016 Local Committee Chair



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Citizen Forestry Program Starts Up in Denton

Cross Timbers Urban Forestry Council, in partnership with Keep Denton Beautiful and the City of Denton, is presenting a citizen forester training program in Denton. The class will take place over six Wednesdays from October 7 through January 27. To complete their certification, citizen foresters must volunteer a minimum of 25 hours of community service to their town, city, or county on projects that involve trees on public property. For more information visit kdb.org or www.ctufc.org



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WHAT YOU SHOULD KNOW ABOUT SOIL

by David M. Vaughan

Soil is more than sand, silt, and clay with some small amount of organic matter. In the San Antonio area it can be a few inches of top soil above caliche or solid limestone. In central San Antonio we have some deeper clay soils. And in south Bexar County we can have five feet of sand over a clay hard pan. Whatever you have, soil is teeming with life.

Experts estimate that a tablespoon of forest soil contains 6 billion microorganisms consisting of 75,000 species of bacteria, 25,000 species of fungi, 1,000 species of protozoa, and 100 species of nematodes. And that is not a typo; that is number of species.

James Urban in *Up By Roots* uses a cup of soil (that's a handful for me) and has numbers in the billions: 200 billion bacteria, 100,000 meters of fungi (that's about 60 miles!), 20 million protozoa, 100,000 nematodes, 50 micro arthropods. That's not much soil to contain such mind boggling numbers. The numbers are so large, so extreme, I do not think they register with most of us. It takes an electron microscope to see an individual bacterium. It's hard to imagine how small you have to be to have 200 billion in a handful of soil.

Under good conditions bacteria have the ability to multiply or divide every 20 minutes. They could quickly overwhelm

the soil unless billions of them were consumed every hour. A protozoan can consume 10,000 bacteria a day and there are 20 million in a handful of soil. Nematodes eat bacteria, a lot of protozoa, and a lot of fungi. Arthropods eat all of the above. Fungi consume nematodes, decompose the bodies of whatever dies, and decompose organic matter. Bacteria also decompose organic matter. All are completely dependent upon carbon which can only be supplied by plants.

This is the soil food web. The entire process protects nutrients from leaching out of the root zone of plants by securing these nutrients within the bodies of microbes. Plants and trees are very particular about the nutrients they absorb and are not able to pick up nutrients unless they have been manipulated by microorganisms. The nutrient needs to be consumed by a bacterium that is then consumed by a protozoan or nematode and then pooped out in the rhizosphere. The rhizosphere is a small zone of intense biological activity about 2mm wide (1/10 inch) around a root. Only then is the nutrient in a form that the plant root can absorb. So bacteria put out enzymes that release nutrients that they absorb. A protozoan consumes the bacteria, uses what it needs and releases the leftovers which have been converted into a form plants can use. If the waste is released in the rhizosphere, the expanding root is able to pick it up through diffusion. One protozoan's waste is another plant's treasure (please forgive, couldn't resist).

In exchange, the plant provides carbon sugars it has produced during photosynthesis. About 40% of what a tree produces in its leaves is leaked out through roots to nourish the bacteria and fungi around those roots. That is a lot of product being leaked, an indication of how much our trees depend upon the micro soil food web. The bacteria depend upon their sugar daddy and crowd in on the expanding root like pigs at a feeding trough, forming a physical barrier that excludes bad bacteria. When things are healthy, the bad guys do not have access to the root or to the sugars. When things are right, the good guys outcompete the bad guys, limiting the numbers that could cause trouble.

Fungi can also form a physical barrier around a root, so thick that nematodes and other bad guys are excluded. Many of these fungi are mycorrhizae fungi that are attached to the outer cell of the root or have structures inside root cells. The tree provides carbon sugars to the mycorrhizae in exchange for water and nutrients, especially phosphorus. Fungi hyphae can be 1/60 the size of an expanding root and have the ability to get water and nutrients from very small pore spaces in the soil. Mycorrhizae fungi are able to deposit water and nutrients directly into the plant root.

Fungi eat or consume nematodes. Some form snares with their hyphae, put out a nematode attractant, and close the snare when a nematode enters the trap. They then grow a special structure that penetrates the sightless worm to consume the groceries. Other ►

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◀ fungi produce a poison that kills the microscopic worm when the toxin touches its mouth. Some use glue to glue trap the worm.

And then there are the arthropods (mites). They are the big guys in this micro world, eating fungi and nematodes and protozoa. And all these guys are pooping nutrients in forms that plants can use. Many of these waste products get picked up and consumed enough times in this soil food web to become fairly stable compounds which are how humates are formed.

Trees and plants are completely in charge of this system. They have the ability to change the sugars they provide to stimulate certain bacteria or fungi according to their needs. They change the sugars they produce by season, by temperature, and by moisture levels. If they need iron, they produce a sugar to stimulate the fungus or bacteria that can provide that need. Low on water and they stimulate the mycorrhizae fungi to bring in more water.

Bacteria could easily be washed away so they glue themselves to soil particles. They use organic glues produced from the sugar compounds supplied by plants. These glues are similar to the ones produced by the bacteria in your mouth which we call tartar or scum. Clay particles tend to be rod shaped, and bacteria can glue these end to end, forming odd shaped structures that can resemble a snow flake. This is the smallest soil aggregate and it protects the bacteria and provides space for the slow movement of air and water. In sandy soils bacteria form cuplike aggregates which hold water.

Fungi need to protect their reproductive structures from grazing arthropods, so they weave several of these bacterial soil aggregates together and hide their fruiting structures inside.

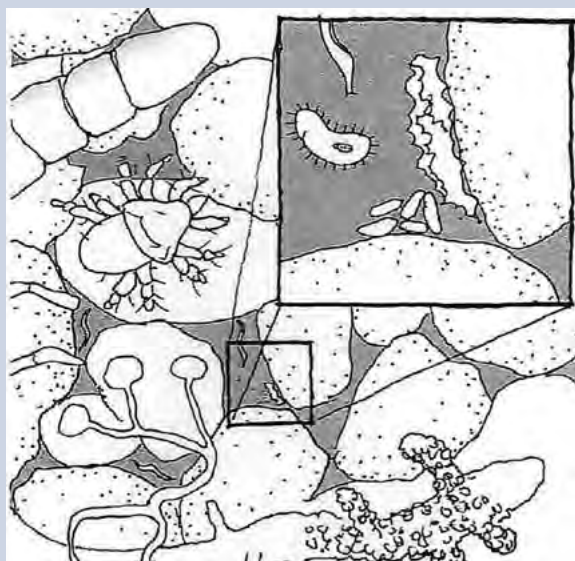
This forms a larger soil aggregate, still too small to see with anything other than a high powered microscope. Millions of these are formed within a handful of soil and they are the important, critical component of soil structure. The movement of nematodes and arthropods and worms (the whales or elephants of the system) create small passages that also provide for the slow movement of air and water. These are the aggregates we destroy with compaction, plowing, tilling, and double spading our gardens. Once these small aggregates are eliminated, water or air will not pass through.

Trees and their roots can get lazy. When we provide nutrients to plants in forms they can use with very little biological activity, the tree will reduce the exudates it releases, which reduces the population of the good guys and can give the bad guys access to our plants. It makes plants dependent upon chemical fertilization. Fertilizers with high salt content (quick release and water soluble) can desiccate bacteria and fungi and irritate worms causing them to leave the area.

We need to regard soil as a complex system of living organisms and seriously think about becoming microbe farmers, like our trees in a forest. With the exception of pH, the physical properties of soil are not nearly as important to a gardener or arborist as the invisible living microbes occupying the soil. Your top priority in caring for soil should be to protect and preserve the soil food web.

This article was based on the incredible work of Dr. Seuss in his landmark soils manuel, *Horton Hears a Who*, with help from *Up By Roots* by James Urban, *The Soil Will Save Us* by Kristin Ohlson, *Teaming With Microbes* by Jeff Lowenfels and Wayne Lewis, and the *Certified Arborist Study Guide*. ■

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Board members represent ISAT at ISA Conference & Trade Show

by Lara Schuman

This year several ISAT board members represented our chapter at the annual ISA Conference and Trade Show August 8–12. Held at the beautiful Gaylord Palms Resort and Convention Center in Orlando, Florida, the conference drew participants from all over the world. This was my first time to attend the international conference, and I was extremely honored to get the opportunity to speak about the City of Austin Urban Forestry program I manage. It certainly is humbling to speak alongside respected arborists like Norm Easy, the Executive Director of the Florida Chapter, and Bryant Scharenbroch, from the Morton Arboretum.



ISAT members at the 2015 ISA Conference and Trade Show (l to r): John Giedraitis, Melinda Adams, Susan Henson, Gene Gehring, James Carse and Lara Schuman.

The Gaylord Palms Resort was spectacular. When they say palms, they mean it. There were real palms, trees, waterfalls, and even alligators all under the glass dome of the main courtyard. It was a great setting for a bunch of tree people to get together and talk trees. While the ISA board got down to work with several meetings, conference participants got a back-of-the-scenes tour of Epcot, and learned about performing technical inspections on mature trees from Frank Rinn, the use of sonic and electric resistance tomography from Lothar Göcke, and several other topics during the Tree Academy workshops.

Dr. Margaret Lowman started off the conference with her keynote address on Life in the Treetops – Adventures of an Arbournaut, all about her years of studying forest canopies

with innovative climbing methods. Meanwhile, all of the latest gadgets in arboriculture were on display at the trade show. They even had a tree set up on the trade show floor

for the “Climbers’ Corner,” where tree climbing techniques were demonstrated by some of the best climbers from around the world including the 2015 ITCC Champions, James Earhart of Virginia, and Jamilee Kempton of Hawaii.

The Texas Chapter worked hard to get the word out about the 2016 Conference, Deep in the Heartwood of Texas, in Fort Worth next August. We manned a booth and “branded” visitors with Texas stickers and t-shirts.

My turn to speak finally came on Tuesday morning, as part of the Heritage Tree Symposium. I think I managed a pretty good showing, and represented us Texans well. After speaking, I was ready to relax. The Florida Chapter of the ISA really knows how to put on a good party. They treated us conference goers to a “Chill Out” Reception at Seaworld®, where we got to visit with penguins while we enjoyed cocktails and snacks. All in all it was a wonderful experience.

We’ve got our work cut out for us to make the 2016 conference in Texas even better than Orlando, but I know we can do it. We’ll need lots of volunteers, so if you’re interested, get ahold of one of our board members and we’ll put you to work. See you in Fort Worth!



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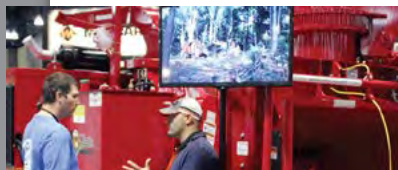
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