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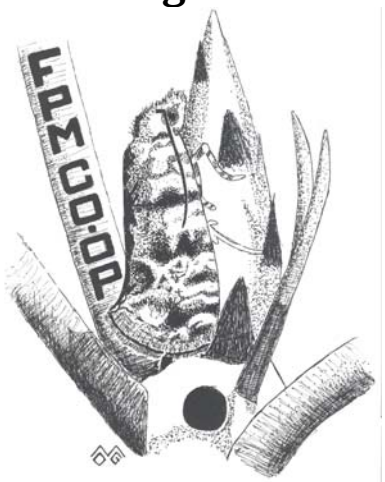
March 2016

Quarterly Newsletter on Forest Pest Management Issues

Forest Pest Management Cooperative



Nantucket Pine Tip Moth, *Rhyacionia frustrana* (Comstock)

Texas A&M Forest Service
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PEST is a quarterly newsletter that provides up-to-date information on existing forest pest problems, exotic pests, new pest management technology, and current pesticide registrations related to seed orchards, forest plantations and urban trees. The newsletter focuses on, but is not limited to, issues occurring in the South (Texas to Florida to Virginia,).

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Important Meetings – ETFES and NAFIWC

The spring session of the East Texas Forest Entomology Seminar is scheduled for Thursday, April 21st, at Kurth Lake and Friday, April 22nd, at SFASU Arthur Temple College of Forestry and Agriculture in Nacogdoches. The agenda will be distributed in early April. For more information, contact co-chairman Ron Billings at rbillings@tfs.tamu.edu.

Also, mark your calendars for the North American Forest Insect Work Conference, to be held at the Washington Marriott Wardman Park Hotel in Washington, D.C. on May 31 to June 3, 2016. See www.cpe.vt.edu/nafiwc16/program.html for program and registration details.

FPMC Celebrates its 20th Year

In March, the Forest Pest Management Cooperative (FPMC) completed 20 years of successful operation. Known for the first several years as the Western Gulf Forest Pest Management Cooperative, the FPMC was initiated on March 1, 1996. The original goal was to conduct applied research and technology transfer on pests of pine seed orchards and commercial pine plantations. More recently, the goals were expanded to also include forest health issues affecting urban landscapes.

From 1996 until 2013, the FPMC operated under the direction of Coordinator Dr. Don Grosman and Administrative Coordinator Dr. Ronald Billings of the Texas Forest Service (known as the Texas A&M Forest Service since 2012), with support from a small field staff based in Lufkin. There were five charter members: Boise Cascade Corporation, Bosch Nursery, Champion National Corporation, Temple Inland Forest Products Corporation, and the Texas Forest Service. Dr. Melissa Fischer became coordinator in September 2013 but left the position in November 2014. Dr. Billings, with headquarters in College Station, assumed the coordinator position in February, 2015.

During the first 20 years, the FPMC achieved various major accomplishments, including the registration of several new chemical insecticides to improve forest pest management. For example, based largely on FPMC field trials, Pounce®, Waylay™, and Arctic® were registered for regeneration weevils, Volcano®,

PTM™, and Amdro® Ant Block for Texas leafcutting ant control, and SilvaShield™ Forestry Tablets (imidacloprid) PTM™ Insecticide (fipronil) for prevention of Nantucket pine tip moth became commercially available.

Perhaps the most significant achievement in terms of new pesticides was development and registration of emamectin benzoate for use in pine seed orchards and commercial forests. Sold by Syngenta, Inc., under the trade name of TREE-äge®, this systemic insecticide has enjoyed wide use, particularly for protecting threatened ash trees from infestations of emerald ash borer.

Applied research in recent years has been targeted at a variety of other forest and urban pests, such as conifer mites, pine wood nematodes, oak wilt, hypoxylon canker, thousand cankers disease, and salt cedar beetles. The FPMC has devoted much effort also to monitoring the impact of pine tip moth on growth and survival of pine seedlings with and without various chemical treatments.
Over $1 million of outside research grants have been captured over the years to supplement operating costs of the coop.

Members in 2016

In CY2016, the FPMC has 11 dues-paying members, comprised of 6 full members, 4 associate members, and one supporting member. Full members are Hancock Forest Management (since 2006), Plum Creek (since 2000), Texas A&M Forest Service (since 1996), USDA Forest Service/Forest Health Protection (since 1998), USDA Forest Service/International Programs (since 2016), and Weyerhaeuser Company (since 2002). Associate Members are Anthony Forest Products Company (since 2002), Arborgen (since 2007), Arborjet (since 2014), and International Forest Company (since 2010). The one Supporting Member, International Society of Arboriculture – Texas Chapter, joined in January, 2016. Forest Investment Associates, a full member since 2003, Campbell Global, a full member since 2007, and Rayonier, a full member since 2008, have decided not to renew their memberships in 2016. We appreciate their contributions and support in previous years.

Summary of 2015 FPMC Research Projects

In 2015, six primary research project areas – leaf-cutting ants, tip moths, conifer mites, hypoxylon canker, walnut twig beetle (vector of the thousand cankers disease fungus), and systemic injections for southern pine beetle and oak wilt – were continued from 2014. The FPMC also evaluated new control options for seed orchard insects, evaluated the longevity and effects of *Beauvaria bassiana* fungal spores in relation to southern pine beetle control, and conducted a survey to determine the most important forest health issues affecting urban trees (see survey results in December issue of PEST). Results of walnut twig beetle studies and *Beauvaria* fungus exposure tests are summarized in this issue. Other research results will be presented in the June 2016 issue of PEST.

Walnut Twig Beetle and Thousand Cankers Disease

The walnut twig beetle (WTB, *Pityophthorus juglandis*) has been associated with widespread mortality of black walnut in the western U.S. The beetle is the vector of a fungus that causes thousand cankers disease (TCD), an accumulation of many small branch and stem cankers that can kill an infected tree. The beetle is native to Arizona, California, New Mexico, and northern Mexico. TCD was recently discovered in TN, VA and PA, within the native range of black walnut. Protection of individual, high-value walnut trees from insect attack has historically involved applications of liquid formulations of contact insecticides to the tree bole and/or foliage.

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Adult walnut twig beetle (Photo by K. K. Garvey)

In 2012, Dr. Don Grosman, then coordinator of the FPMC, received funding from the USDA Forest Service/Forest Health Protection, to evaluate the efficacy of the insecticide emamectin benzoate in combination with the fungicide propiconazole for protecting black walnut trees from WTB and TCD. The trials were conducted in a plantation of black walnuts infected with TCD located in Sevier County, Tennessee. Four treatments were evaluated, with 10 replicates per treatment, as follows: 1) TREE-age® (emamectin benzoate) alone; 2): propiconazole alone; 3) TREE-age® + propiconazole, and 4) untreated check.

In April, 2012 (at the time of treatment) and then four (August 2012), 16 (August 2013) and 38 (August 2015) months post-treatment, the stem and crown of each tree were ranked as to the extent of insect damage. In addition, three small branchs (12" in length) were collected from the low, mid and upper crown of several study trees in 2012. The branches were evaluated for the presence of and ranked on the level of WTB (TN) and other insect damage (TX and TN).

Results are summarized as follows:

- Emamectin benzoate and propiconazole were detected in the phloem at very low concentrations (< 1 part per million). Neither chemical was detected in nut meat.
- A single injection of emamectin benzoate (alone) reduced walnut twig beetle emergence from infested branches by 60%.
- None of the injection treatments significantly improved health parameters (overall crown condition, % dieback, number of dead branches) compared to the untreated check.
- Low beetle populations and abundant rainfall during the study period likely reduced insect/disease pressure on more resistant study trees.

Can Botanigard® Withstand the Texas Heat?

The commercial insecticide known as BotaniGard® 22 WP has been used to control various insect pests, including western bark beetles. The product contains active spores of the fungus *Beauvaria bassiana* and has been registered for microbial control of insect pests of forest and shade trees since 1999.

In 2015, the FPMC conducted a test in East Texas to evaluate the duration of BotaniGard® 22WP on loblolly pine logs under various environmental conditions in East Texas. Six log sections, each 4-feet in length, were cut from two 8-inch loblolly pine trees and treated with BotaniGard®. In June, two log sections were placed horizontally under each of the following conditions: full sun, partial shade within a pine stand, full shade within a pine stand, and under an open shelter from June through September at Hudson, TX.

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The treated logs were sampled at intervals of 4, 8, 12 and 16 weeks following treatment by removing 100 square cm samples of bark from the upper (top) and lower (bottom) surfaces of each log. Samples were sent to Dr. Rabiu Olatinwo (USDA Forest Service, Southern Research Station) to sample for *Beauvaria bassiana* presence and activity. Each bark section was sampled at four points for viable spores of *Beauvaria bassiana*.

Results (Table 1) suggest that the fungal spores don't survive for long periods of time, particularly when exposed to full sunlight and Texas summer heat. No viable spores were found on treated bark after just 4 weeks of exposure to full sunlight on the top of treated logs. When exposed in partial sunlight, 50% of the sampling points had viable spores on the top of logs after 4 weeks, but this percentage dropped to 0 by week 16. On the bottom side of the same logs, 62% of the sampling points had viable spores after 4 weeks, which declined to 25% after 16 weeks.

For logs maintained in full shade, viable spores were detected on 100% of the points sampled on the top of logs after 4 weeks, but none were found at week 16. On the bottom side of shaded logs, viable spores were detected on 100% of the sampling points after 8 weeks, but this level of viability dropped to 50% by week 16. In the case of logs stored under an open, shelter, viable spores were found on 100% of samples taken at 4 weeks from both the top and bottom sides of logs. This viability declined to 0% and 25% after 16 weeks on the top and bottom aspects, respectively.

When data for all sampling sites were combined, the average percentage of points with viable fungal spores declined from 67% after four weeks to just 14% after 16 weeks. Whether the viability of *Beauvaria* spores in BotaniGard® applications is sufficient to have an effect on southern pine beetle during its 4-5 week life cycle within host trees was the objective of a field test applied to standing trees colonized by SPB.

Table 1: Percent of four sampling points per 100 cm2 with viable spores of *Baeuvaria bassiana* under different environmental conditions in East Texas (June-October 2015).

Week	4	8	12	16
Full sun/top	0%	0%	0%	0%
Full sun/bottom	37%	75%	12%	25%
Partial shade/top	50%	37%	37%	0%
Partial shade/bottom	62%	100%	12%	25%
Full shade/top	100%	37%	50%	0%
Full shade/bottom	87%	100%	50%	50%
Open shelter/top	100%	87%	37%	0%
Open shelter/bottom	100%	62%	37%	25%

A preliminary evaluation of the effectiveness of BotaniGard® for control of southern pine beetle was conducted on the Bienville National Forest in Mississippi in June, 2015. Two live pines were treated by spraying the bark with BotaniGard® 22 WP from ground level to a height of 25 feet using a backpack sprayer. On the same day, the treated trees were baited with SPB lures (frontalin and alpha-pinene) to induce attacks. The trees were monitored until the crowns began to fade, indicating successful SPB colonization. Examination of bark samples taken at heights of 4, 12, 20 and 50 feet revealed no apparent treatment effect. Beetles had attacked the baited trees at typical densities and SPB brood developed and emerged at densities comparable to baited trees without BotaniGard® application.

FPMC Research Projects in 2016

The FPMC is pursuing several research projects in 2016 and has submitted proposals for several others, as follows:

1. *Evaluation of Sivanto™ and XXpire WG™ for control of insect pests in southern pine seed orchards.* This project to evaluate the effectiveness of two new insecticides for control of coneworms and seed bugs in pine seed orchards was initiated in 2015 and a proposal to repeat the study in 2016 has been submitted to the US Forest Service as a Pesticide Impact Assessment Project. Data analysis and seed evaluation from the 2015 trial are underway.

2. *Incorporating emamectin benzoate into control strategies for the southern pine beetle: winter study.* The FPMC has received funding from Syngenta, Inc., to evaluate winter-season injections of emamectin benzoate (TREE-age®) for control of southern pine beetle. Trees were injected with TREE-age® at three dosage levels (1.25, 2.5 and 5.0 ml per diameter inch) on the Oakmulgee National Forest in Alabama. Treated and check trees (10 replicates) were baited with SPB pheromones in January, 2016. Levels of SPB attack, colonization and brood survival will be monitored throughout the winter and spring.

3. *Improving the Prediction System for the Southern Pine Beetle.* In the late mid-1980s, the Texas A&M Forest Service (TFS) developed a reliable system to predict SPB outbreaks using pheromone traps. The system is based on the relative numbers of SPB and checkered beetles (*Thanasimus dubius*) caught in pheromone traps during the spring dispersal period. With the aid of a network of federal and state collaborators, the prediction system was established across the South and has been conducted annually since 1986. However, failures to predict several recent outbreaks in Mississippi in recent years has suggested that the trap lures or elution devices have changed over the years and are not as effective as they once were. This three-year study, funded as a Special Technology Development Project (STDP) by the US Forest Service/Forest Health Protection, consists of a series of replicated bioassay of different host lures and SPB pheromones. The lure combinations are being tested in Louisiana, Mississippi, and Alabama during the spring and fall months to evaluate attractiveness to SPB and its major predator, the checkered beetle. Results will be used to modify the existing prediction chart as a means to better detect SPB outbreaks in early stages of development.

4. *Evaluation of Siesta™ Fire Ant Bait for Control of Texas Leafcutting Ant Colonies.* BASF Corporation has recently developed, registered and marketed a new commercial bait to control fire ants. Siesta™, containing the active ingredient metaflumizone, is formulated on corn grit, along with soybean oil, a proven attractant for native and imported fire ants. The FPMC plans to test the commercial bait on Texas leafcutting ants. Previous studies with other corn grit baits (i.e., Amdro™) have shown that leafcutting ants are more likely to retrieve the bait and take it to their underground colonies if it is formulated in a larger-size pellet. Accordingly, plans are to use the FPMC pelletizer to make a larger-size bait (2.5 x 10 mm) and compare the pelletized bait to the commercial formulation. Preference and efficacy trials are being conducted with the two bait formulations using active colonies of both leafcutting ants and imported fire ants.

5. The FPMC has prepared and submitted two additional proposals to the U. S. Forest Service Pesticide Impact Assessment Program. Objectives are to conduct more

comprehensive evaluations of macro- and micro-injection systems for application of oak wilt fungicides and to incorporate emamectin benzoate injections into a southern pine beetle direct control tactic. As of March 1, no word has been received on whether these proposals will be funded.

Cut-and-leave for SPB Control: A Comment out of Bounds

The current outbreak of southern pine beetle (*Dendroctonus frontalis*) in Honduras has increased alarmingly in recent months. As of February 1, forestry officials estimate over 1 million acres had become infested, becoming the worst outbreak in this country since the early 1960s. This represents 14% of the entire pine resource in Honduras (6.9 million acres).

A summary of the current outbreak in Honduras was provided in the December 2015 issue of *PEST*. In that article, it was stated: "Cut-and-leave, a mechanical control method developed in East Texas in the 1970s, is being implemented to halt expanding infestations along the leading front of the outbreak." In reference to this statement, Hancock representative Ragan Bounds – an East Texas forester who used to work for Kirby Forest Industries – was quick to point out this historical-based comment isn't entirely true. As reported in *A Century of Forestry* (Billings 2014), Kirby first applied a version of cut-and-leave as early as 1939 by cutting a ¼-mile wide buffer around a large SPB infestation in southeast Texas to successfully halt advance of the outbreak.

To set the record straight, although the first application dates back to 1939, cut-and-leave didn't become a routine direct control measure for southern pine beetle infestations until the early 1970s, after East Texas forest industries became disenchanted with a decade's use of BHC insecticide mixed in fuel oil. Interestingly, in the 1960s Kirby initially recommended use of cut-and-leave in East Texas to treat inactive SPB infestations, just so the spots wouldn't be reported in subsequent detection flights. Presumably, foresters observed that small, active infestations could be controlled during summer months if freshly attacked trees and a horseshoe-shaped buffer of adjacent uninfested pines were felled and left on site. Cut-and-top – a version of cut-and-leave in which crowns of felled trees were severed to increase brood mortality – was recommended for SPB control in fall and winter months when prompt salvage was not feasible (Source: *Kirby's Southern Pine Beetle Control System*, unpublished document, 1972).

The Texas A&M Forest Service (TFS) was the first state agency to recommend cut-and-leave as an alternative to insecticides for control of SPB infestations. But cut-and-leave was not accepted by other state or federal agencies in the South until TFS published a research study in 1979 (Billings and Pase 1979). This study utilized first-of-a-kind computerized spot detection records to document that application of cut-and-leave did not cause increased proliferation of new spots near treated spots during summer months (as many others had claimed). This finding was later collaborated by other Texas A&M University researchers (Fitzgerald et.al. 1994). The cut-and-leave tactic also has been effectively used to treat SPB infestations in Central America since it was first introduced into Honduras in 1982. Despite decades of continued research to develop other control tactics, cut-and-leave continues to be the most practical method for addressing SPB outbreaks if prompt salvage removal is not feasible.

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Fitzgerald, J. W., R. N. Coulson, P. E. Pulley, et al. 1994. Suppression tactics for *Dendroctonus frontalis* Zimmermann (Coleoptera: Scolytidae): An examination of the occurrence of infestations adjacent to treatment sites. Journal of Economic Entomology 87 (2): 417-425.

Plum Creek to Remain a FPMC Member in 2016

Weyerhaeuser Company and Plum Creek Timber Company – two full members of the FPMC – announced in November that they plan to merge, creating a timberland and forest products company with more than 13 million acres in the US. The combined company, a real estate investment trust (REIT), will retain the Weyerhaeuser name and is expected to have a value of $23 billion. Fortunately for the FPMC, Plum Creek decided to renew its dues as a full member of the Coop in 2016, since the merger is not scheduled to take place until later this year. We appreciate the continued support of Plum Creek Timber Company and Weyerhaeuser Company.

Texas Monitors for Emerald Ash Borer

(Contributed by Shane Harrington, TFS)

As spring draws near and temperatures begin to rise, you may begin to see purple looking boards hanging from trees around Texas. These are actually traps designed to catch the emerald ash borer (EAB), an invasive pest of Asian origin. Texas A&M Forest Service (TFS) in collaboration with USDA Animal and Plant Health Inspection Service (APHIS) began monitoring for the EAB in Texas in 2012.

Each spring TFS staff works with various collaborators and landowners to place traps in and around live ash trees. Since 2012 TFS and partners have deployed over 4,000 traps and to date no EAB beetles have been identified in Texas.

The emerald ash borer was originally identified in southeastern Michigan in the summer of 2002 and since then has been confirmed in 25 states and two Canadian provinces. During 2015, EAB was confirmed in northwest Louisiana raising the concern that EAB would be soon identified in Texas. The larvae (the immature stage) feed on the inner bark of native ash trees (*Fraxinus* spp.), disrupting the tree's ability to transport water and nutrients, eventually killing the tree.

Retired TFS forest health specialist Joe Pase inspects a typical emerald ash borer detection trap during the 2012 EAB detection survey (Photo by Ron Billings).

During March and April of each year, TFS staff along with partners such as Texas Master Naturalists, Sam Houston State University and Texas A&M Agrilife Extension Service place assigned traps near ash trees in high risk areas of the state. In May and June, each trap is inspected, rebaited and any beetles suspected to be EAB in the trap are collected and sent to expert entomologists for identification. Again in late August or early September, all insects resembling EAB are collected and identified before the traps are removed from the field. All information collected during the monitoring season is entered into the National EAB Database that APHIS maintains.

To date no adult EAB have been collected and identified during annual detection surveys in Texas and efforts are currently under way to initiate the 2016 detection survey. Should a landowner or forest worker see a dying ash tree or suspect an infestation of EAB, they should contact the local Texas A&M Forest Service office for assistance in identifying the cause of health decline. If needed a TFS Forest Health Specialist can provided additional assistance and expertise in identifying insect damage or tree health decline. For more information on identifying EAB and symptoms, please visit the TFS website at http://tfsweb.tamu.edu/foresthealth/invasivespecies/.

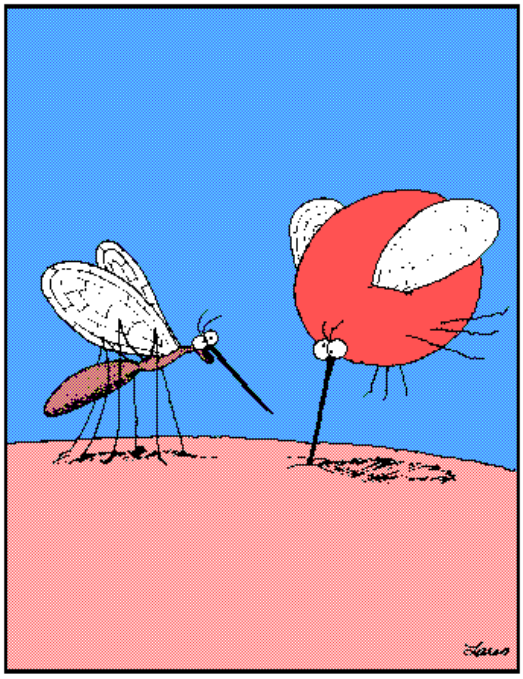
New Innovation to Treat Firewood

(Source: *National Woodlands* Fall 2014)

Transporting untreated firewood long distances is believed to be a primary method by which invasive insects and diseases become established in new areas. The "buy it where you burn it" public awareness campaign was developed to promote use of local firewood as a precautionary measure. Despite this effort, the rising cost of energy has resulted in a dramatic increase in demand for firewood. The current available methods for treating wood to kill invasive pests use either chemicals or extreme heat. Interestingly, two Virginia Tech researchers have developed a new method for treating firewood to address these concerns while saving time, energy and resources.

Research Scientist Zhangjing Chen and Professor Marshall White have developed a vacuum-contained steam method as an efficient way to treat firewood and other forest products. Their system consists of a vacuum pump, control unit, flexible vacuum container, and steam generator. The wood to be treated is encased in a bladder tank, resembling a large plastic bag with a zipper. Small business operators can use this portable technology to treat firewood, pallets and other products.

Large bladder tanks can be carried and used in the back of a pickup truck for small loads of firewood, but large logs must be treated in large, rigid chambers, typically found at a research or production facility. The new method was tested with firewood from ash infested with emerald ash borer in Virginia and proved successful at killing all the insect's life stages in the wood. The steam and vacuum method took less than half the time and 25 percent less energy than the 140-degree, 60-minute heat treatment currently required by the U.S. Department of Agriculture for firewood treatment.



"Pull out, Betty! Pull out! . . . You've hit an artery!"

Zika Virus Declared a Global Emergency

(Sources: *BBC News*, February 1; *Medscape Medical News*, January 11; *CBS News*, January 22, 2016)

The World Health Organization (WHO) has declared the Zika virus a global emergency, placing Zika in the same category of concern as Ebola. Experts are worried the Zika virus is spreading far and fast, with devastating consequences.

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Zika virus - a mosquito-borne infection believed to cause microcephaly in infants born to infected mothers - may also be connected to some rare but serious cases of Guillain-Barré syndrome, which can cause paralysis, the Center for Disease Control (CDC) stated in January. The Zika virus has crossed from Latin America into Texas, experts reported in early January (see December 2015 issue of PEST for a description of Zika virus).

Peter Hotez, MD, dean of the National School of Tropical Medicine at Baylor College of Medicine, stated "There is a perfect storm brewing for Zika virus in the US. I was never worried that Ebola would take off here, but I am worried about Zika. We have 2 species of *Aedes* mosquitoes that can transmit Zika in our area. We also have high levels of poverty, resulting in people living without window screens and near discarded tires and other water-catching containers where the mosquitoes can breed." Dr. Hotez said that Zika infection usually produces nonspecific, influenza-like symptoms in pregnant women, with the associated birth defects becoming apparent only 9 months later. "By that time, it is too late," Dr. Hotez said. In a recent case in Texas, the Zika virus was transmitted from a traveler returning from Venezuela to an uninfected person by sexual contact, which increased the potential seriousness of this disease.

Countries currently known to have Zika infections include those in tropical Africa, Southeast Asia, the Pacific Islands, and Central and South America (and now the United States). The first case of Zika in Puerto Rico was reported in December 2015. Heightened international concern about Zika was driven not by its relatively mild effect on infected adults, who typically recover in about a week, but by its devastating effect on babies in utero.

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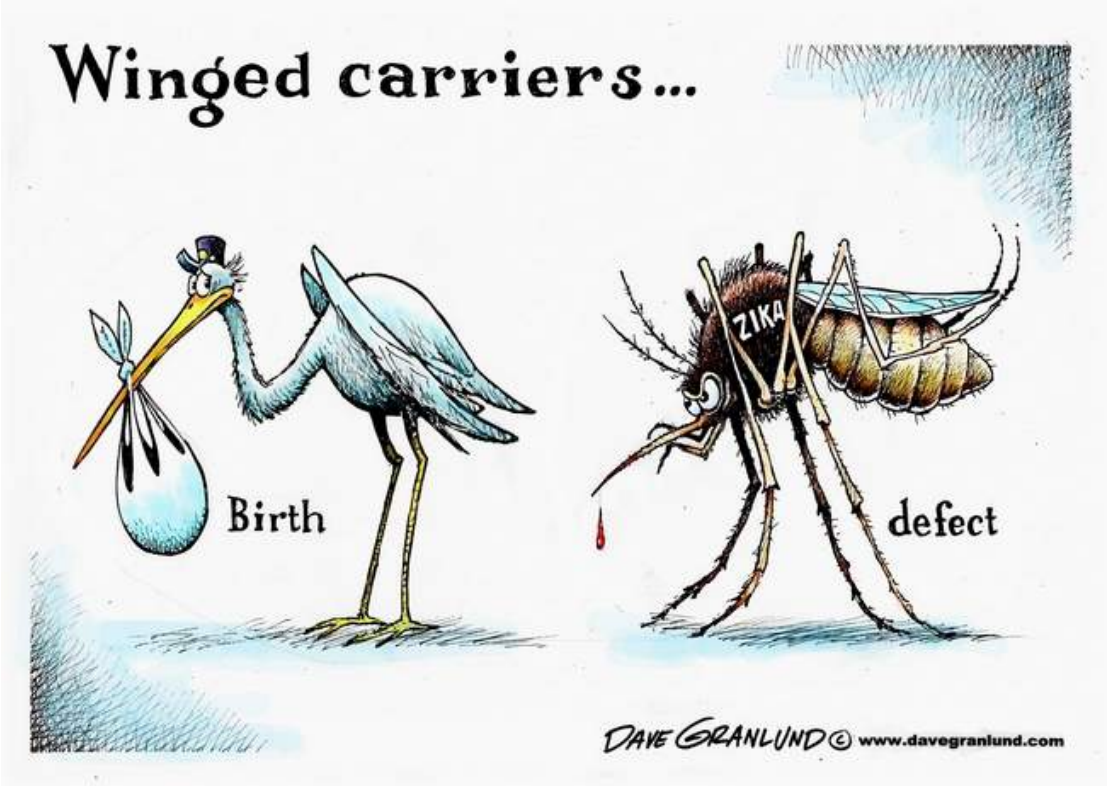

Health officials said Guillain-Barré syndrome has been reported in a number of patients with probable Zika virus infections in French Polynesia and Brazil. The CDC said more research is needed to understand the connection. "Guillain-Barré syndrome is an autoimmune disorder in which the body usually is responding to another infection. It has an immune response that destroys the covering of nerves and interferes with the ability of nerves to function and survive," said Dr. Bruce Hirsch, an infectious diseases specialist at North Shore University Hospital, in Manhasset, New York. Hirsch told CBS News that Guillain-Barré causes an "ascending motor paralysis" that starts at the feet and moves up towards the head. "When it involves the muscles of respiration, people who have Guillain-Barré require a breathing machine in order to survive and get through the experience," said Hirsch.

It can lead to death, but many survive, he said. The syndrome is "very, very variable" from person to person -- some may just experience numbness in the feet while others may suffer complete paralysis. "There is recovery. Usually recovery is generally complete. Sometimes mild weakness can occur," said Hirsch.

On March 13, 2016, in Maceió, Alagoas, Brazil, the Entomological Society of America (ESA) and the Sociedade Entomológica do Brasil (SEB) will host a gathering of the world's entomological societies to discuss collaborative control options to combat one of the world's most deadly animal species – *Aedes aegypti*, a mosquito that transmits Zika virus, dengue, chikungunya, and yellow fever. The purpose of the summit will be to marshal the international community of entomologists to better control mosquito-borne diseases in the Americas and around the world (Source: Entomological Society of America).

A new webpage (www.texaszika.org) has been created to provide more local information on the disease. As of March 3, there were 18 confirmed cases of Zika virus disease in Texas. All but one were travelers infected abroad. The other was someone who acquired the disease from sexual contact from a partner who had travelled abroad.

Monarch Butterfly Populations Rebound

(Source: Victoria Burnett, *The New York Times*, February 27, 2016)

Monarch butterfly (Photo by Joe Pase)

After years of being ravaged by severe weather and shrinking habitats, the monarch butterflies hibernating in the Mexican mountains rebounded last year, kindling cautious hope that one of the insect world's most captivating migrations may yet survive.

The World Wildlife Fund said at a news conference that the orange-and-black butterflies, which fly more than 2,500 miles each year from Canada and the United States to a cluster of mountain forests in Mexico, covered about 10 acres this winter, an area more than three times as large as the space they covered last year.

Scientists and environmentalists said a variety of factors had contributed to the increase: new plantings of milkweed, mild weather and efforts to protect the Mexican forests where the insects rest from illegal logging.

The United States is trying to replace about 7.5 million acres of milkweed either by planting or by stopping the use of pesticides that destroy it. Mr. Ashe said Wednesday that the area of milkweed increased by about 250,000 acres last year. Let's hope this positive trend continues.

Hundred Million Year-Old Beetle Provides Clues to the Past

(Source: *Entomology Today*, December 28, 2015)

The attraction of beetles to resin-producing conifers is not a new phenomenon. About 100 million years ago in present-day Myanmar, a tiny beetle flew into a coniferous tree and became engulfed in its resin. Over time, the resin fossilized into amber — with the beetle fully encased — resulting in one of the most spectacularly preserved ancient beetle specimens yet described.

"For a beetle taxonomist and for the entomological community as a whole, this is an exciting discovery," said Michael Caterino, director of the Clemson University Arthropod Collection. "This is an extraordinary 99 million-year-old fossil in Burmese amber. We can see all the details of the external sculpturing of the wing covers and the head. We can see the mouth parts, which enable us to predict that this was a predator much like its modern relatives. And it has a lot of tantalizing characteristics that we hypothesized early members of this family had. But we no longer have to guess. Now we can confirm."

The ancient insect is a member of a family of beetles called Histeridae, which still thrive today with more than 4,000 species. "This is a new fossil genus and species that we've called *Cretonthophilus tuberculatus*," Caterino said. Fossils provide windows into the past, and with today's high-tech visualization and DNA technologies, along with a form of X-ray imaging called micro computed tomography that can peek internally into tiny structures, scientists are able to obtain more detailed data from fossil specimens than ever before. Caterino is currently discussing the possibility of CT-scanning the unique specimen of *Cretonthophilus* to see if its internal anatomy is as well-preserved as its exterior structure.

Editor's note: Just think, in another 100 million years a future entomologist may discover a fossilized specimen of *Dendroctonus frontalis* in a chunk of Honduran amber. I'll be sure to let you know when and if this happens.

New Drought Synthesis Published

(Source: US Department of Agriculture Release No. 0029.16, February 1, 2016)

The U.S. Forest Service recently released a new report entitled *Effects of Drought on Forests and Rangelands in the United States: A Comprehensive Science Synthesis*. This 289-page document provides a national assessment of peer-reviewed scientific research on the impacts of drought on U.S. forests and rangelands. This report will help the Forest Service (and others) better manage forests and grasslands impacted by climate change. Chapter 6 addresses *Forest Insect and Fungal Pathogen Responses to Drought*.

"Our forests and rangelands are national treasures, and because they are threatened, we are threatened," said Agriculture Secretary Tom Vilsack. "This report confirms what we are seeing, that every region of the country is impacted by the direct and indirect effects of drought conditions and volatile weather patterns. Sixty million Americans rely on drinking water that originates on our 193 million acres of national forest and grasslands. They support 200,000 jobs and contribute over $13 billion to local economies every year."

The report establishes a comprehensive baseline of available data that land managers can use to test how well their efforts to improve drought resilience and adaptation practices are working nationwide. Major findings from the report include:

- Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation.
- Even if current drought patterns remained unchanged, warmer temperatures will amplify drought effects.
- Drought and warmer temperatures may increase risks of large-scale insect outbreaks and larger wildfires, especially in the western U.S.
- Drought and warmer temperature may accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.
- Forest-based products and values – such as timber, water, habitat and recreational

opportunities – may be negatively impacted.

- Forest and rangeland managers can mitigate some of these impacts and build resiliency in forests through appropriate management actions.

Edited by Forest Service scientists in partnership with Duke University, the document provides a valuable new tool to inform discussion, planning and implementation of adaptation strategies for land managers and policy makers. The collaborative effort, authored by 77 scientists from the Forest Service, other Federal agencies, research institutions and universities across the United States, examines ways to understand and mitigate the effects of drought on forests and rangeland including the 193 million acres of National Forest System lands. A copy of the document is available at http://www.fs.fed.us/sites/default/files/DROUGHT_book-web-1-11-16.pdf.

ChemChina to Acquire Syngenta

(Source: *Morning Ag Clips*, February 4, 2016)

Syngenta , a world leader in crop protection and a supporter of FPMC research projects over the years, announced on February 3 that the China National Chemical Corporation (ChemChina) has offered to acquire the company. Michel Demaré, Chairman of Syngenta, said: "In making this offer, ChemChina is recognizing the quality and potential of Syngenta's business. This includes industry-leading R&D and manufacturing and the quality of our people worldwide. The transaction minimizes operational disruption; it is focused on growth globally, specifically in China and other emerging markets, and enables long-term investment in innovation. Syngenta will remain Syngenta and will continue to be headquartered in Switzerland, reflecting this country's attractiveness as a corporate location."

The Board of Directors of Syngenta considers that the proposed transaction respects the interests of all stakeholders and is unanimously recommending the offer to shareholders. There is committed financing for the deal and a strong commitment to pursue regulatory clearances. A Swiss and U.S. tender offer will commence in the coming weeks and the transaction is expected to conclude by the end of the year.
Syngenta's existing management will continue to run the company. After closing, a ten member Board of Directors will be chaired by Ren Jianxin, Chairman of ChemChina, and will include four of the existing Syngenta Board members.

John Ramsay, Chief Executive Officer, said: "Syngenta is the world leader in crop protection having significantly increased its global market share over the last ten years. This deal will enable us to maintain and expand this position, while at the same time significantly increasing the potential for our seeds business. It will ensure continuing choice for growers and ongoing R&D investment across technology platforms and across crops. Our commitment to cost and capital efficiency will remain unchanged."

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