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Moving Particles**

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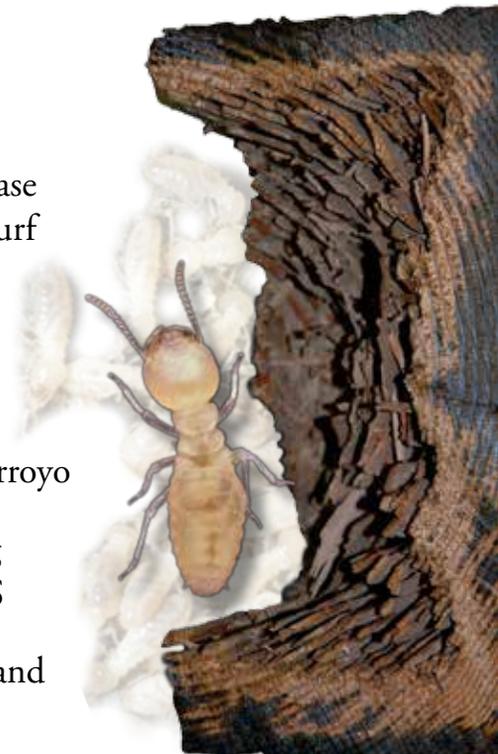
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Termite: Gerald J. Lenhard  
Wood: Edith Chenault



## ON THE COVER

Responsible pest control sometimes means observing wildlife laws when on the job. Watch out for bats, birds and other animals your work might impact. Give any building the all-clear well before fumigation proceeds.

Tent by Skyhobo and myotis bats by JAH, iStockphoto.



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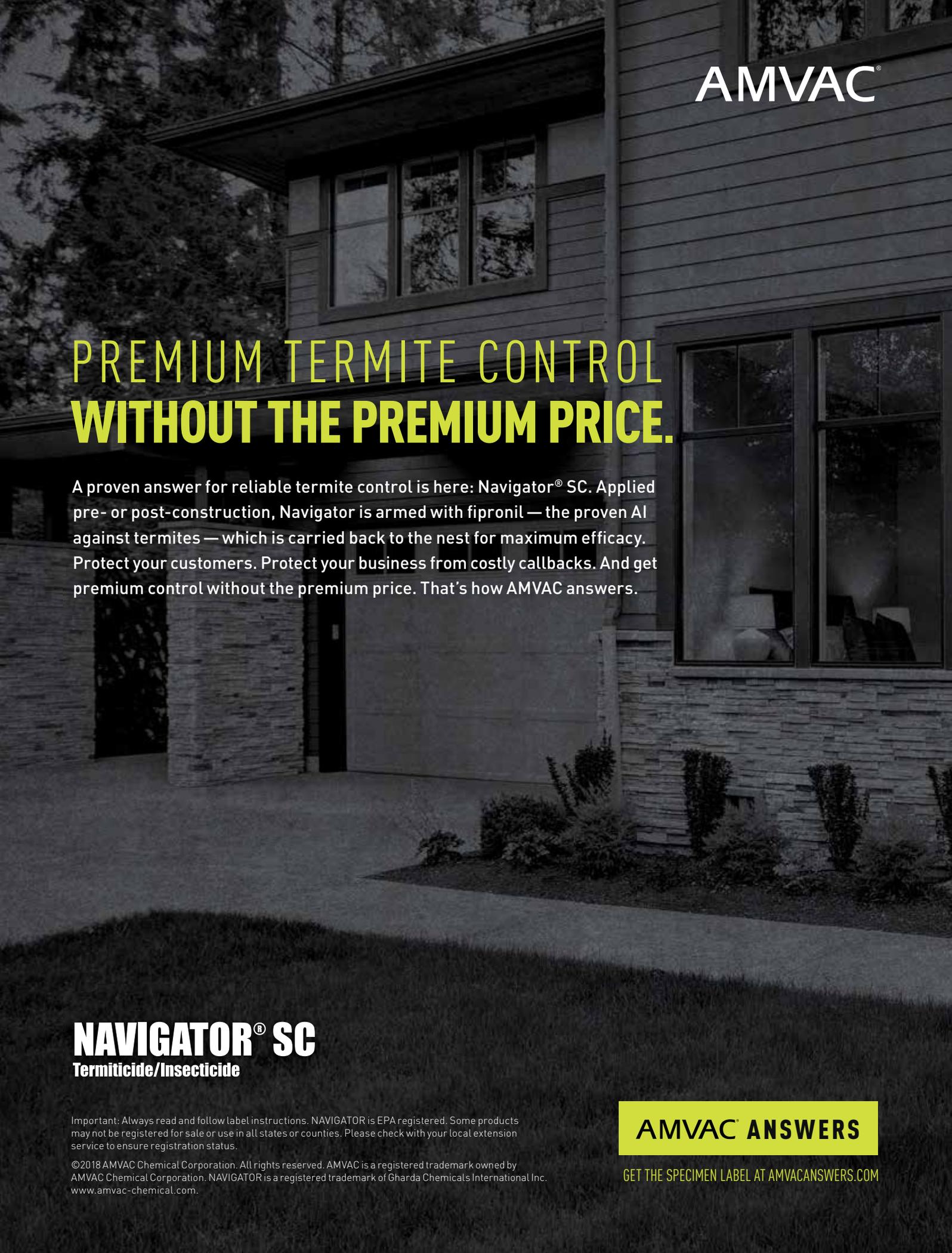
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# Thankful

## Message from the President of FPMA

Steve Lum

FALL HAS ARRIVED, and winter is fast approaching. Time marches on as 2018 seemingly races to a close. In a few short weeks, 2018 will be history.

In my last message I shared how we have great opportunities in the fourth quarter of the year to make up any shortfalls in our business goals for the year. I explained there is a direct relationship between attaining goals and the quality of our people, and especially the quality of the leader.

I mentioned the importance of taking advantage of opportunities for learning and networking presented by FPMA and by other industry partners. Opportunities exist for advanced development at region meetings, conferences, and at special events like the “Behind the Scenes” tours, and of course, through training at University of Florida’s own Pest Management University.

I explained the need to make and execute plans. Hopefully many of you are working on your plans and are adapting the action plans as needed so you can advance daily toward your income and profit goals for the year.

In today’s message I want to touch on a concept that complements advanced planning and training. Work is of the utmost importance, but focusing on work and on profit alone will only get us so far.

There is a way to exponentially grow and develop over time, and that is through caring for your customers, coworkers and loved ones as if your future depends on them, because it does. None of us is a really self-made man or woman. We succeed or fail largely due to the people around us.

As in many industries, the pest management industry is a people business. Pest management is what we do, and caring stewards of people and the planet is who we really are. We simply use pest management as a vehicle through which we help others.

Tops on our list of caring are our clients, our families, our coworkers and ourselves. It is people who matter most, yet we can become so busy doing the work that we begin to

see people as replaceable tools and machines that do the work. Sometimes we even view clients simply as replaceable assets.

Once we cross that line we are no longer connected to life. We are no longer living and, in my opinion, we are no longer moving forward in life. Life is better, more fulfilling and more profitable financially and experientially when we acknowledge each other — when we consider others above ourselves.

All over America, November 22 is Thanksgiving. We set aside one day a year to give thanks. What if we thanked others every day? What if we woke up thankful for the day instead of stressed about work? What if we regarded as special the people that God or fate put in front of us each day?

What would happen? **PP**

**Steve Lum**  
President, FPMA

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Register at [www.flpma.org](http://www.flpma.org) under "Events."

# Hurricanes and Pests

AT THE UF Urban Entomology Lab we are often asked about the effect of weather on pest populations. This year we had the strongest hurricane anyone remembers hit the Panhandle and devastate the area.

Lots of people need help, and we are sure that many of our readers in the western portion of Florida need help. A hurricane the strength of Michael disrupts pest control company infrastructure, employees' lives and property, and even their ability to continue service for their customers. That disruption is likely to continue for months, putting pest control businesses in financial hardship as well as their employees in turmoil. We certainly hope they will survive and rebuild their businesses.

Although we often think about these human impacts of hurricanes on our lives, it is important to remember that insects often survive and thrive when these natural disasters happen. In fact, the state has set up emergency services to these areas to provide protection from mosquitoes and mosquito-borne diseases. But that is just one of the pests that will thrive due to the hurricane damage.

## MANY INSECT PESTS WILL ABOUND

Flies immediately come to mind when a hurricane like Michael devastates an area. Stores and warehouses are without power and refrigerated food remains at room temperature for days. Because infrastructure is disrupted, garbage is not picked up. So food is often thrown out of supermarkets and warehouses onto the ground around their loading docks. There is nothing else that can be done with these supplies. When food rots, flies flourish.

Also, the disruption of infrastructure means that human and animal waste may not be processed in a sewage treatment plant. Often toilets and septic tanks overflow and provide nutrition for house flies and other filth-breeding flies. When there is no power, the pumps at sewage lift stations may not work, and backups occur. Flies in these situations may go from egg to adult in less than a week. Weather is usually warm, and there certainly is an abundance of filth for them to speed development.



## Hurricane Michael, October 2018

In fact, after Katrina I was told that when Louisiana sprayed for mosquitoes, people could hold their cupped hand out and it would completely fill up with flies. Filth flies actually have faster reproduction than mosquitoes, so after a hurricane, flies are one of the first pests to arrive. And along with flies comes the danger of fly-borne diseases, like cholera, Salmonella and other pathogens that flourish in filth. You can imagine that control of flies in the aftermath of a major hurricane is almost impossible.

But the problems do not stop with flies and mosquitoes. Fire ants evolved in parts of Brazil where there is frequent flooding. So fire ant populations are not really affected by storms or excessive rainfall. In fact, fire ant colonies have developed methods to avoid drowning. The whole colony holds onto one another and forms a ball of fire ants that floats on water. Even the brood are protected in the center of the ball. The ball rotates so an ant never stays under the water long enough to drown.

There are many stories about these balls of fire ants attacking people who are swimming in the flood being attacked by thousands of fire ants. It is not bad enough that these victims have been relocated from their homes by water. During the flood, they often experience being attacked and stung by these floating balls of fire ants.

You would think that the best news about flooding from a hurricane would be that subterranean termites would drown. Termites do not escape drowning by moving to higher ground. What they do is enter a

state of immobility to hold their breath. There have been several studies about termites and their ability to survive floods. Eastern subterranean termites have been found to be better at holding their breath than Formosan termites. About 50 percent of termites survived under water for 20 hours. Formosan termites are less durable, and about 50 percent die after 11 hours under water.

Formosans are well known for infesting flood-prone areas. So their approach to survival is to have part of the colony above ground in trees or structures.

One purpose of the above-ground carton nest is to provide shelter in trees during floods. Although colonies of termites are flooded, they do not escape the impact of a hurricane. One study demonstrated that 75 percent of a subterranean termite colony may be killed by flooding.

People whose lives are disrupted by hurricanes often go to shelters and live for extended periods of time with large numbers of others. These are great situations for other kinds of pests, like lice, bed bugs, and scabies mites. These days people do not pay attention to these pests as much as they should in times of disaster. There will be a great likelihood of outbreaks of these insects and mites that live on or near where people sleep.

The hurricanes in Florida present many challenges for pest control. Luckily, the Florida pest management industry is one of the best and biggest in the world. They are known for their generosity and service. We need to be proud of having saved as many people as possible from the effects of flies, mosquitoes, fire ants, bed bugs, lice, termites, and other insects that affect people during and after disasters. **PP**

— Dr. Philip Koehler,  
Managing Director, *PestPro*



**CORRECTION:**  
In the September/October issue, this photo of carpenter ants was mislabeled as fire ants.

# Florida Wildlife Laws

## That Affect the Fumigation and Pest Control Industries

### WHAT IS A nuisance wildlife species, and what methods can be used to control it?

F.A.C. 68A-9.010 Taking Nuisance Wildlife<sup>1</sup>

(1) Wildlife that may not be taken as nuisance wildlife:

- (a) Species listed in Chapter 68A-27 F.A.C. (Endangered or Threatened species).
- (b) The following mammals:
  1. Black bear.
  2. Deer.
  3. Bats — Except that bats may be taken either when:
    - a. The take is incidental to the use of an exclusion device, a device which allows escape from and blocks re-entry into a roost site located within a structure, or incidental to the use of a registered chemical repellent, at any time from August 15 to April 15, or
    - b. The take is incidental to permanent repairs which prohibit the egress of bats from a roost site located within a structure provided an exclusion device as described in sub-subparagraph a., above, is used for a minimum of four consecutive days/nights for which the low temperature is forecasted by the U.S. National Weather Service to remain above 50° F prior to repairs and during the time-period specified.
  4. Bobcat.
- (c) The following birds:
  1. All birds listed in 50 C.F.R. §10.13 (as protected by the Migratory Bird Treaty Act unless the take is authorized by the U.S. Fish and Wildlife Service by a permit or depredation order).
  2. Bobwhite quail.
  3. Wild turkey.

(2) Methods that may not be used to take nuisance wildlife:

- (a) Gun and light (except armadillos, coyotes, feral hogs on private land, roof and Norway rats).
- (b) Steel traps.
- (c) Live traps and snares unless they are visited at intervals not exceeding 24 hours.
- (d) Poison, other than those pesticides that are registered by the Florida Department of Agriculture and Consumer Services without additional authorizations and are only used in a manner consistent with the product labeling.
- (e) Bat exclusion devices or any other intentional use of a device or material at a roost site which may prevent or inhibit the free ingress and/or egress of bats from April 16 through August 14.
- (f) Any method prohibited pursuant to Section 828.12, F.S.

### THE DEFINITION of animal cruelty in Florida could relate to pest control.

Sections related specifically to livestock species have been omitted, but can be viewed in their entirety at the website below.<sup>2</sup>

*Florida Statutes Chapter 828 ANIMALS: CRUELTY; SALES; ANIMAL ENTERPRISE PROTECTION*  
828.12 Cruelty to animals. —

(1) A person who unnecessarily overloads, overdrives, torments, deprives of necessary sustenance or shelter, or unnecessarily mutilates, or kills any animal, or causes the same to be done, or carries in or upon any vehicle, or otherwise, any animal in a cruel or inhumane manner, commits animal cruelty, a misdemeanor of the

first degree, punishable as provided in s. 775.082 or by a fine of not more than \$5,000, or both.

(2) A person who intentionally commits an act to any animal, or a person who owns or has the custody or control of any animal and fails to act, which results in the cruel death, or excessive or repeated infliction of unnecessary pain or suffering, or causes the same to be done, commits aggravated animal cruelty, a felony of the third degree, punishable as provided in s. 775.082 or by a fine of not more than \$10,000, or both.

- (a) A person convicted of a violation of this subsection, where the finder of fact determines that the violation includes the knowing and intentional torture or torment of an animal that injures, mutilates, or kills the animal, shall be ordered to pay a minimum mandatory fine of \$2,500 and undergo psychological counseling or complete an anger management treatment program.
- (b) A person convicted of a second or subsequent violation of this subsection shall be required to pay a minimum mandatory fine of \$5,000 and serve a minimum mandatory period of incarceration of 6 months. In addition, the person shall be released only upon expiration of sentence, is not eligible for parole, control release, or any form of early release, and must serve 100 percent of the court-imposed sentence. Any plea of nolo contendere shall be considered a conviction for purposes of this subsection.

(3) A person who commits multiple acts of animal cruelty or aggravated animal cruelty against an animal may be charged with a separate offense for each such act. A person who commits animal cruelty or aggravated animal cruelty against more than one animal may be charged with a separate offense for each animal such cruelty was committed upon.

<sup>1</sup> <https://www.flrules.org/gateway/RuleNo.asp?ID=68A-9.010>

<sup>2</sup> [http://www.leg.state.fl.us/statutes/index.cfm?App\\_mode=Display\\_Statute&URL=0800-0899/0828/Sections/0828.12.html](http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0800-0899/0828/Sections/0828.12.html)



Watch for bat houses attached to the walls of the building. Check them to see if they are occupied. Most will not be occupied, but check them.

# Wildlife *and* Fumigation

William H. Kern, Jr.

**I**N 2018, we in the fumigation industry had several newsworthy incidents. This is never good for our industry.

## ISSUE 1

A colony of bats was killed in a structure during a fumigation. The Florida Fish and Wildlife Conservation Commission (FWC) was pursuing criminal charges for this incident as of September 28, 2018. It is a good idea to refresh our knowledge of the wildlife laws, shown on page 8, that may affect the fumigation and the pest management industries.

Bats are becoming a conservation concern of the public and the FWC. Therefore, what should a fumigator do to protect himself and his company?

I recommend adding the following lines to the pre-fumigation customer checklist.

- ✓ Are you aware of bats roosting in your building?
- ✓ Are you aware of any birds or other wildlife nesting, roosting, or denning in your building?

If property owners tell you no, then they have some liability

for any accidental take of bats or other wildlife.

If they tell you yes, then they must schedule and complete an exclusion or renovation at the appropriate season: between August 15 and April 15 for bats, and later fall for chimney swifts.

The fumigator is ultimately responsible for fumigating a structure occupied by wildlife. Bats and some wildlife species invading structures can be highly cryptic, so even the homeowners or residents are unaware of their presence. Here's what to look for during inspections:

### Evidence of Bats in a Structure

- Bats flying around at dusk. Few pest inspections are done after dark.
- Bats seen roosting in the attic space during inspection or fumigation preparation.
- Staining around roost entrance.
- Droppings on the outside of the structure.
- The sound of colony chatter — squeaking — from inside the structure.
- The homeowner tells you they have bats. They may even want you to fumigate to kill the bats. Don't do it!

If bats or other protected wildlife species are present, the property owner must arrange for and have an exclusion completed before scheduling the fumigation.

Other species to look for include chimney swifts, barn owls, and Carolina wrens<sup>1</sup>, as well as raccoons, opossums, and squirrels because of the odor resulting from their accidental take during a fumigation. In the case of chimney swifts, barn owls, and Carolina wrens, perform the exclusion after they have migrated away or finished nesting and fledged their young.

Concerns over accidental killing of nontarget pets, feral animals such as cats, and wildlife make it advisable to check the crawlspace under the house as well. Furthermore, a quick check could save a human life.

Just an inspection from the hatch with a flashlight might have prevented a human fatality in Orlando this year. Prior to this tragic incident, I never would have considered the need to inspect the crawlspace under a house for a person living or hiding there. Now we should check crawlspaces for homeless persons as well as feral cats, raccoons and opossums.

*Continued*



**Southeastern bat**



**Seminole bat**



**Tricolored bat**



*Staining around a bat roost entrance.*



*Bat droppings below a roost entrance on the outside of the structure.*

<sup>1</sup> Protected by the Migratory Bird Treaty Act, 16 U.S.C. 703 (MBTA)

## ISSUE 2

The increasing use of polyurethane spray foam insulation, or PSFI, to completely seal the attic space, including covering of the attic vents, has created some concerns regarding fumigation. This technique is sometimes called attic encapsulation.

The problem is that this airtight encapsulation of the attic makes aeration extremely difficult, and current aeration procedures may be inadequate to reach 1 ppm clearance level in the normal aeration time frame. You are ultimately responsible for clearance of the structure to 1 ppm.

The attic is now part of the living envelope of the building. That means you must clear the attic space to 1 ppm of sulfuryl fluoride and check that off-gassing — desorption of SF — from the foam insulation does not cause the concentration of sulfuryl fluoride to creep back up above 1 ppm.

Due to these concerns and lack of proven aeration procedures for this type of construction, Douglas Products has recommended that their products not be used to fumigate these construction or remedial renovation situations (see box at right).

Ensystem II issued an advisory on September 21, 2018, that single-family homes with PSFI attic encapsulation should not be treated with Zythor structural fumigant.

Your inspector/sales person is responsible to check the attic to determine if this technique of insulation has been used. The certified operator in charge should be informed of this fact before any contract is signed. Finding this situation while installing the attic fans during fumigation preparation is too late.

The manufacturers and the research community will be working on collecting information on how to safely use sulfuryl fluoride in structures with polyurethane spray foam insulation. You will be kept informed by your registrants during their annual and first-time stewardship trainings. **PP**

---

*William H. Kern, Jr. is Associate Professor of Entomology at UF/IFAS Ft. Lauderdale Research and Education Center.*



*Examples of attics enclosed with polyurethane spray foam insulation, or PSFI.*

## Vikane Restrictions

Because of concerns and lack of data, Douglas Products issued the following notice.

“Effective Immediately — Notice of Recommended Restrictions on Use of Vikane® (Master Fume®) Fumigant in Attics Enclosed with Polyurethane Spray Foam Insulation (PSFI)

### **To All Customers Using Vikane® Fumigant:**

This notice provides important information on the safe and effective use of Vikane (and Master Fume) that should be followed by all users and potential users of Vikane (and Master Fume) in all cases, without exception. It appears possible that a recently developed method for insulating unfinished attics with polyurethane spray foam insulation (PSFI) in single-family residential structures constructed on-site can require extended aeration times when the current label-prescribed aeration procedures are used to obtain a concentration of 1 ppm or less of Vikane (and Master Fume) in the breathing zones of all rooms before the structure can be reoccupied.

The concerns arise from the application of open or closed cell PSFI to cover the underside of roof sheathing (either between or over the roof rafters or joists) in attics where the PSFI also partially or fully covers access to attic air circulation vents (including those in soffits, gable end-walls, and roof ridges). These attics have PSFI applied to create an unvented attic, which does not have a functional passive or active ventilation system(s) that enable air movement between the attic air space and outdoor air.

Therefore, in an abundance of caution, Douglas Products is strongly recommending that the fumigation industry cease using Vikane (and Master Fume) to fumigate single-family residential structures constructed on-site, and other structures of similar construction, with unfinished attics insulated with PSFI as described above. This notice applies to the current label-prescribed Aeration Procedures 1 and 2 and the California Aeration Plan (CAP).

Douglas Products is evaluating information it has received about the extended aeration time frames and has notified EPA and regulatory agencies in key states where Vikane (and Master Fume) is used of this Notice and the restrictions it is recommending its customers to follow. Please contact your local Douglas Products representative if you have any questions. We greatly appreciate your continued use and stewardship support of Vikane (Masterfume).”

---

*This notice was issued on September 18, 2018, by Heather Kern, Commercial Leader, Douglas Products.*



# LARGE PATCH

*A cool-weather disease in warm-season turf*

Erin Harlow and Philip Harmon

As the weather cools, watch for large patch — especially on St. Augustinegrass and ‘Empire’ Zoysiagrass. This disease may affect any warm-season turfgrasses in Florida.



**A**S WE MOVE into fall and winter, you may notice the unmistakable circular brown, dead areas caused by *Rhizoctonia solani*. Long known as brown patch, we now know that brown patch and large patch are actually two different strains of *Rhizoctonia*, with large patch affecting warm-season turfgrasses.

Large patch disease symptoms include round circles of yellowing and dying turf that can grow to 6 feet or more in diameter. Active large patch typically has a red and yellowish outer ring where the pathogen is most active. Because this disease affects the lower leaf sheaths, the turf can easily be pulled up from the stolons and roots. Newly infected plants will have a water-soaked appearance at the base of the blades that moves upward as the disease progresses.

The infection of large patch on turfgrass is temperature dependent. This disease becomes active in the fall and spring because the pathogen infects the lower leaf sheaths when

the thatch layer reaches between 50°F and 75°F and there is moisture for approximately 48 hours. So cool, wet days are perfect for this disease to explode in a lawn.

The disease development can be encouraged by a thick thatch layer, increased soil moisture, and low mowing heights. Excessive irrigation and late fertilizations also improve the success of large patch in a lawn.

## **MANAGING LARGE PATCH in TURF**

There are two approaches to large patch management: proactive and reactive. The proactive approach is to apply a preventive fungicide before the disease becomes established. This is a great approach if the large patch reoccurs each year on a site.

Recordkeeping can be an important part of the integrated management program, and technicians should be encouraged and trained how to properly document diseases on a property. This approach also allows you to use less fungicide and get better results.

*Continued*

Photo at right:  
Large patch disease  
develops during  
cool, wet weather.



Harold Jones

Timing is important because the fungicide really needs to be applied prior to disease development. This means that timing will vary depending where you are in the state. The farther south you travel, the later in the year the application would be made. During normal-weather years, north Florida would aim to have their product down in mid to late September, central Florida might aim for October, and South Florida November.

Again, it is really dependent on moisture and soil and air temperature. Air temperatures between 65°F and 75°F for a couple of days, coupled with moisture, are pretty good indications that large patch is coming.

After symptoms develop, a reactive approach would be utilized. Typically, this is going to result in higher application rates, more expensive products, more stress on the turf, and possibly higher overhead due to callbacks.

#### LARGE PATCH RESEARCH

The University's plant pathology department has been conducting fungicide trials for many years and evaluating how well fungicides work on large patch. Some great new additions to your large patch program include flutolanil (ProStar), penthiopyrad (Velista), and fluopyram (Exteris). These are all part of the SDHI (succinate dehydrogenase inhibitors) group of fungicides.

Budget-friendly options still include the DMI fungicides such as propiconazole (Banner Maxx II),

*Continued on Page 15*

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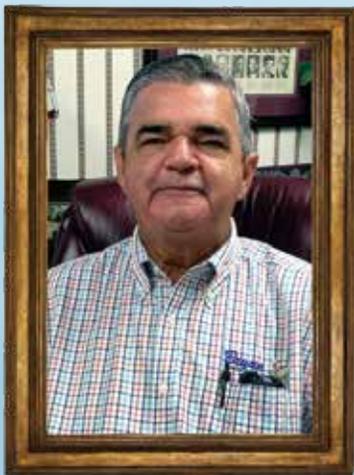
Healthy turf

**Name:** Bryan O. Grimes

**Hometown:** Opp, Alabama

**Where you live now:** Fort Walton Beach, Florida

**About your company:** After working in the pest control industry for over 15 years, I decided it was time to start my own company. God has blessed me and my family in tremendous ways. We started Bryan Pest Control in 1977 out of my home as a one-man operation. The company has grown



**Bryan O. Grimes**

steadily and now employs 65 team members. We have one main location, three branch offices and serve five counties in northwest Florida. We take pride in staffing with individuals who represent our company with the values and integrity that we believe.

**First paying job and what you learned from it:**

I was living in Winter Garden, Florida, at the time as an 11-year-old boy. There was an elderly couple who owned a shoe repair store in town. The woman would roast peanuts, and after school I would go to the store and sell the peanuts for her at 10 cents a bag. She would pay me 2½ cents for each bag that I sold. I quickly learned that I enjoyed having some spending money in my pocket, and I was actually a very good salesman.

**First break in the pest business:** Soon after I started Bryan Pest Control in March 1977, I was awarded a contract at Eglin Air



Force Base to perform the pest control services for all of the military housing structures.

**Best business book:**

Favorite book to read daily is the Bible, especially Proverbs 3:5 and 6.

**Best piece of business advice you received:**

Always treat people —

your customers — the way you say you will.

**What is the most important trait you look for when hiring?** Positive attitude.

**What you would tell someone new to the pest business?** Be honest, trustworthy, and reliable; do what you say you will do.

**Where can we find you when you are not at the office?** Working around my home, in my vegetable garden, or playing golf. **PP**

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Grass leaf bases are dark and rotted

## LARGE PATCH quick facts

**Pathogen:** *Rhizoctonia solani*

### Turfgrasses Affected:

All warm-season turfgrasses, especially St. Augustinegrass and zoysiagrass, can be affected.

**Occurrence:** This disease is most likely to be observed from November through May when temperatures are below 80°F. It is normally not observed in the summer. Infection is triggered by rainfall, excessive irrigation, or extended periods of high humidity resulting in the leaves being continuously wet for 48 hours or more.

**Symptoms/Signs:** The fungus infects the leaf area closest to the soil, eventually killing the leaf. A soft, dark rot occurs at the base of the leaf, and leaves can easily be pulled off the stem — see photo, above left. The base of a pulled leaf has a rotted odor. Roots are not affected by this pathogen.

This disease usually begins as small patches about 1 foot in diameter that turn yellow and then reddish brown, brown, or straw colored as the leaves start to die. Patches can expand to several feet in diameter. It is not uncommon to see rings of yellow or brown turf with apparently healthy turf in the center. Turf at the outer margin of a patch may appear dark and wilted.

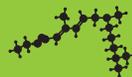
— M.L. Elliot and P.F. Harmon  
UF/IFAS



Bill Barrs,  
Regional  
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*Large Patch, continued from page 12*

triadimefon (Bayleton), and myclobutanil (Eagle). These products have to be applied prior to symptoms developing to be most effective.

The QoI fungicide group is also a good choice when needing a reactive approach and includes products such as azoxystrobin (Heritage). Two-way mixes of products such as trifloxystrobin + triadimefon (Armada) and azoxystrobin + propiconazole (Headway) provided excellent results.

Large patch management should be an integrated approach and not rely solely on chemicals. The importance of proper mowing height, thatch removal, and proper fertilizer timing cannot be emphasized enough. Successful, disease-free accounts rely on these factors just as much as the proper identification of diseases and product selection and timing.

## DIAGNOSING LARGE PATCH

To assist with diagnosing turf-related pathogens, the UF Plant Diagnostic Clinic provides two options for turf managers to receive diagnosis. The first is the regular plant disease submission. This process costs \$40 per sample and takes a couple of weeks to receive results.

The Rapid Turf sample submission is for managers who need a quick turnaround time of 24–48 hours. The lab will give you an initial diagnosis and then plate the disease to confirm. This process is \$75 and well worth the extra money.

Both programs and forms can be found at the UF/IFAS Plant Diagnostic Center website at <https://plantpath.ifas.ufl.edu/extension/plant-diagnostic-center/>. **PP**

---

*Erin Harlow is the Commercial Horticulture Agent for UF/IFAS Extension Duval County. Dr. Philip Harmon is a Professor and Extension Specialist for the UF/IFAS Plant Pathology Department.*



**Booklice can indicate a moisture problem in a home**



***Psoquilla marginepunctata***



**Booklice found in a box of Cream of Wheat**

*Photos by Lyle J. Buss.*

## Booklice in the Home

Lyle J. Buss

**A**MONG THE smallest insects you'll find infesting homes are the psocids ('sō-səds). Most psocids live outdoors and are called *barklice*. Species that can live inside buildings are called *booklice*.

You may already be familiar with booklice that infest stored foods in the kitchen and pantry. These booklice are usually wingless. They get the name booklice because they can feed on the starch in the bindings of old books.

Booklice may also feed on mold, so they are often associated with damp areas in homes. Therefore, the presence of booklice in a home may indicate a moisture problem, where a water leak or condensation has led to mold growth.

Sometimes they can be a problem in newly constructed houses. In these cases, building materials may be damp, or moisture gets trapped inside walls, leading to growth of mold or fungi.

Many of the booklice that feed on mold in homes have wings. Most are difficult to identify to the species level, but one of the more distinctive species of booklice is *Psoquilla marginepunctata* — sorry, no common name! It is tiny at under 2 mm long, but the wings are clear with bold, black markings. Within North America it is only known from peninsular Florida, and it is mainly found in buildings.

Booklice that infest books and stored food products are obviously pests that cause damage. Other booklice that feed on mold are not really damaging, but they are nuisance pests. Even more importantly, their presence may indicate a moisture problem that needs to be fixed. Correcting the moisture problem and drying out the area should lead to the disappearance of the booklice. **PP**

---

*Lyle J. Buss, Scientific Photographer, manages the Insect Identification Lab at the UF/IFAS Entomology and Nematology Department.*



# TERMITES MOVING PARTICLES

Roberto M. Pereira and Philip G. Koehler

Social insects such as ants and termites build empires by working together. At the UF Urban Entomology Lab, we work hard to understand pest insects. Gather 'round as we reveal an unusual aspect of our termite research.

**Termite mound in Australia, built bit by bit. The mound serves as ventilation for a subterranean nest.**



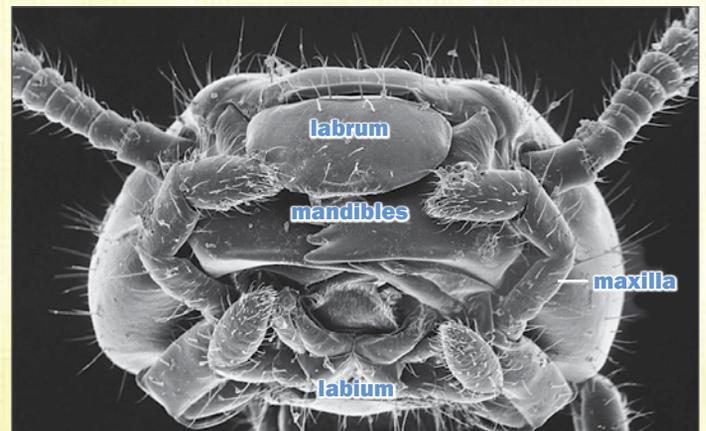
**H**AVE YOU noticed that ants and subterranean termites build enormous nests and tunnels without using any tools? They have no way to carry their building materials except for using their mouthparts. Termites tunnel through soil and build their nests by moving soil particles and doing just about everything else using their mouthparts.

In fact, in order to move through soil, termites have only three options: 1) they can move individual soil particles by picking them up with their mouths and moving the particles somewhere else; 2) if a particle cannot be picked up with the termite mouthparts, the termite

can push the particle sideways, as long as it is light enough for that; and 3) termites can squeeze between soil particles that are too heavy to be pushed aside.

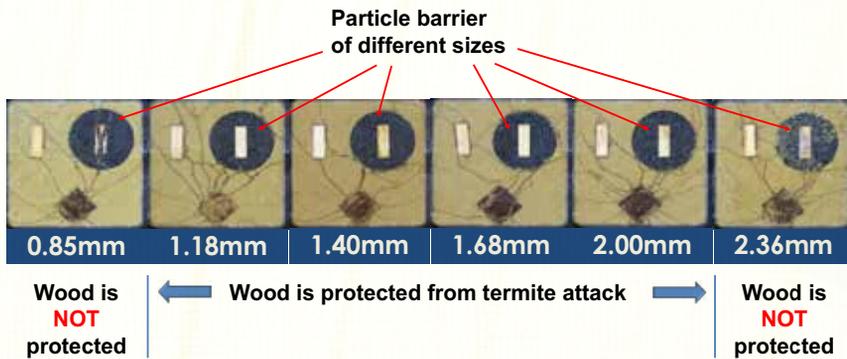
Thus, in building tunnels and nests, we can observe that a termite will excavate the soil particles and move them from their original location into the termite buccal cavity, or mouth. The termite may load several small particles in the buccal cavity, packing them so they can be transported somewhere else.

The mandibles, maxillae, labrum, and labium — mouthparts in a termite — hold the sand particles together until termites arrive at the deposition site. There, the particles can



Front view of termite head showing mouthparts





be unloaded and used in the construction of tunnels and galleries.

So the particles that can be moved by termites are determined by the size of the termite and its mouthparts, the size of the particle itself, and the weight of the particle, because even a particle that is small enough could be too heavy for the termite to move.

Now that you understand the process, you can figure out that there are three sizes of particles that the termite is able to identify: 1) particles that will fit in their buccal cavity either alone or with other particles; 2) particles that they can push aside with their head but cannot be carried; and 3) particles that are too large to move and that the termite must navigate around.

**TO MOVE or NOT TO MOVE?**

In the laboratory we can figure out the particle sizes that different termites can or cannot move. It is a simple process: We give termites a bunch of different particles and check which ones they are able to move. The termites will move these particles either to get to food (wood) or to build tunnels

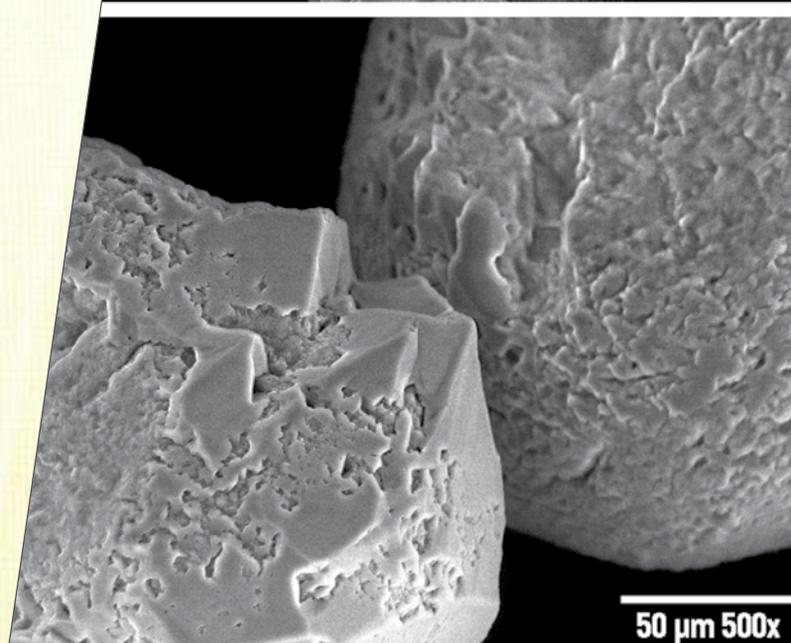
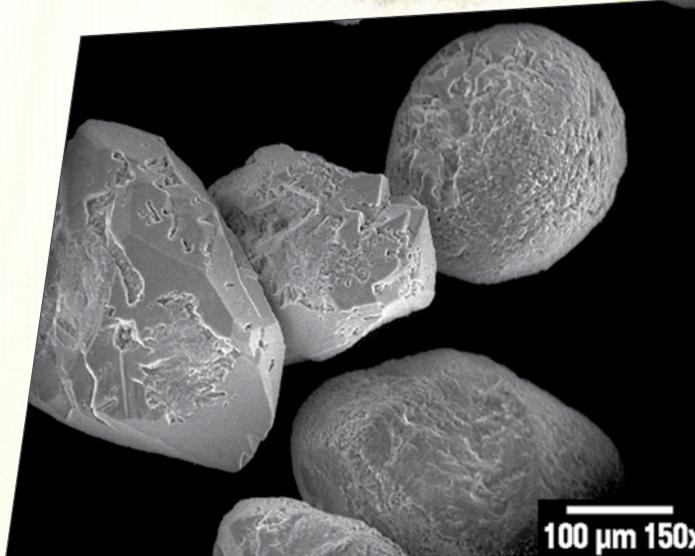
in which to move around. But even among the particles that the termites can move, they may actually choose to move some types of particles more than others.

How do we know that? We asked the termites! Not in words, of course, but by offering them a bunch of particles of a size they could move, and then looking at the particles they moved.

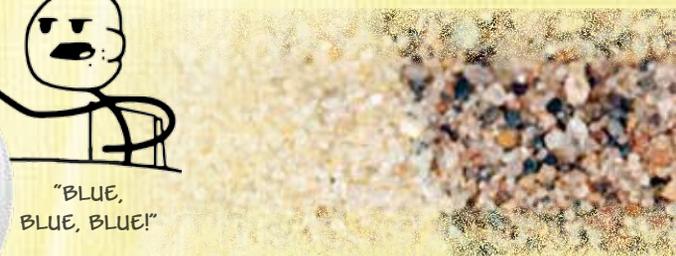
We then compared the characteristics of the particles that were moved and the particles left behind. The particles that were moved represented the particles the termites chose to move. The particles left behind were a mixture of particles that termites could have chosen but did not have time — in our experiment — to move, and particles that the termites would not have chosen to move.

Imagine yourself in front of a bowl of M&M's. You can eat all the M&M's — and you may eventually do so! — but you may choose to eat some first, either because they are your favorite color or some other odd reason. By the way, you know they all taste the same, right?

*Continued on page 20*



Extreme closeups of sand particles





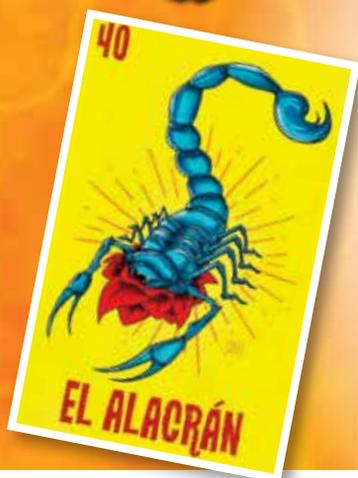
Hussein will focus on teaching and mosquito research.



Family time



## Q AND A with URBAN LAB GRADUATE **HUSSEIN**



### Were you always interested in entomology while growing up in Mexico?

I became interested in insects when I was in high school, collecting and preserving in alcohol all the insects that I could catch.

### What path did your education take?

When I was student at the undergraduate level, I was interested in med/vet entomology. However, I got my bachelor's degree in agricultural

parasitology in 1983. This area includes phytopathology, weeds, nematodes, equipment for pesticide application, and of course, entomology.

In 1987 I got my MsC degree in entomology, and my thesis was about control of some stored grain pests.

### In what other ways have you pursued your entomology career?

I always have been interested in teaching. At the age of 24 I started teaching medical and veterinary entomology at the undergraduate level in Mexico. Now I teach three regular courses related to insects as pests: two at the graduate level (urban entomology and med-vet entomology) and one at the undergraduate level (urban pests), so I am a little busy teaching!

### How is teaching college in Mexico similar to teaching in the United States?

Working at Colegio de Postgraduados [in Montecillo, Mexico] means that you need to teach at graduate level and do research accordingly. Being a professor in Mexico includes having to advise students and guide them during their studies toward their degree. My particular interest is in applied entomology, so the students interested in urban entomology are always welcome. I have been involved in teaching for 35 years now, and sometimes, I think that it is time to retire.

### Is urban entomology the same in Mexico and the US in terms of subject matter?

I have advised about 35 graduate students in topics related to cockroaches, bed bugs, scorpions, house flies, and mosquitoes. The specific insects that I like to work with are mosquitoes and scorpions, because arthropods have become very important in Mexico in the last 10 years.



Marathon man



Taking flight



Field research

**When did you first decide to visit Florida to continue your education in entomology?**

In 1994, I was planning to do my PhD, and the idea was to do that in another country, because I was inspired by a couple of professors I had at undergraduate level. They guided me to pursue my dreams. At that time, I took a course in mosquito biology taught in Spanish at the Florida Medical Entomology Lab in Vero Beach, Florida. It was a very interesting two-week course taught by Dr. Phil Lounibos.

**And that course must have led to the UF Urban Entomology Lab?**

At that time, I had the opportunity to visit the University of Florida main campus, where I met Dr. Jerry Butler and asked him about the graduate program in med/vet at UF. However, he had no room in his lab and suggested that I talk with Dr. Phil Koehler.

That was a great idea, because I talked to Dr. Koehler and decided

to switch to urban entomology. That was a great decision, and when I got back to Mexico, I made all the arrangements needed and started my PhD program at the UF Entomology and Nematology Department. I finished my PhD program in urban entomology, working with the German cockroach.

**In what ways did you benefit from your time learning at the Urban Lab?**

The thing I appreciate most in the Urban Entomology Lab is that the research is focused on practical issues, and that is why I wanted to do my sabbatical in this lab. I have been working on a project to determine if the insecticides used to control mosquitoes affect honey bees. It is a great opportunity to contribute information on this important issue.

When I went back to Mexico after graduating with my PhD, I got in touch with the pest control industry people and started a good relationship that continues to this day.

**Have your career or research focus changed as a result?**

I usually evaluate the effectivity of insecticides intended to be used in pest control (public health and urban areas). This kind of practical research is required in order for the companies to get the legal registration of insecticidal products. I think I was the first urban entomologist in Mexico. Teaching and doing research about this topic changed my life.

**Are there any other areas of entomology you intend to pursue?**

As part of my job in Mexico, I get involved in different communities that advise the government about the right use of insecticides in public health. Also, I was involved in the administration and was director of the Phytosanitary Institute at Colegio de Postgraduados for two years.

That was a good experience, but I decided that administration is not for me. In the coming years, I will continue teaching and I will focus on mosquito research.

**How about your interests outside of work?**

Taking time to enjoy my family, especially my wife Estela and my son Sebastian, is very important in my life.

Additionally, I enjoy some outside activities like long-distance running and hang-gliding. Both of these sports are passions of mine.

I have been running since I was 18 years old, and as a long-distance runner, I have run the Mexico City and Atlanta marathons. I still run about 12 km (7.5 miles) daily. I have been doing hang-gliding since 1993, and I have flown in different cities in Mexico and also in Colombia.

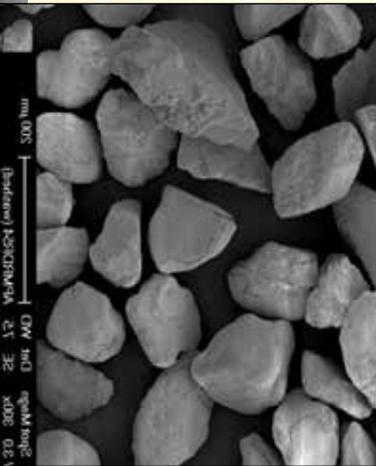
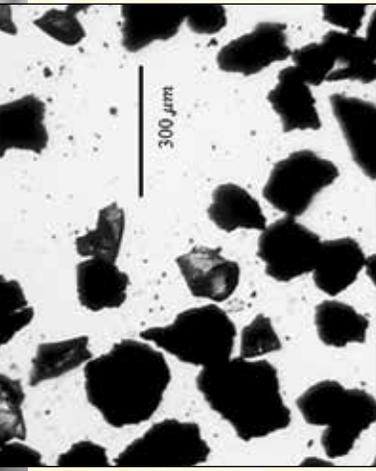
**Any quieter pursuits?**

I do have a hobby that is a little bit more relaxing. I grow orchids at home, and I have about 200 orchid plants now! **PP**



# SÁNCHEZ-ARROYO





**I**N SOME of our experiments, we compared sand particles with shale particles of similar sizes. At a certain size, shale particles are lighter than sand. Not surprisingly, in a certain amount of time termites are able to move a lot more shale particles than sand particles. Shale particles require less effort because they are lighter, so termites are able to dig longer tunnels in shale particles than in sand.

### SIZE MATTERS

For the same reason, no matter what kind of particle, termites are able to move more of the small particles than large particles within a given period of time. For small particles, termites may be able to carry more than one at a time by packing them into their buccal cavities.

The weight of particles may explain why termites may be more abundant and destructive in some areas than others. If the soil consists of particles that are heavy, the termites may have to spend more energy tunneling than termites in another area

where the soil has lighter particles. That may be part of the explanation why termites are a greater concern in certain areas than others with similar climate.

### SHAPE MATTERS

But the really interesting observation we made was that termites do choose to carry certain particles based on the particle *shape*. The particles that termites move are more uniform than the particles that are left behind, indicating that the termites are selecting some particles to move based on something other than just the size of the particle. The particles that are moved by the termites tend to be rounder than the particles not moved.

How do we know all this? We used image analysis, which is just a fancy way to say that we took a picture of the particles and asked a computer to take a bunch of measurements of these particles. Image analysis is really a nice way to analyze soil particles and particles moved by termites.

### WHAT does it ALL MEAN?

So, why is it important to know all this about soil particle that can or cannot be moved by termites? The answer relates to termite control. If we know the particles that termites cannot move, we can use these particles as barriers to prevent termites from reaching a building we want to protect.

But the particles must be of a certain size so that termites cannot move the particles or navigate through the spaces between the particles.

This idea has been around for quite some time, and researchers have determined that different termite species are not able to go through barriers consisting of particles of a certain size. Back in 1957, it was determined that particles with sizes between 1.20 and 1.70 mm (0.05 – 0.07 inches) were effective against the western subterranean termite.

The eastern subterranean termite can be blocked by a barrier with particles between 1.00 and 2.36 mm (0.04 – 0.09 inches), and the Formosan subterranean termite can be blocked with particles between 1.70 and 2.40 mm (0.07 – 0.09 inches).

Extreme closeups of shale (top) and sand particles

### FINAL THOUGHTS

The tricky part of using a particulate barrier is maintaining the integrity of the barrier. Digging by animals, the growth of plant roots, and washing off by rain are just a few problems that may affect particulate barriers and allow termites to overcome this obstacle.

But in many situations, the use of these particle barriers may be a viable alternative or complementary treatment to other termite control measures.

**PP**

*Roberto M. Pereira is Research Scientist and Philip G. Koehler is Endowed Professor at UF/IFAS Entomology and Nematology Department.*



Lance Osborne of UF/IFAS

# UF/IFAS tips to keep urban landscaping profitable, fun and pest-free

Beverly James



Morning glory

**H**OME LANDSCAPING is a booming business in Florida, contributing about \$21 billion to the state economy. But the industry spends millions a year to fight invasive pests such as whiteflies, spider mites and other insects that damage plants. Lance Osborne, University of Florida professor of entomology, is one of many scientists researching ways to keep urban landscaping profitable, fun and pest-free. Osborne, who is based at the UF/IFAS Mid Florida Research and Education Center in Apopka. He was interviewed by Beverly James of IFAS.

**Q: What is a biological control?**

A: Using one living organism to manage another. The biocontrol agent could kill the pest causing all the problems, or it could

simply outcompete the pest for resources. For example, scientists introduced dung beetles to eliminate certain flies. The dung beetle takes the cow dung, buries it in the ground and lays its eggs in it. Flies usually do this, but the dung beetle takes that resource first.

Another example is using predatory mites that eat spider mites. The most widely used chemical was often recommended to control mites in landscapes. But we introduced predatory mites to eat the spider mites. This reduced the need to spray chemicals. We use biocontrols on everything from roses in the yard to tomatoes on a patio.

**Q: Why don't we use more biocontrol agents since it seems to be a way to reduce pesticide use?**

A: Biocontrol is a very big industry in Europe, and becoming very big in the United States. Though the biocontrol agents can be cheap, it is very expensive to ship a living organism. So, the cost is what is hampering the use of biocontrol agents by the general public.

Right now, we are trying to figure out how to make biocontrol agents economical for homeowners and sponsors of community gardens to use.

**Q: Why is it so important to protect this industry?**

A: In addition to overall economic contributions, UF/IFAS economists estimated the industry employs 232,648 full- and part-time workers. So, we have billions of dollars and many, many jobs at stake. The green

*Continued on page 24*

# Tiny USB Microphones Reveal Surprise

## About How Bees Behave

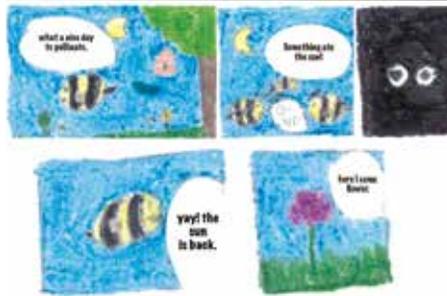
PEOPLE couldn't stop buzzing during the great North American total solar eclipse of 2017. Bees, however, stayed silent.

In fact, the little buzzers stopped flying altogether during the big event, according to research published Wednesday in the *Annals of the Entomological Society of America*.

Though a number of formal studies have looked at animal behavior during solar eclipses, few have tracked insects. So researchers from the University of Missouri had citizen scientists and elementary school teams set up acoustic monitoring stations to listen in on bees August 21, 2017, the day of the first total solar eclipse in 99 years to cross the US from coast to coast.

The researchers anticipated bee activity would drop as the sunlight dimmed, and would reach a minimum at totality.

"But we had not expected that the change would be so abrupt, that bees would continue flying up until totality and only then stop, completely," lead researcher Candace Galen, a professor of biological sciences at the University of Missouri, said in a statement. "It was like 'lights out' at summer camp. That surprised us."



Bee pollination cartoon by student Pierce Plues.

Bees commonly fly more slowly at dusk and return to their colonies at night. That the solar eclipse triggered similar behavior offers information on how the creatures respond when environmental cues occur unexpectedly.

"The eclipse gave us an opportunity to ask whether the novel environmental context — midday, open skies — would alter the bees' behavioral response to dim light and darkness," Galen said. "As we found, complete darkness elicits the same behavior in bees, regardless of timing or context. And that's new information about bee cognition."

For the project, more than 400 participants, including school teachers and

students, set up 16 bee monitoring stations in the path of totality in Oregon, Idaho and Missouri. The stations featured USB microphones the size of flash drives hung on lanyards near bee-pollinated flowers far from foot and vehicle traffic.

Once the eclipse passed, participants sent the sensors to Galen's lab, where the team matched up with the eclipse periods from each location and analyzed for the number and duration of bee flight buzzes.

After the eclipse, student participants learned how to measure the frequency, amplitude and duration of buzzes, and how to use this data to recognize and count bee buzzes in recordings made at their schools. The research team then asked students to draw cartoons illustrating the eclipse from a bee's perspective as a way to synthesize their results.

Those students will have more chances to observe bees during eclipses should they choose. Total solar eclipses are rare, but there are more occurring on Earth between now and 2031, in case anyone wants to give bees the memo. **PP**

— Leslie Katz, c|net

BUSINESS AND OPERATIONS

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# IN PARADISE

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# Seven Steps To Optimize Your Business on Google

Alain Parcan



**C**LAIMING and verifying your business on Google — it's typically Step 1 of any local search marketing strategy. And then unfortunately, it tends to be neglected by businesses happy to just "check the box." I know what you're thinking: "Okay Alain, why so dramatic about this topic?"

If you're reading this, chances are you've already claimed and verified your business on Google, (if not, we need to talk). But your listing — now referred to as Google My Business, or GMB — may be missing some very important pieces. GMB is a top priority for Google and should be for you, too.

Plus there are plenty of new features being rolled out for GMB, including business descriptions, feature lists, and custom posts for events and offers.

These new features are becoming increasingly relevant to pest control businesses like yours this year, simply because ranking high in the Maps section has become an even greater centerpiece to your marketing.

Here are seven simple steps to optimize your GMB listing:

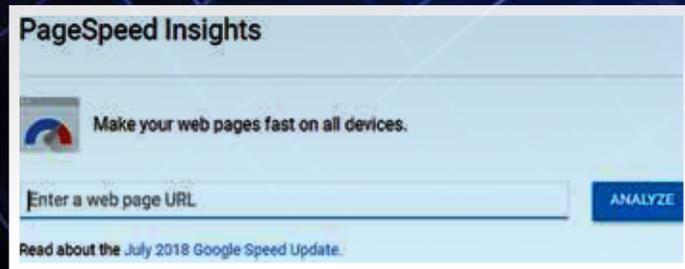
- 1A. Search for your business on Google.
- 1B. Ensure that it is verified — if not, request verification. [Hint: If you don't know how to do these first two steps, feel free to give me a call or email me, and my team will let you know. They can even walk you through the verification process for free.]

2. Take a good nap! You deserve it. Okay, seriously. What I mean to say is, confirm that your listing has an accurate "NAP": name, address and phone number.
3. List your hours of operation.
4. Choose a relevant business category.
5. Upload relevant images of your business/staff/equipment.
6. Build reviews. [Hint: This should be a company-wide function.]
7. Publish general posts about your business, and monitor for any new Q&A submissions.

Checking these off shouldn't take long. It's a small investment that could pay off this year, especially as Google brings more emphasis to their GMB section. Keep in mind that like many web marketing strategies, this should be ongoing. It is not something you can "set and forget."

Feel free to reach out if you have questions about this process, and my team and I would be happy to help. **PP**

*Alain Parcan, Director of Marketing for Market Hardware, Inc., contributed this article. Alain brings nearly 10 years of experience in educating businesses so they can market themselves more effectively. Market Hardware helps small businesses compete on the web and offers special discounts for professional association members. You can reach Alain's team at 888-381-6925.*



## BONUS STEP: Use These 2 Google Tools For More Powerful Web Marketing

**M**OST PEST CONTROL professionals would agree: Working with ineffective tools puts you at a disadvantage, especially when compared to working with efficient, finely tuned equipment.

So when it comes to fine-tuning your website's performance, how do you go about finding the best tools? We're here to point you in the right direction.

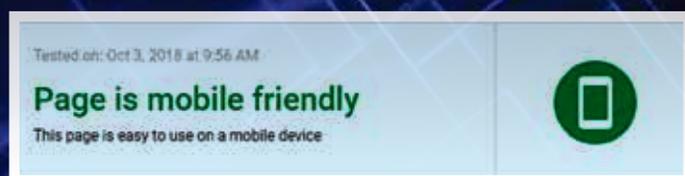
The first tool we recommend is Google's **PageSpeed Insights**, which reports on the real-world performance of a website for mobile and desktop devices and provides suggestions on how that page can be improved. Given the increased urgency for your website to load quickly in order to rank high on Google searches, this is a must-use tool. It will help identify the parts of your website that are slowing down your load time, and it will ensure you can provide visitors with an optimized user experience.

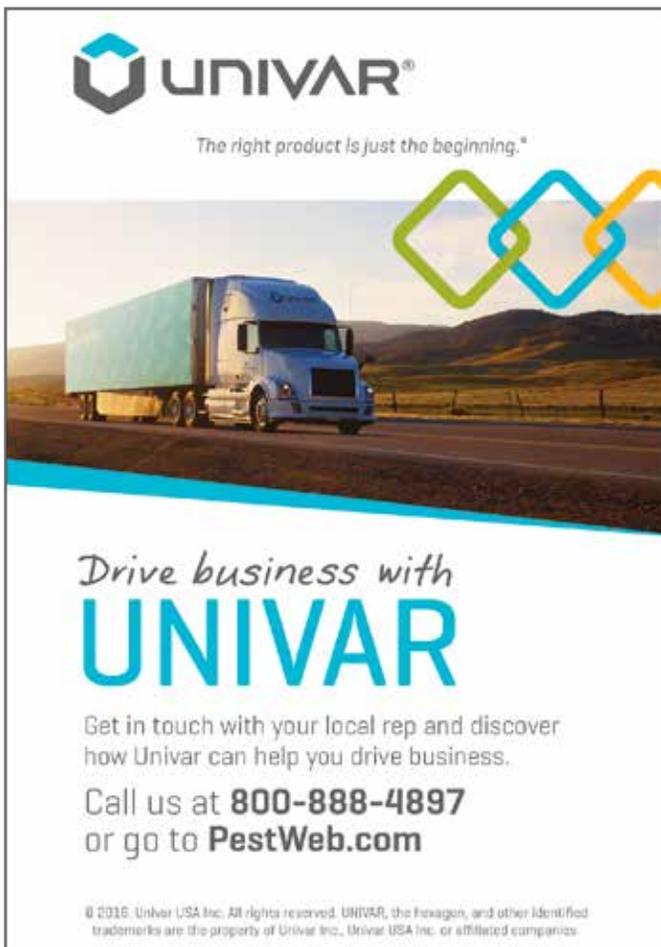
Next up, the **Mobile-Friendly Test Tool** is essential in today's online market. With the web being accessed more and more on mobile devices, designing your website to be mobile-friendly ensures your pages perform well on all devices.

The Mobile-Friendly Test Tool is as simple as could be. It provides a yes/no answer as to whether your website is mobile-friendly. Additionally, it provides a more detailed breakdown of technical information.

Note that while most of Google's earlier tools were aimed at developers, site designers, and other more technical users, these new testing tools are designed for everyday business owners who may not have quite as much technical expertise.

These tools are especially valuable as Google continues to transition to a mobile-first web. Most of their recent algorithm updates have focused on factors like these, so be sure to use these free tools to keep your website ahead of the competition.





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**Seven Decades Strong  
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*Urban Landscaping, continued from page 21*

industry is a powerhouse for Florida, and it's an industry that is vulnerable to pests that could and have costs millions of dollars' worth of damage.

With Florida having new pests becoming established in the landscape every month, I always have something new to work on. There are hundreds of different host plants, so managing the pests on all ornamental plants is a moving target. As soon as we manage one successfully, another pops up.

**Q: Why focus on urban landscaping? Wouldn't it be more economical to focus on farms?**

A: It's a growing trend to grow your own food. We not only have urban gardens, but we also have community and school gardens, and Floridians are growing vegetables in and around their homes. But they don't put a lot of effort into managing diseases on these plants. Homeowners are told to spray chemicals, and some people don't want to spray. And, the pesticides may

not be as effective, especially if the pest has become resistant.

Most people don't have the tools to manage pests in their landscape. That's where we come in. We can give them those tools to successfully manage pests.

**Q: What pests are causing the most problems now?**

A: Whiteflies, mealybugs and thrips. Whitefly issues are huge, and thrips seem to thrive in orchids and roses. As certain chemicals are banned or their use drastically reduced, mealybugs are becoming a major issue. Another issue is that we are not seeing the natural biological control agents we once did. There are five or six types of whiteflies mostly found in home landscapes. They were first found in Palm Beach County, and we can manage some with biocontrols.

There's also the chilli thrips on roses, spider mites, scales, aphids and

mealybugs, which are always present and can increase in severity. Experts recommend a chemical to manage it, but the chemical causes problems in landscapes because of the effect on natural enemies, including pollinators like bees and butterflies.

**Q: What's the next step?**

A: We are trying to figure out a way to get "beneficials" or biological controls to homeowners through the UF/IFAS Extension master gardener program. That would be the best way to manage invasive pests.

For more information, homeowners and landscapers can call the local UF/IFAS Extension office in their county. They can find a list at [sfyl.ifas.ufl.edu](http://sfyl.ifas.ufl.edu).

**PP**

*Beverly James is Director of Public Relations, UF/IFAS Communications. Article from Orlando Sentinel online, October 23, 2018.*

# Falling Apples and Falling Down: Preventing Ladder and Slip/Trip Injuries

Allen Fugler



FOR PEST PROFESSIONALS, maintaining a healthy, injury-free workforce is the key to long-term growth, profitability and company morale. PMPs are familiar with everyday hazards such as auto accidents, insect stings, dog bites, and heat exhaustion. However, they may overlook a common and deceptively persistent threat — one that is a constant characteristic of our physical world: **GRAVITY**.

**L**IKE ISAAC NEWTON, let's look at gravity from a whole new perspective, without the inspiration of the famous falling apple. Let's look at gravity as the most common hazard we face, and how to prevent accidents caused by the most subtle and undeniably most dangerous force in nature.

## Improving ladder safety

Ladders are important tools for PMPs, used in WDO inspections, bird, rodent and bat control, and in structural fumigations. However, falls from ladders are some of the most commonly reported Workers Compensation injuries and OSHA violations. In fact, over 15,000 workers were injured and 113 were killed last year in ladder-related falls.

Occupational Safety and Health Administration (OSHA) guidelines for fall protection and ladder safety, and some simple devices, techniques and company policies, are useful in reducing this hazard that technicians face every day. OSHA is the enforcement agency charged with ensuring worker safety; the National Institute of Occupational Safety and Health (NIOSH) is the rulemaking organization that develops OSHA standards.

Let's start with the ladder: it should be in good condition



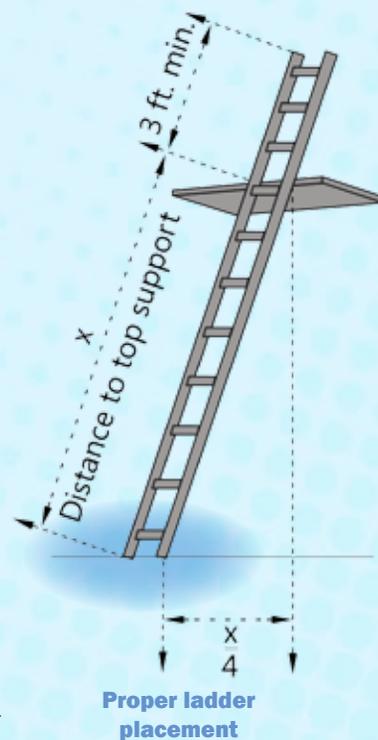
with nonskid feet, solid rungs without cracks or missing pieces, and rated for weight-bearing loads for the technicians and materials using it. For heavier weights and roof access, the use of stabilizer arms at the roofline can increase ladder stability. They are lightweight, inexpensive, easy to assemble and adjustable for a variety of roof types. Many models cost under \$40, store easily, and quickly connect to the ladder at the top of the vertical rails. They are modest investments with high returns of increased worker safety.

Proper ladder placement is critical to its safe use; ladders should be placed on level ground, with at least three feet or rungs above the roofline. The angle of placement is critical to ladder safety; for every four feet in ladder height, the ladder should be placed 1 foot from the structure (known as ladder pitch).

To determine the correct angle of ladder placement, NIOSH provides a measuring tool for use with smart phones, found on their website<sup>1</sup>. You simply open the application (downloadable from the Apple iTunes Store or the Google Play Store), place

your phone along the ladder rail, and read the angle measurement. The app will inform you when the ladder is at the proper angle.

Training on ladder use is critical to worker safety and regulatory compliance; sessions should be documented and training records available in case of an OSHA inspection. Technicians must stay inside ladder rails and maintain three points of contacts when ascending and descending. They must always stay 3 feet below the top rung. When leaning a ladder onto a roof, a fall arrest system must be used for heights greater than 6 feet. *Continued*



<sup>1</sup> [www.cdc.gov/niosh/updates/upd-06-17-13.html](http://www.cdc.gov/niosh/updates/upd-06-17-13.html)



Proper safety shoes can help prevent an accident.

OF COURSE, use of proper footwear can avoid slips and falls from roofs and other surfaces. Safety shoes with nonskid soles and no excessive wear, along with fall protection equipment and training, are inexpensive investments in worker safety that can pay big returns in lower workers compensation claims rates and in experience modifiers.

OSHA fall protection standards for nonconstruction work call for the use of nets or harnesses as part of a fall arrest systems. For heights greater than six feet, where these systems are not possible due to roof configurations, companies should use a spotter and holder at the ladder base.

Inconvenience and expense are not valid reasons for noncompliance to OSHA Fall Protection regulations. These regulations can be found on the OSHA website<sup>2</sup>.

With proper tools and training, you can avoid ladder mishaps, Workers Compensation claims, and OSHA violations and fines. You can maintain a safe, productive workforce and deliver consistent service to your pest control clients.

### Preventing slip-and-fall accidents from the shoes up!

Slip-and-falls may be the subject of comedy video shows such as “America’s Funniest Home Videos,” but for pest control employers, they are no laughing matter.

Slip-and-fall injuries are among the most frequent claims and debilitating injuries, often leading to days away from work, medical expenses and worker’s compensation indemnity payments. The National Safety Council cites annual costs exceeding \$10.7 billion in worker’s compensation alone, with an average medical cost of \$43,000 per accident. Employers should take this issue seriously and conduct documented training programs.

Head trauma is one of the more serious injuries resulting from slip-and-fall accidents and has been a recent focus in the sports world. The settlement of litigation against the NFL by former players, and Will Smith’s portrayal of a pioneering neurologist in the “Concussion” movie have moved the issue of head trauma to greater awareness. A University of Rochester study points to long-term effects can include psychological problems, trouble sleeping, chronic headaches, and memory loss.

Slip-and-fall accidents can also result in fractures and dislocation to bones and strains

*Continued on page 32*

<sup>2</sup> www.osha.gov/SLTC/fallprotection/standards.html

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## Panhandle Update

# Educating Students at Florida A&M University About Mosquito Control

Ben Hottel

**M**OSQUITOES can be a major pest in Florida and a threat to public health because of the diseases they can spread. It is of little surprise, then, that Florida had a county named “Mosquito” from 1824 to 1844. The county was one of only two counties in the territory at the time, the other being Escambia County.

Mosquito County encompassed present-day Orange, Brevard, Indian River, St. Lucie, Martin, Seminole, Palm Beach, Osceola, Polk, and Lake counties in Florida. It is probably a good idea the name was changed, because it is unlikely that tourists would be as excited to book a vacation to Disney World if they knew it was in Mosquito County, Florida.

Disney, however, has not been complacent in the war against mosquitoes here in Florida. Malaria, a deadly disease that is found globally but has been more of a serious problem in sub-Saharan Africa, used to be present in the United States until the early 1950s. The U.S. government commissioned Disney to make a film, “The Winged Scourge,” in 1943. The film educates citizens on the biology, prevention and management of mosquitoes that spread malaria. Disney would later start to develop Walt Disney World in the 1960s, after the eradication of malaria.

In Florida, mosquito control can be performed by pest control companies (Florida Statute Chapter 482) and public mosquito control programs (Florida Statute Chapter 388). Together these groups fight against mosquitoes as nuisance pests but also the spread of mosquito-borne diseases such as West Nile, Zika, dengue, and chikungunya.

There have been a total of 12 human cases of West Nile acquired in Florida this year as of September and no locally acquired cases of Zika, dengue, and chikungunya. While there have not been any locally acquired cases of these diseases, there have been 70, 22, two, and 48 travel-related cases of Zika, dengue, chikungunya, and malaria, respectively. These numbers highlight the importance of ongoing mosquito control efforts in this state.

### Mosquito control for the next generation

On September 21, I took a graduate medical entomology class from Florida A&M University to the Leon County Mosquito Control District in Tallahassee. The goal of this visit was to see how mosquito control programs in the state helped

*Continued on page 31*



Map of Florida before 1844 with Mosquito County present, here called “Musquito.”



Left: Students observe how a BG-Sentinel trap functions. Photo by Ben Hottel.



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## Inspecting and Treating Formosan Termites in Trees

WHO CAN inspect and treat trees for Formosan termites? This question has been asked, and some clarification is necessary, since things may not be as simple as many think.

First, we need to identify the location of the trees to determine if they are in an agricultural area. If the tree is in an agricultural area, then inspection and treatment of any infestation would fall under Florida Statute Chapter 487. Florida Statute Chapter 482 defines an agricultural area as follows: 482.021(1) "Agricultural area" means an area:

- (a) Upon which a ground crop, trees, or plants are grown for commercial purposes;
- (b) Where a golf course, park, nursery, or cemetery is located; or
- (c) Where farming of any type is performed or livestock is raised.

If the trees are not in any of the above areas, then they are not in agricultural

areas and, therefore, would fall under "pest control" as defined in Chapter 482.021(22). This regulation states that "pest control" includes:

- (a) The use of any method or device or the application of any substance to prevent, destroy, repel, mitigate, curb, control, or eradicate any pest in, on, or under a structure, lawn, or ornamental;
- (b) The identification of, or inspection for infestations or infections in, on, or under a structure, lawn, or ornamental;
- (c) The use of any pesticide, economic poison, or mechanical device for preventing, controlling, eradicating, identifying, inspecting for, mitigating, diminishing, or curtailing insects, vermin, rodents, pest birds, bats, or other pests in, on, or under a structure, lawn, or ornamental.

So, clearly, even the inspection of trees for the presence of termites is included in the statutes' definition of "pest control."

Chapter 482.051(3) provides for the adoption of rules that require, among other things:

- (3) That written contracts be required for providing termite and other wood-destroying organism pest control, that provisions necessary to assure consumer protection as specified by the department be included in such contracts, and that require licensees to comply with the contracts issued.

Therefore, a company must be licensed in termites and other wood destroying organisms, and technicians must have received training for inspecting and treating for termites on trees that are in non agricultural areas. No other licenses (GHP or L&O) can be used for this type of service.

I hope this information helps. **PP**

---

*Report by Paul Mitola, Florida Department of Agriculture and Consumer Services.*

## Black Widows? Don't DIY, Just Call a Pest Pro

FRESNO, Calif. — This is a story without judgment or condemnation. We have all been that person at one time or another, terrified by nature's instinct to lash out at humans and reconquer its land. Sometimes we respond with arms. This time, the weapon of choice just happened to be a blowtorch.

The man's identity is not known. But he was housesitting for his parents in Fresno, Calif., on Tuesday, October 23, when the black widows came.

There were at least "a couple" of them, ABC 30 reported.

It is not known whether the man was a budding arachnologist or just happened to know how to identify black widows — or specifically, the exclusively dangerous females that bear the scarlet hourglass marking, according to researchers.

Maybe he did not know any of that. Maybe the spiders were not black widows at all. But just that possibility apparently was enough propel him into action.

The man grabbed a propane torch, pointed in the general direction of the spiders and went to work, he later told authorities.

Flames licked and crawled along the base of the house before carving into the interior wall, Fresno Fire Department deputy fire

marshal Lee Wilding told ABC News. The flames then traveled upward, triggering a larger blaze on the second floor and in the attic, he said.

Firefighters, ultimately numbering more than two dozen, sped to the scene in response to a 911 call. The damage could be as much as \$10,000, the Los Angeles Times reported. The man is 23, the paper said.

"We don't ever recommend using some type of heating device like that to get rid of any vermin or spiders," Fire Battalion Chief Tony Escobedo told ABC at the scene.

Escobedo, employing great understatement, added: "This probably was a bad idea."

That sentiment was echoed by a department firefighter union.

"Please don't use a blowtorch to kill spiders," the local 753 wrote Wednesday on Twitter.

The Fresno Fire Department did not respond to a request for comment but told local media outlets that no one was injured.

It is not clear whether the man will be charged. The Fresno Police Department did not respond to a request for comment.

Black widow bites can be dangerous, causing vomiting, severe pain and other

issues, according to research published by *Permanente Journal*.

About 2,500 bites are reported to poison control authorities each year in the United States, but researchers said the actual number is almost certainly higher. Deaths are very rare, with only three worldwide reported in medical literature, the researchers found.

But who really stops to consult scientific journals to properly contextualize the nature of a threat like a black widow? The man acted, although his parents are probably not pleased, and no one could blame the firefighters if they were frustrated after learning what triggered the blaze.

And yet, there are the spiders. They have held dominion for hundreds of millions of years before humanoid species began to grasp stone tools for the first time in eastern Africa, one day destined to wield fire in a clumsy twist of five digits.

We don't know what happened to these particular Fresno spiders. They may be dead. They may have survived. There may have been other spiders.

But we do know that the man fled outside, leaving the house empty. And perhaps, for a moment, the spiders reclaimed their kingdom. —Alex Horton, *The Washington Post*

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Above: Leon County Mosquito Control District staff shows students how to draw blood from a sentinel chicken.

At right: Artificial pools where predatory *Gambusia* fish are reared. Photos by Ben Hottel.



*Mosquito Control, continued from page 27*

prevent the spread of mosquito-borne disease. The students learned about both mosquito surveillance and mosquito control.

Students were shown how the Leon County Mosquito Control District uses a variety of surveillance techniques to monitor mosquito populations and some of the pathogens they vector. Current surveillance methods include using CO<sub>2</sub>-baited BG-Sentinel traps and the use of sentinel chickens.

The BG-Sentinel traps can be used to capture mosquitoes in various areas of the county. The mosquitoes are attracted to the traps using two different attractants: CO<sub>2</sub> and a chemical lure. CO<sub>2</sub> is generated using dry ice purchased at a local grocery store and placed in a thermos container. The thermos is hung above the trap, and the CO<sub>2</sub> drifts down into the trap opening. The chemical lure consists of compounds that mimic the odors found on human skin.

Both of these attractants draw mosquitoes toward the opening of the trap, then a fan sucks the mosquitoes into a bag inside the trap. The number of mosquitoes and the species of mosquitoes caught are recorded in a database.

The sentinel chickens are used to monitor mosquito-borne diseases such as West Nile, Eastern equine encephalitis, and St. Louis encephalitis. The chickens live in cages outdoors and can be bitten by mosquitoes in the area. Blood is drawn from the mosquitoes and tested for the above-listed diseases.

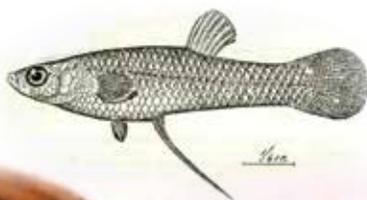
Both the BG-Sentinel traps and the sentinel chickens can help give the mosquito control district information on the population of mosquitoes and diseases in the county. This information can be used to determine if control efforts are needed in various regions of the county.

**T**HE STUDENTS were also shown some of the management techniques the district uses to combat mosquito populations in Leon County. The students saw how truck-mounted ultra-low-volume (ULV) sprayers can be used for adult mosquito control, as well as some of the other methods used to control the larval stages of mosquitoes.

The larval control methods included the use of insect growth regulators, or IGRs; the bacteria *Bacillus thuringiensis israelensis*, or Bti; and predatory *Gambusia* fish. Both IGRs and Bti can be applied to mosquito-breeding areas where larvae are found. IGRs prevent the larvae from developing successfully into adults, and Bti kills the larvae because of a toxin produced by the bacteria that injures the mosquito larvae's digestive tract. The *Gambusia* fish are reared by the district in artificial pools and can be added to natural pools that have mosquito larvae. All of these management methods are used throughout Florida by other mosquito control programs.

Through a combination of efforts by Florida mosquito control programs like the Leon County Mosquito Control District and pest control companies throughout the state offering mosquito control services, Florida is better protected against mosquito-borne disease. **PP**

*Ben Hottel is Assistant Professor at the Center for Biological Control, Florida A&M University.*



A *Gambusia*, or "mosquito fish," approaches a mosquito larva.



**Shoulder fracture**

*Preventing Injuries, continued from page 26*

and tears to connective tissues in joints. Ankle, knee, back, shoulder, arm and hand are often injured when falling onto hard surfaces from uneven and frozen ground, stairs, ladders, and elevated surfaces. While they won't result in long-term cognitive impairment like head trauma injuries, they can result in lost-time costs, lower productivity, and even permanent injuries for which the injured technician can be eligible for large financial settlements. These injuries can have a lifelong effect for the employee and can raise workers compensation insurance costs for the pest control employer.

Workers compensation claims will likely raise the experience modifier (a ratio of claims to premium) for the employer, which has long-landing cost multiplier effect that can last for years after the accident. They can even threaten the insurability and financial viability of the company.

**Preventing slip-and-fall accidents**

Pest control employers should be doing all they can to implement strong safety guidelines, provide proper training, and equip their technicians with the proper gear. Wearing the correct footwear for the job can decrease the likelihood of slip-and-fall accidents. Safety shoes with slip-resistant soles can help prevent accidents on slippery and icy surfaces. Combined with a safety training course, proper footwear can protect workers from the head injury.

Requiring standard safety footwear also completes the uniform of a technician and makes for a truly professional appearance.

There are several vendors serving industries that are prone to slip and fall accidents, such as pest control. Shoes For Crews ([www.shoesforcrews.com](http://www.shoesforcrews.com)) is one such vendor. It has been a trusted leader in the slip-resistant footwear industry for over 30 years. Their warranty program pays up to \$5,000 in direct medical costs for accidents that occur while wearing footwear less than six months old.

**PP**

*For more information about OSHA slip and fall regulations, go to [www.osha.gov/SLTC/walkingworkingsurfaces](http://www.osha.gov/SLTC/walkingworkingsurfaces).*

*For more information about Loss Control resources, contact HIIG-CRU Director of Risk Management Allen Fugler at 407-241-3037 or [afugler@hiig.com](mailto:afugler@hiig.com). You can also review Loss Control Resources on the Client Area of the HIIG Xterminator Pro website: [www.hiigxterminatorpro.com/client-area/](http://www.hiigxterminatorpro.com/client-area/).*

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## Giant Mosquitoes Flourish Following Hurricanes

RALEIGH, N.C. — After Hurricane Florence, reports started rolling in of “giant mosquito” sightings — and bitings — throughout North Carolina. What’s going on with these mega mosquitoes that can be as big as a quarter?

As a mosquito biologist, I often get asked to identify a mosquito based upon someone’s verbal report of the little buggers. I usually do okay with an educated guess based on descriptions like “It had striped legs and was brown,” or “It looked kind of purple.”

What I have always struggled with is when someone says, “It was little,” or “It was pretty big.” For the most part, size is not a good identifying feature of the common mosquitoes Americans encounter close to home.

This is because you can grow relatively large mosquitoes or small ones just depending on the conditions where they grow up — what entomologists call their larval environment. If the larval



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environment has few other competing mosquitoes, or is rich in nutrients, or has a cool temperature, the result is larger adult mosquitoes.

There are a couple of species of mosquitoes that are truly gigantic, though. If someone says they saw a big

mosquito, and I follow up with, “big for a mosquito, or too big to even be a mosquito?” and they say “too big to be a mosquito, but it was biting me,” then I know we truly have one of a couple species of “giant” mosquitoes.

Under normal circumstances, these giant, biting mosquitoes — known locally in North Carolina as “gallinippers” or scientifically as *Psorophora ciliata* or *Psorophora howardi* — are quite rare. They are two of about 175 species of mosquitoes we have in the United States. Their moment in the spotlight comes after major flooding events, like we had with Hurricane Florence. These mosquitoes can be as much as three times larger than their more typical cousins.

The gallinippers belong to a genus of mosquitoes that specialize in responding to floods. Females produce lots of eggs, which they spread out around areas that might flood, such as wet

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*Gallinippers, continued from page 33*

meadows, floodplain forests or even agricultural land. Those eggs are resistant to desiccation — that is, they aren't damaged by dry conditions — so they can wait around for a flood the following year, forming an "egg bank." The eggs are fertilized as the female lays them, from sperm she's stored during mating. In order to get the blood meals necessary to make many eggs, these mosquitoes are aggressive feeders on mammals, and maybe other vertebrates occasionally.

But evolving to a giant size doesn't seem necessary to carry

out these tasks. Indeed, many other species in this genus are not giants; they're more typically mosquito-sized. So what separates the gallinipper?

One possibility is the fact that gallinippers, as larvae, prey on other mosquito larvae. Perhaps their size is an adaptation to consuming other floodwater mosquitoes, allowing them to more easily capture and consume smaller species? The more typical-sized mosquitoes that use floodwaters are not predators. Size may also allow them to produce many more eggs, which can

also be an advantage when the floodwaters come.

Gallinippers have a painful bite that is usually well noticed by human victims, so the large numbers that emerged after Florence have received lots of attention.

While being bitten by a giant mosquito may not seem like a great thing, there are reasons to take heart. First, these mosquitoes likely get just one good blood meal in their lives, limiting their ability to transmit a pathogen. As far as entomologists know, they don't transmit any pathogens to people. And since, as larvae, these giants eat other mosquitoes, maybe one big bite is worth 10 small ones? Finally, it's a great post-hurricane brag to announce "I got bit by a giant freakin' mosquito!"

Other good news is that the adults likely don't live more than a couple of weeks, so the great boom of mosquitoes from Florence is winding down. Of course, now it looks like Hurricane Michael may bring about another round of gallinippers. Winter does end the most immediate threat, but all those eggs are still out there, awaiting next year's floodwaters.

PP

— Michael Reiskind  
 NC State University

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