

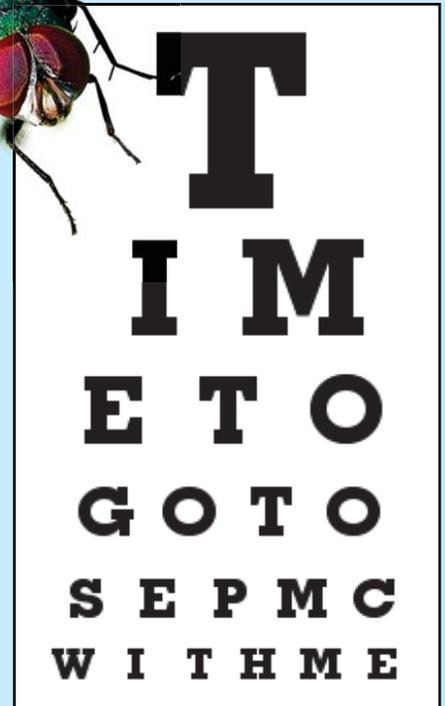
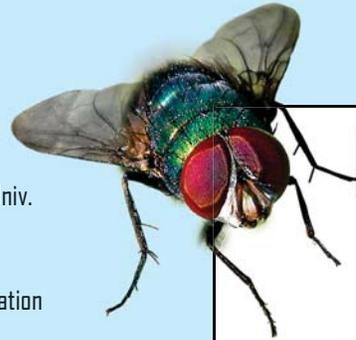


# 20/20 PERFECT VISION

20TH ANNUAL SOUTHEAST PEST MANAGEMENT CONFERENCE  
MAY 3–6, 2015, UNIVERSITY OF FLORIDA, GAINESVILLE, FLORIDA

## May 4, 2015: General Household Pests (GHP)

- 7:00 AM – 8:30 AM Registration
- 8:30 AM – 9:20 AM **GHP** Ants and Ant Control – Karen Vail, PhD, Univ. of Tennessee
- 9:20 AM – 9:40 AM Break
- 9:40 AM – 10:30 AM **GHP** Bed Bugs in the United States – Dini Miller, PhD, Virginia Tech Univ.
- 10:30 AM – 10:50 AM Break
- 10:50 AM – 11:40 AM **GHP** Delusory Parasitosis – Nancy Hinkle, PhD, Univ. of Georgia
- 11:40 AM – 12:00 PM SEPMC, Urban Entomology Lab, and FPMA: Partners in PCO Education
- 12:00 PM – 1:15 PM Lunch
- 1:15 PM – 1:40 PM **GHP** Occasional Invaders – Marie Knox, MS, Control Solutions
- 1:45 PM – 2:10 PM Ticks: Know the Big Five and Their Management – Jeff Hertz, MS, LT US Navy
- 2:10 PM – 3:00 PM **GHP** Pest Control in Politically Unstable Areas – Joe DiClaro, PhD, LT US Navy
- 3:00 PM – 3:20 PM Break
- 3:20 PM – 4:10 PM **CORE** 2-HOUR CORE: Past, Present and Future of the Pest Control Industry – Bob Rosenberg, NPMA
- 4:10 PM – 5:00 PM IPM for Pest Control Companies – Richard Kramer, PhD, Innovative Pest Solutions



## May 5, 2015: Wood-Destroying Organisms (WDO)

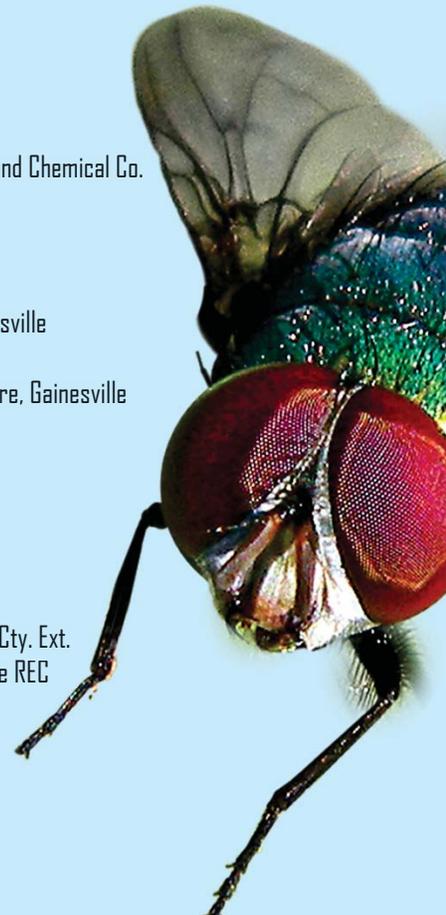
- 7:00 AM – 8:30 AM Registration
- 8:30 AM – 9:20 AM **WDO** Recognizing Wood-Destroying Organisms – Dan Suiter, PhD, Univ. of Georgia
- 9:20 AM – 9:40 AM Break
- 9:40 AM – 10:30 AM **WDO** Methods of Termite Testing – Clay Scherer, PhD, Syngenta
- 10:30 AM – 10:50 AM Break
- 10:50 AM – 11:40 AM **WDO** Wood-Boring Beetles – Bennett Jordan, PhD, NPMA
- 11:40 AM – 1:15 PM Lunch
- 1:15 PM – 2:05 PM **WDO** Wood Treatment for New Construction – Dina Richman, PhD, FMC
- 2:05 PM – 2:55 PM **WDO** Termiticide Injection System – Bob Hickman, BS, BASF
- 2:55 PM – 3:15 PM Break
- 3:15 PM – 4:05 PM **CORE** 2-HOUR CORE: Specializing Business for Company Growth – Jonathan Simkins, BS, Insect IQ
- 4:05 PM – 4:55 PM History of the Florida Pest Management Industry (Dempsey Sapp) – D.R. Sapp, Fla. Pest Control and Chemical Co.

## May 6, 2015: Lawn & Ornamentals (L&O)

- 7:00 AM – 8:30 AM Registration
- 8:30 AM – 9:20 AM **L&O** Current and Expected Trends in Disease – Carrie Harmon, PhD, UF/IFAS Plant Pathology, Gainesville
- 9:20 AM – 9:40 AM Break
- 9:40 AM – 10:30 AM **L&O** Selecting Nitrogen Sources for Turf – Laurie Trenholm, PhD, UF/IFAS Environmental Horticulture, Gainesville
- 10:30 AM – 10:50 AM Break
- 10:50 AM – 11:40 AM **L&O** Interpreting Soil Tests for Landscape Results – George Hochmuth, PhD, UF/IFAS, Gainesville
- 11:40 AM – 1:15 PM Lunch
- 1:15 PM – 2:05 PM **L&O** Landscape Plant Scene Investigation (PSI) – Jim Davis, MS, UF/IFAS Sumter County Extension
- 2:05 PM – 2:55 PM **L&O** Managing Specialty Turf – Jason Kruse, PhD, UF/IFAS Environmental Horticulture, Gainesville
- 2:55 PM – 3:10 PM Break
- 3:10 PM – 4:00 PM **CORE** Working Safely With Pesticides: Interactive Skillathon – Sheila Dunning, MS, UF/IFAS, Okaloosa Cty. Ext.
- 4:00 PM – 4:50 PM **CORE** Identification of Pest Droppings and Burrows – William H. Kern, Jr., PhD, UF/IFAS Ft. Lauderdale REC

[http://entnemdept.ifas.ufl.edu/sePMC/Main\\_Page.html](http://entnemdept.ifas.ufl.edu/sePMC/Main_Page.html)

<http://www.eventbrite.com/e/southeast-pest-management-conference-registration-15048162459>



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## ON THE COVER

Dr. Phil Koehler and Dr. Roberto Pereira display some of the pest management publications they have authored and edited at the University of Florida.

*Photograph by Tyler Jones, UF/IFAS*

# UF Entomology

## And the Future of *PestPro* Magazine

**T**HIS IS an exciting new year for us in entomology at the University of Florida. We have the most respected urban entomology program in the country, with many talented faculty and staff helping us.

The most important part of our laboratory is our students. We want to introduce you to our students in the pages of *PestPro* over time, and hope you will appreciate how dedicated they are to the improvement of the pest management industry.

We have three main goals for our programs. The first is to educate students so they are prepared to enter the field of urban pest management. The second goal is to investigate new methods of pest management so the industry will be able to remain current and prosper. The third is to provide education and current information of pest management. Research not shared with the pest management industry often gets put on the shelf, forgotten, and does not help anyone. Our goal is not only to produce new research-based information, but also to communicate those results so the information benefits the pest management industry.

We have a very diverse lab in terms of pests. We maintain millions of individual pests in colony. Ironically, in order to find ways to control pests, we have to produce pests.

We produce 14 species of cockroaches that represent all the pest species in the United States and most of the pest species in the world. Those cockroaches are destined to become parts of experiments on novel methods of control. We have insecticide-resistant cockroaches, insecticide-susceptible cockroaches, and bait-averse cockroaches. We have to be sure that new insecticides have potential for management of all the different strains, as well as different species. On page 5 we introduce you to Mariah Baggio, from Brazil, who is investigating methods of killing cockroach egg capsules using biological control organisms.

Also in our laboratory, we produce about nine species of ants in colony. Those ants are used for evaluation of insecticide direct effects as well as potential for transfer throughout colonies. It does not do much good to kill an individual ant. The workers that everyone sees foraging for food are old, sterile females who are expendable from the ant colony. Good toxicants delay toxicity so that ants have the opportunity to transfer the



*Dr. Phil Koehler, far left, and Dr. Roberto Pereira, third from left, with some of the students and staff at the Urban Entomology Lab.*

chemical back into the nest and distribute it to others. A successful product is one that can be transferred to the queen or queens in order to prevent the production of eggs and another generation of workers. Especially difficult to control are ant colonies with multiple queens. Ant species that produce multiple queens include tawny crazy ant, pharaoh ant, white-footed ant, and Argentine ant.

Besides work on ant control, we have a special project with a student, Megan Bernier, to develop new treatments for traumatic brain injury. We have found that traumatic brain injury in ants mimics human brain injuries from sports and auto accidents. We can inflict brain injury and observe whether ants behave normally by following trails and finding their way back to the colony.

Another group of pests that we have in the laboratory is flies. We have large flies, like the house fly, and small flies, like phorid and fruit flies. Student John Cooksey has been evaluating the effectiveness of insect light traps and the effect of bulb aging on fly catch. Currently, it is recommended that bulbs be changed yearly. That recommendation comes from the bulb manufacturers. Nobody ever has asked the flies whether they would be attracted to old bulbs or not. In fact, John has found the flies don't really care. They are attracted to bulbs that produce light, and are not attracted to bulbs that do not produce light.

We also have been working on new methods of termite control. Student Abdullah Alothman, from Saudi Arabia, is working on the tunneling behavior of termites in soils of different particle sizes. Recently, Bennett Jordan, now with National Pest Management Association, investigated the effects and speed of action for

Altriset, a new soil termiticide. We also have been putting together a study on the history and evolution of termite control. See story on page 9.

Bed bugs have made a comeback since the period of the 1950s to about 2000, when pest control operators did not have to try to control them. We have several research projects on bed bugs. Student Ben Hottel is working on the effect of surfaces on bed bug movement. His work may influence the design and construction of furniture to reduce bed bug problems. Ben also developed a method of constructing bed bug interceptor traps from recyclable materials, and another student,

Heather Erskine, is working on a new design of interceptor traps for hotel rooms. Student Holly Beard is working on bed bug feeding behavior, and our newest student, Brittany Campbell, is working on the use of insect growth regulators for bed bug control.

Mosquitoes are a growing part of the pest management industry. We are investigating new methods of mosquito management for the industry with Casey Parker, a student working on lethal ovitraps. Kristen Donovan is working on the effects of insect growth regulators on mosquito pupation. Jodi Scott is developing mosquito baits, and other students are developing perimeter spatial repellents for the pest management industry.

Other researchers at the University of Florida are working on pests of landscape and turf as well as methods of using and applying pesticides properly. You will also see that our group of writers includes experts on management of turfgrass and ornamental plants around the landscape.

**W**hen the original publishers of *PestPro* magazine decided to stop producing the publication, we were concerned that our conduit of technical information from our laboratories to the industry would no longer exist. Therefore, we decided to take on the task of continuing the magazine directly from our laboratories. Despite the fact that we are researchers and educators rather than publishers, we felt the need to ensure the research we are conducting can be used in the field.

We are all glad to be a part of the continuation of *PestPro* magazine. *PestPro* has been published for 10 years, and we hope to continue it for many more years. **PP**

— Dr. Philip Koehler, Managing Director

Mariah Valente Baggio,  
PhD Candidate and Intern at  
the UF Urban Entomology Lab



Photographs on pages 4 and 5 by Tyler Jones, UF/IFAS

*Q: What do  
venomous  
scorpions and  
American  
cockroaches have  
in common?*

*A: They  
both inspired  
Mariah's passion  
for urban  
entomology.*

# Mariah Baggio Finds Her Future In Pest Management

**U**RBAN PEST management is a thriving, multibillion dollar industry that is growing rapidly in many parts of the world. Most pest management professionals know that University of Florida urban entomologists train people for employment in the United States. However, the future of the industry is expected to include great international growth.

Young scientists like Mariah Valente Baggio, with training and experience in urban pest management, are positioned to become leaders in the global pest management field. Mariah is interning at the University of Florida as she completes her PhD from the Agricultural College at São Paulo State University in Brazil. She plans to work in the urban pest

management field solving public health problems when she graduates in 2015. Her ultimate career goal became evident only after her career path took a few twists and turns.

### BRAZIL TO NEBRASKA, AND BACK

Mariah's journey to urban pest management began during her freshman year of college in Brazil. Most of her classmates were looking into genetics as their career path, but she was undecided on which of the life sciences would become her profession. However, she knew she wanted a career that would allow her to apply the theory she learned in ways that could benefit society — something involving research, teaching and extension. Mariah was thinking about a university career and did not realize the opportunities in, and importance of, the urban pest management industry.

She started her practical training with internships in the education of youth and adults, as well as biochemistry and microbiology, but these experiences did not satisfy her. Something was missing.

"In education I had extension and theory, but it was missing research," Mariah recalls. "In microbiology I had much research, but not the benefits to society right away."

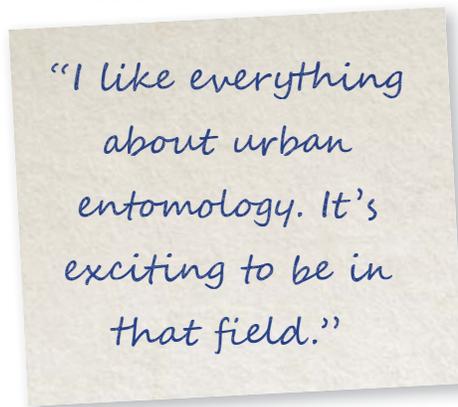
In her junior year, her scientific methodology professor, Dr. Sérgio de Freitas, offered her an internship in agricultural entomology. This Scientific Initiation internship at UNESP, paid for by a grant from São Paulo State Research Foundation, got Mariah working on the biology of the common green lacewing, an insect biological control of several important agricultural pests. This internship sparked her interest in entomology.

As she worked on her internship, Mariah engaged in academic research and attended several scientific meetings, where she presented her research. Her outstanding research achievements were recognized, and in 2006 she was selected to intern in entomology at the University of Nebraska–Lincoln for three months. There, Mariah learned the techniques of basic molecular biology and its application to the study of insects.

When she returned to Brazil, she worked in a lab associated with microbial pest control of sugarcane crops. She became interested in biological control of pests.

It was there that Mariah realized the diverse options within entomology. She was admitted into the master's degree program

at UNESP, with emphasis on agricultural entomology. Her project included a molecular study of different common lacewing populations.



### FINDING A NEW DIRECTION

After completion of her Master of Science degree, Mariah learned that most of the available job openings were for high school teaching positions, but she wanted to continue entomological research. A friend told her about career opportunities in urban pest management. She contacted several companies and got her first job in the urban pest management industry.

Mariah had knowledge on agricultural entomology, but she had not been taught about urban pests. She dedicated herself to learning all she could about urban pest management and, in the process, found her true profession. Her new job involved surveys, sales, technical training, and supervision of technical services for pests including rodents, birds and insects. The more she learned about urban pest management, the more she realized how much technical knowledge and research was needed.

Looking back on the time she first worked as a biologist, she said, "Sometimes we didn't have much of an answer for oothecae control in cockroaches. There aren't many options for alternative methods, such as physical and biological control."

Eventually, Mariah decided she wanted to contribute more to the pest management industry by doing further research and development. During one of the courses offered by the Urban Pest Management Association in São Paulo, Brazil, Mariah met the owner of a pest management company in Matão. In this city near Jaboticabal, a PhD program was available at UNESP, with a possible partnership to work with a researcher from the Biological

Institute in São Paulo. Mariah started the PhD program and eventually quit her job at the pest management company in Matão to dedicate herself to her studies.

At the International Conference on Urban Pests, which was held in the historical city of Ouro Preto, Brazil, Mariah met with Dr. Marcelo da Costa Ferreira from UNESP, who introduced her to Dr. Roberto Pereira from the Urban Entomology Lab at the University of Florida. Dr. Pereira and Mariah discussed the possibility of conducting research on the microbial control of urban pests in the future.

### FOCUS ON PUBLIC HEALTH

The unfortunate death of her PhD advisor forced a change in the direction of Mariah's research in February 2012.

She considered conducting research on the control of scorpions in Brazil's sewer systems, which accounted for 11,549 stinging incidents in 2011 — leading to a few deaths. Brazil is home to the yellow scorpion, *Tityus serrulatus*, the most important venomous scorpion species in Brazil.

These scorpions "generally don't attack people, but if you touch them they feel threatened and might sting," Mariah said.

Mariah found that the scorpions frequent the sewers because that is where they find generous helpings of cockroaches to feed on. Occasionally, however, the scorpions make their way into homes, seeking other types of food or shelter. And that is where they are likely to find a human victim to sting.

Pondering this unique ecosystem, Mariah realized that little research had been done on American cockroaches in Brazil. She also realized that the scorpion populations needed the cockroach populations.

"Although cockroaches may not seem as important as other pests, by controlling them the result will be to reduce populations of scorpions," Mariah said. "If it's possible to reduce populations of cockroaches, you will also reduce populations of scorpions."

Why? Because the scorpions heavily rely on the cockroach populations — in the sewers — to provide a such significant portion of their diet.

Of course, cockroaches are notorious public health pests in other ways, spreading many diseases and causing allergies in humans. "That's another reason they are important to control," said Mariah.

## BRINGING IT ALL TOGETHER

As her research progressed, Mariah wanted to unite different areas of knowledge, comparing the chemical and biological control of American cockroaches in sewer systems and analyzing the genetic variability between populations and how that variation related to the level of control with different agents. In 2013 a new course on urban pest control, taught by Dr. Pereira, was offered by UNESP. This contact eventually led to a grant offered by CAPES for Mariah's internship at the University of Florida Urban Entomology Lab.

Mariah jumped at the opportunity to learn more. "UF has a great environment for students of entomology, and very good research," she said. "The lab I am in is a reference for all over the world because we can find information on urban entomology, through their publications."

Since August 2014, Mariah has been evaluating differences in the chemical and biological control of American and German cockroach oothecae, or egg capsules, under the supervision of Dr. Philip Koehler and Dr. Pereira in Gainesville.

Dr. Koehler explained Mariah's cutting-edge research. "Everyone who tries to control cockroaches knows that egg capsules are really resistant to insecticides," he said. "Usually it is necessary to wait days or weeks for an egg capsule to hatch and produce 10 to 51 young. Then these newly hatched cockroaches can contact insecticide and die. Mariah is investigating ways to kill young cockroaches *inside* the egg capsule."

At the Urban Entomology Lab, Mariah has been involved in other research, education and extension efforts, and with the Urban Entomological Society. Mariah attended PestWorld in Orlando and met people in the pest management industry from many countries. Her internship at the lab reaffirmed her desire to continue working in urban entomology.

"I would love to have a job continuing research — that's my main goal," she said.

Mariah feels she can achieve all of her professional goals — to train professionals, conduct scientific research in the laboratory and in the field, and ultimately improve public health through her work.

"It can lead you to different areas of knowledge," she said about her journey to urban entomology. "That's why it's exciting." **PP**

*Dr. Roberto Pereira and Jane Medley, UF/IFAS, contributed to this report.*



*Above: Mariah handles a tray of German cockroaches in the University of Florida Urban Entomology Lab.*

*Right: Metarhizium anisopliae, at left, and Beauveria bassiana are two fungi that Mariah has tested as biological controls of cockroaches.*



*Photographs by Jane Medley, UF/IFAS*



▲ Pest control operators made their own pesticides. Above, students concoct a lime sulphur solution.

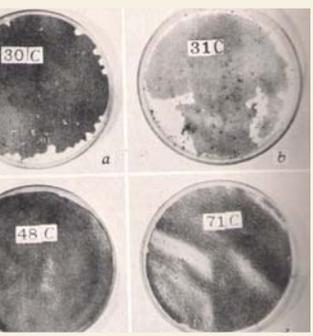
1920s



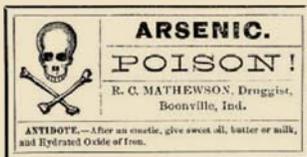
1930s



▲ Tree stump in the basement? Termite paradise. IPM concepts we take for granted were discovered around this time.



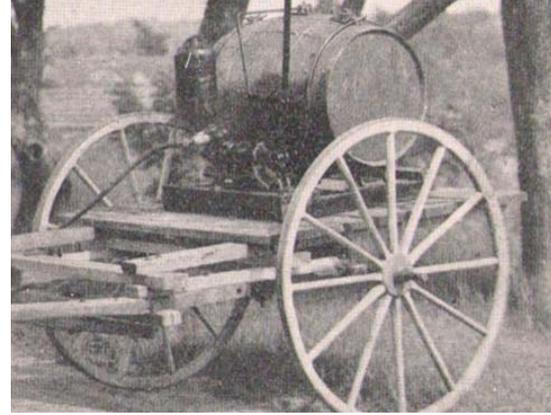
▲ Ferric oxide, turpentine, and arsenical products: Toxic paints enjoyed a brief heyday.



# Evolution of Termite Control

Philip G. Koehler and Roberto M. Pereira

WHEN YOU are driving around in your shiny new truck going to do one more termite job control job, do you ever start thinking how we got to the current termite control techniques and products? It has been a long journey since the beginning of modern termite control practice.



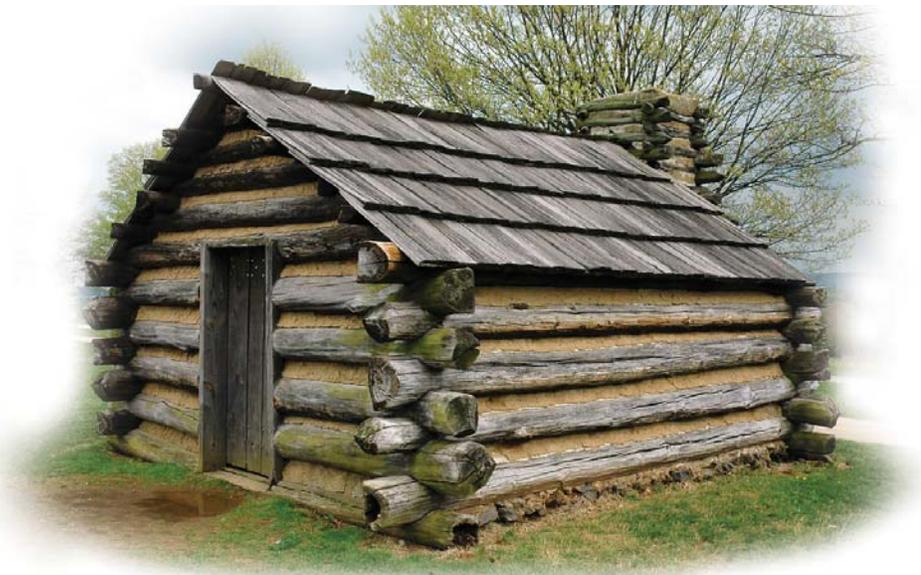
Once products were prepared and ready to be applied, the next problem was dealing with the pumping devices and sprayers that looked like medieval objects when compared with modern application equipment. One noticeable difference was the size of the containers. Because large amounts were used, some of the sprayers were very large and heavy, and were pumped manually. Some of the sprayer technology was not much different from the manual sprayers we use today, but without the modern light plastics and thin metals that make the portable sprayers so much easier to carry these days.

## INTRODUCING IPM

The idea of integrated pest management for termite control started back in 1926, when a survey of structures attacked by termites produced some interesting results that were quickly incorporated into construction recommendations. That survey revealed a concept that is still central in preventing termite infestation. Out of 100 structures attacked by termites, the great majority — almost 77 percent — had some wood contacting soil directly. So most termite problems could be resolved simply by avoiding wood-to-soil contact and leaving an 18-inch clearance between the soil and untreated wood. This concept is still valid today, although you probably see too many examples of structures where untreated wood contacts soil even in some very modern and fancy structures. In fact, many of the recommendations of construction elements that should be avoided in building houses and other buildings in order to prevent termite infestations come from the early 1930s.

Some builders still insist on leaving stumps and other wood products under houses, or do not provide proper ventilation of crawl spaces, creating conditions for survival and development of termite colonies under or close to

Cabin photograph by R.D. Smith, Wikimedia Commons



In the *really* old days, when we all lived in log cabins, replacement of damaged wood was a common operation, so termite control was a maintenance issue. This persists today in the eyes of homeowners insurance companies, which do not consider termite attacks as a coverable damage, but as a maintenance issue.

## DAWN OF TERMITE TREATMENTS

In the early 1900s, a common remedy for subterranean termite damage to a structure was to locate the colony, dig the termites out, and drown them in kerosene or other oil. Besides mechanical removal of termites, chemical treatments were also used. In 1928, a book by Metcalf and Flint recommended that mildly damaged wood be sprayed with warm creosote,

using compressed-air equipment that was capable of producing high pressure likely to force some of the product deeper into the wood. Creosote, coal tar, other petroleum products, and some arsenical products were a few of the products used for termite control and prevention in the early 20th century.

Back at the start of the 20th century, pest control operators had to produce their own termiticides, and some of the recipes were scary dangerous. A mixture of lead acetate and sodium arsenate in water was probably good at killing termites, but you would want to handle it with extreme care and keep it far away from any living thing you were not trying to harm. Pest control classes included exercises on making pesticides out of toxic raw materials.

Native subterranean termites photograph by Lyle Bass, UF/IFAS

structures. Another recommendation, the use of proper metal shields on top of foundation elements, is often ignored when mobile homes are installed.

In the mid-1930s, toxic paints containing ferric oxide, turpentine, or arsenical products were developed as preventive treatments against attack by termites. They did not work very well.



Frank Campbell

#### POST-WORLD WAR II ERA: NEW TREATMENTS EMERGE

The use of soil insecticide started with a product that eventually became the name of a very successful pest control brand. Terminix, a termiticide first produced by the E.L. Bruce Company from Memphis, was composed of orthochlorobenzene, other solvents, and salts, and was used in the prevention of wood deterioration due to different causes. The product was formulated to penetrate easily into wood or soil, and came with a five-year warranty from the manufacturer. Only licensed companies were allowed to use the product. Back then, the idea of blaming the pest control applicator for the defects in wood-treatment products had not been invented yet. That came much later!

An idea that came from that time is the five-year warranty for termite treatments. Berger suggested in 1947 that five years was a "safe average period of effectiveness for good soil poisons." The products changed, but the notion of a good product is still the same — even though some products may last much more than five years with more sophisticated formulations and active ingredients.

In the 1950s, chlorinated hydrocarbon pesticides, including DDT, chlordane, dieldrin and heptachlor, became the choice products for termite control. These

products dominated the market for close to 40 years before being banned for the control of termites.

#### MODERN PRACTICES EVOLVE

The application rates we generally see in the labels these days were firmly established in the NPMA guide published in 1965, including 1 gallon per 10 square feet for horizontal treatments, 4 gallons per 10 linear feet for vertical treatments, and 2 gallons per 10 linear feet for masonry void treatments.

The products that immediately followed as the choice for termite control did not establish a stronghold in the market, mostly because applications did not last long enough under the harsh conditions soil treatments encountered in order to remain in the correct place and active around structural foundations. Pyrethroids and organophosphates battled for the termite control market during the last decade of the 1900s, but the real winners were new active ingredients that appeared during the closing years of the 20th century.

From the mid-1990s to the early 2000s, we developed research at the University of Florida that clearly showed some termiticides worked as repellents, while others would not repel termites. That subtle difference made a world of difference in termite management, and ultimately caused a huge change in termiticide use. While repellent termiticides are very good in keeping termites away from treated soil, they can also force the termites into areas where the repellent termiticide is not present. If these untreated areas happen to be gaps in the treatment, the termites end up finding a way around the treatment. With nonrepellent termites, the termites enter the treatment zone, unaware that they are exposing themselves to the killing agent.

Although imidacloprid was the first nonrepellent pesticide into the market, fipronil really established the reputation of this new class of termiticides and started its domination of the soil-applied termiticide market.

In the early 1990s, a new idea in termite control started gaining a foothold in the market: the use of termite baits. This new concept —

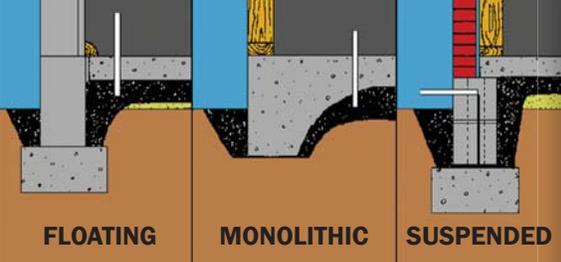
attracting termites to consume a poisonous bait that is later passed to other termites in the nest through the food exchange — proved to be an interesting idea in termite management. Just like the idea of bait use in ant and cockroach control, it exploits food-sharing and social behavior to maximize the distribution of the termiticide within the colony. This distribution can occur only if the termiticide does not kill the insect rapidly. Active ingredients used in termite baits are normally insect growth regulators that affect the development of the termite colony without immediately killing the individual termites, thus allowing for horizontal transfer of the termiticide among the nest population.

The idea of poisonous bait was extended when wood treatments with borates were added as an option for preventive control during the structure construction. This moved the termite bait from outside the structure to inside the structure and thus created a greater chance that termites can somehow reach untreated wood and damage the structure before being exposed to sufficient termiticide to eliminate the colony.



UF/IFAS file photo

Above: UF researcher Dr. Nan-Yao Su demonstrates the Sentricon Colony Elimination System at the Fort Lauderdale Research and Education Center, in the 1990s.



UF/IFAS

From left: Modern treatment of floating, monolithic and suspended concrete slabs.

## THE FUTURE OF TERMITE CONTROL

More recent additions to the termiticide market include some chemistries with very interesting action on the termites. Chlorfenapyr is an active ingredient that reduces the ability of termites to generate enough energy inside their bodies to allow them to function. Chlorantraniliprole, the latest addition to the market, causes the termites to lose muscle control and incapacitates the insects, preventing them from tunneling and damaging wood. Besides not being repellent, these termiticides kill the termites slowly enough to allow ample time for the termiticide to be distributed throughout the colony. These new chemistries are also much safer to the environment and other nontarget organisms. Altriset (chlorantraniliprole) became the first reduced-risk liquid termiticide registered by the EPA.

Today, there are more than 80 different termiticides registered in Florida as soil treatments, baits, or wood treatments. More products are added to the market as aging chemistries lose their patent-protection rights, and generic brands are added to the list of available products.

## COST PERSPECTIVE

With all these changes in termiticide technology and treatment approaches, one could probably expect tremendous increases in the cost of termite control, right? Well, back in 1931, the cost of subterranean termite control was estimated at a little less than \$88, which in today's dollars adjusted for inflation would be equivalent to about \$1,271. The cost of a drywood termite job was about \$65, or about \$938 in current dollars. So it looks like things have not changed that much in terms of cost, although the technology and products have changed drastically in the past 100 years. **PP**



Thatch roof feeding damage photo by Matthew Taylor, Green Solutions Lawn Care & Pest Control. Adult moth and larva photos by Lyle Buss, UF/IFAS

# A Tiki Hut Caterpillar

Lyle J. Buss

**HAVE YOU** been in the business so long that you've pretty much seen it all? Of course, as soon as you say that, something new or weird is bound to come across your path. After all, this is Florida, where there is no shortage of pest problems. In any given area you can list the pest problems that you regularly see.

But then there are the occasional oddities that appear in structures or in the landscape. It might be an exotic species new to the state, an organism attacking a new host, or some other pest that is present because the alignment of the stars led to just the right conditions for it to thrive.

In this and following issues, *PestPro* will present unusual organisms, whether it be an insect, fungus, or something else entirely. Remember these peculiar pests, and you may impress the heck out of a client someday!



**I**N AUGUST 2012, the Insect Identification Lab received a sample of caterpillars that had been feeding on the palm thatch roof of a tiki hut in the Tampa area. After raising them to the adult stage, I was able to determine that they were a moth species called *Simplicia cornicalis*. It is native to southeast Asia and was first found in Florida in 2006.

Although most types of moth caterpillars feed on living plants, this one feeds on dead plant tissue and plant debris. It especially likes palm thatch, and has been recorded as a pest of thatch structures in Malaysia and India. Here in Florida, it prefers the leaves of cabbage palm, *Sabal palmetto*, which are used to make roofs of tiki huts and chickees. They appear to get onto the leaves after the roof has been assembled.

The caterpillars are dark brown and an inch long. Their head capsule has a netlike pattern of dark brown markings on a light brown background. The adult moths might be seen around the palm thatch, and are drab brown with a narrow, pale stripe near the tip of their wings. The first indication of an infestation may be the tiny fecal pellets falling from the caterpillars in the thatch roof. Feeding damage is evident as large notches eaten from the edges of the leaves. **PP**



*Raccoon photograph by Darkone4, Wikimedia Commons*

❧ **Nuisance Wildlife** ❧

# Northern Raccoon

**William H. Kern, Jr.**



Photographs on this page by William H. Kern, Jr., UF/IFAS

Above: Northern raccoon, *Procyon lotor*, adult male. Upper right: Juvenile raccoon. Right: Typical raccoon tracks. Below: Various raccoon droppings.

**T**HE NORTHERN raccoon, *Procyon lotor*, is usually just called raccoon or “coon.” This is one animal that most people are well acquainted with wherever it occurs, because of its large size, abundance, ecological success, and often its nuisance behaviors.

Raccoons are found commonly in all the lower 48 states, much of southern Canada, and throughout Mexico and Central America. Raccoons are very adaptable animals and thrive in all kinds of habitats from the desert southwest to tropical forests and northern hardwoods. Unlike many wildlife species, raccoons do especially well in urban areas.

Raccoons are found statewide in Florida in ever-increasing numbers. Urbanization and agriculture often help their population because food becomes more available in these conditions. Exotic fruit and ornamental plants provide a greater diversity of food in human-managed landscapes. Wetlands also provide greater resources than upland habitats, so raccoons are more abundant near wetlands than in drier habitats. These factors mean that it is not at all uncommon to encounter raccoons near your home or neighborhood.

There is no mistaking a raccoon for any other animal. Its stout, bearlike body, prominent black mask, and heavily furred, ringed tail all are distinctive. Adult raccoons are about 2 to 3 feet long including their 10-inch

tail and weigh anywhere from 10 to 30 pounds. Their color generally is a grizzled, salt-and-pepper gray and black with a light gray belly. Both all-black and all-white animals sometimes occur. Males are called boars, females are called sows, and young are called kits.

Raccoons are active mostly during the evening hours. Raccoons are adaptable and midday is often the quietest time in suburban neighborhoods because people are at work, kids are at school, and dogs tend to be confined inside the house. Therefore, it is not uncommon or unusual to see a raccoon foraging during the day as well. Seeing a raccoon out during the day does not mean it is rabid or dangerous.

Individual raccoons normally use a home range of 1 to 3 square miles and are somewhat territorial, especially the males. Raccoons seen in small groups most likely are females with young or unassociated adults from neighboring territories brought together by a large food source. *Continued*



**The word for “raccoon” has been translated into many languages. Many of these names are local translations that mean “washing bear.”**

- malpache norteno – Spanish
- malpache boreal – Spanish
- malpachin – Spanish
- osito lavador – Spanish
- guaxinim – Portuguese
- tzil – Mayan
- mapachitli – Aztec
- kvtili – Cherokee or Tsalagi
- ati:ron – Mohawk
- esiban – Algonquin
- eehsipana – Miami-Illinois
- nahënëm – Lenape Delaware
- sawa – Alabama
- sawá – Koasati
- shauí – Choctaw
- shawi’ – Chickasaw
- wotko – Muskogee
- waschbär – German
- wasbeer – Dutch
- orsetto lavatore – Italian
- araiguma アライグマ – Japanese
- raton laveur – French
- tvättbjörn – Swedish
- pesukarhu – Finnish
- mosómedve – Hungarian



## FLORIDA RACCOON RULES

### Florida Administrative Code 68A-4.001. General Prohibitions.

(3) Intentionally placing food or garbage, allowing the placement of food or garbage, or offering food or garbage in such a manner that it attracts black bears, foxes or raccoons and in a manner that is likely to create or creates a public nuisance is prohibited.

### Florida Administrative Code 68A-9.010. Taking Nuisance Wildlife.

(3) Disposition of live-captured nuisance wildlife.

(a) Wildlife live-captured by any method shall be released or euthanized within 24 hours following capture or inspection of a trapping device containing wildlife, provided any species described in subsection (1) above or any non-target wildlife shall be released immediately at the site of capture.

(b) Nuisance wildlife may only be released if:

1. The nuisance wildlife is released on the property of the landowner provided the release site and capture site are located on one contiguous piece of property or

2. The nuisance wildlife is a native species and,

3. The property where the nuisance animal is to be released is located within the county of capture and is a minimum of 40 contiguous acres and

4. The person releasing the nuisance wildlife is in possession, at time of release, of written permission from the property owner allowing such action.

(c) Euthanasia of nuisance wildlife shall be humane as defined by the American Association of Zoo Veterinarians or the American Veterinary Medical Association.

(d) The provisions of this subsection shall not prohibit the personal possession of wildlife as authorized by subsection 68A-6.0022(2), F.A.C.

(4) Transportation of nuisance wildlife.

(a) Live-captured nuisance wildlife may be transported under authority of this section only for:

1. The purpose of euthanasia as provided in subsection (3) above or

2. The purpose of release as provided in subsection (3) above.

(b) Transportation of wildlife authorized by this section shall not supersede the provisions of any rabies alert or area quarantine issued by County Health Departments or County Animal Services.

**EFFECTIVE DATE: July 27, 2010**

**R**accoons are not fussy about their choice of food. Although classified as a carnivore, the raccoon eats as much or more plant as animal matter during the year. Food includes fruits, acorns, seeds, bird and turtle eggs, insects, crayfish and crabs, frogs, fish and small mammals. They raid pet food bowls, bird feeders for seed and suet blocks, and they check out garbage cans that are not secured.

Raccoons usually den in a hollow tree. Dens in trees may be anywhere from ground level to 60 feet above ground. In urban and other areas where tree cavities are lacking for dens, raccoons choose a wide variety of “cavities” including rock and debris piles, attics, crawl spaces beneath homes, decks, sheds, culverts, sewer drains, and the burrows of other animals.

Breeding occurs first when they are one year old. Normally, one litter is born each year. In Florida, this generally occurs in March and April. Litters average about three to four young, though as many as seven have been recorded. Newborn raccoons’ eyes remain closed until about 20 days old. Baby raccoons are weaned at 10 to 12 weeks, but the offspring may stay with their mother until they are 10 months old.

Raccoons have few natural enemies left in Florida other than man. A few are killed by predators such as alligators, dogs, coyotes, bobcats, panthers, and great horned owls. The coyote, which has become established in Florida over the last few decades, readily preys on raccoons, but it is uncommon in the suburban areas where raccoons thrive. Large alligators, over 8 feet in length, are important raccoon predators near water. Their presence around bird rookeries helps to limit raccoon predation on nests and roosting birds at night.

Due to fear of alligators, the public often wants large alligators removed by trappers before they are even large enough to prey on adult raccoons or dogs. Even humans have largely stopped hunting raccoons for food and hides. Automobiles likely kill more raccoons than all natural predators combined.

The greatest concern with raccoons is disease. Raccoons are known to carry a wide variety of diseases and parasites. Most of these are not dangerous to them or people, but a few are deadly. Distemper and rabies will kill raccoons if they become infected. When raccoon populations get too dense, an epizootic outbreak — the animal equivalent to an epidemic in people — can occur. During an epizootic outbreak, these diseases can also infect pets that are not vaccinated.

Distemper is not a risk to people, but rabies is. The risk of rabies is small, with fewer than one out of 200 raccoons in the wild exposed to rabies, but the risk should never be taken lightly. Raccoons are wild animals and should never be treated as pets.

## Solving Raccoon Problems

Raccoons are one of our most successful urban animals and are, therefore, frequently observed in our yards and around our homes. This should not, by itself, be cause for alarm.

Because they eat just about everything imaginable, raccoons are almost never in danger of starving, especially in Florida’s mild climate. Even in urban landscapes, raccoons find plenty to eat. By putting food out for them, we condition them to lose their “respect” for people, a trait that aids greatly in their ability to survive. It also causes local populations to become denser than the habitat can adequately support. When that occurs, raccoons begin to look more closely at your home to provide them shelter and they are more likely to become ill and to transmit diseases.

If welfare of the animals is not enough to stop you from feeding them, IT IS ILLEGAL! Under Florida Administrative Code 68A (4.001), it is illegal to feed bears, foxes, or raccoons. As of June, 2002, the Florida Fish and Wildlife Conservation Commission will enforce this rule with penalties including 60 days in jail and fines up to \$500.

## Types of Problems and Control Techniques

### Feeding Around Homes

If raccoons are raiding your pet’s food dish, feed your pet during daylight hours and remove the uneaten food before dusk. If raccoons are raiding your garbage can, then make this can inaccessible. Get a raccoon-proof garbage can or weight the lid down so that the raccoons cannot open it. Keep your garbage cans in the garage or build a bin with a latchable lid to store them. Put out only enough bird seed for the birds to consume in one day. This discourages both raccoons and rats.

### Eating Crops

Everyone who has ever tried to grow sweet corn and other fruits and vegetables with a raccoon in the area has likely lost a good share of their potential harvest. Raccoons can be quite frustrating to fruit and vegetable growers. Solving these problems can be equally frustrating. Be aware that repellents of any kind and scare devices will not be successful. Use of mothballs as a wildlife repellent is illegal — a FIFRA violation. No raccoon in the world will pass up the opportunity to dine on something ripe and delicious simply because there is a strange odor or object nearby.

One method that works is to prevent access. Where possible, the best prevention is an electric fence. A single strand electric fence with the wire 8 inches above the ground can do wonders to keep raccoons out while not harming them physically. The only other method is to remove the animal from your yard by means of a live



Photograph by William H. Kern, Jr., UF/IFAS

*Use weighted panels to deny raccoons access to the top step of a swimming pool.*

trap. It is illegal to release raccoons on any county, state, or federal property or on private property without the property owner's permission. It is illegal to relocate any raccoon from a rabies quarantine county.

### **Living In The Attic Or Elsewhere In The House**

Perhaps the greatest problem with raccoons occurs when they set up housekeeping inside your residence. Raccoons often come into an attic or crawl space when an entry point to the outside is not maintained or repaired. Torn screens or soffits, open chimneys or broken windows are common entry points. They also may take up residence beneath your mobile home or deck.

Once a raccoon has moved in, it is difficult to cause it to leave. Chasing the animal out somehow and then sealing off the entry hole may cause the raccoon to return and force its way back in. At this point, it will cause more damage than it did before. This is especially true of mothers with young.

Female sows with young kits can sometimes be encouraged to move their young to another den site by placing cotton balls or strips of cloth soaked with male raccoon urine or other predator urine in the attic or crawl space. Raccoon urine can be found in sporting goods stores or online. It is used as a cover scent by deer hunters. Fox or coyote urine is sold as a repellent for deer or rabbits in the garden and as a trapping lure for these animals. These urines can be purchased from garden or trapping suppliers online.

There are one-way devices that allow the animal to leave but not get back in. This is useful for males and females without young. Physically removing the nuisance raccoon with a live trap and euthanizing it is the least desirable but often the ultimate solution to this problem. Exclusion and prevention are always the cheapest and simplest ways to control nuisance wildlife situations.

### **Defecation In Swimming Pools**

A raccoon defecating on the steps of the swimming pool is a common complaint from homeowners. This behavior is natural for

raccoons. It is a way for them to hide their droppings from other raccoons and predators. To prevent this unpleasant behavior, cover the steps with a plastic sheet or plastic panels to deny them access to the top step. They will not jump into deep water to swim over to poop on the step. They will find a more convenient way to hide the smell of their droppings, often going to the neighbor's pool or decorative pond.

### **Raccoons Digging Up New Plantings**

Raccoons investigate any disturbed soil looking for turtle eggs or other food items. This behavior can be deterred by adding naphthalene or essential oil wildlife repellent or cayenne pepper to the disturbed soil around the new plant. These repellents are temporary, but once the smell of newly disturbed soil dissipates, the repellency is no longer needed. This usually takes three to four days or nights.

### **Live-Trapping**

Check your local ordinances before attempting to solve your raccoon problem by using a live trap. If you are legally able to release the trapped raccoon, you also will want to determine where it would be legal to release it, and obtain permission beforehand. The release site should be at least three miles from your property or the raccoon likely will return.

Raccoons that are causing property damage may be live-trapped without a permit from the Florida Game and Fresh Water Fish Commission, but if the raccoon is to be taken away from your property and released, these conditions must be met: 1) the animals are released in the same county, 2) the person releasing them has written permission from landowner, 3) the recipient site is at least 40 contiguous acres, and 4) both the local County Health Department and County Animal Services verify there is no type of rabies alert or area quarantine in place.<sup>1</sup>

Setting a live trap to remove a problem raccoon is relatively easy, but to achieve

the desired results you have to set it correctly. Traps always should be set where they can be monitored easily. Never place the trap in an attic or under a mobile home unless it is absolutely necessary and you can check it at least daily. It is far preferable to put the trap in the raccoon's normal path of travel or in an open place where it is known to be feeding.

Bait the trap either with something that the raccoon is currently feeding on or with something that will surely tempt the animal. This is not too difficult because raccoons will eat virtually everything. In most cases, a dry cat food that includes fish meal is an inexpensive, nonmessy, excellent choice. Raccoons can be very easy to lure into a trap, but at other times they are exceptionally frustrating. Try switching baits if the raccoon will not enter your trap after the first three or four nights. Chicken necks, an ear of sweet corn, or whole peanuts are some of the varied foods that might tempt your problem animal.

If switching baits does not produce results, you will have to reduce the raccoon's fear of the trap. Wire the door of the trap open so it cannot fall shut. Then place bait both inside the trap and around the outside. After a few days, the raccoon probably will begin to enter the trap to feed. Once it is doing this regularly, you can unwire the door.

One final consideration is your choice of trap. Although there are many brands of live traps, they all work much the same. One difference, even among traps of the same brand, is the number of doors available. When trapping raccoons, traps that open at only one end are preferable to those that open at both ends. If you are using a two-door trap, consider closing one of the doors and locking it down, thus making it a one-door trap. This forces the raccoon to go all the way to the back of the trap to reach the bait and ensure that it will be trapped when the door is triggered.

Because relocated raccoons may spread disease to the resident raccoon population, and because they frequently cause other problems, it is recommended that live-trapped raccoons be humanely euthanized. CO<sub>2</sub> chambers are a simple, safe, and humane method of euthanasia, and the meat is still fit to eat if you so choose. Drowning is not recognized as humane euthanasia.

### **Other Control Methods**

Raccoons are protected by various rules administered by Florida Fish and Wildlife Conservation Commission. It is legal to kill a nuisance raccoon if you hold a valid hunting license when it is done by a humane method. The use of poisons, leghold or body gripping traps are not legal without a permit and are not recommended for raccoons. Check local ordinances before using any lethal control method. Never discharge a firearm inside city limits or in residential areas. **PP**

<sup>1</sup> <http://myfwc.com/wildlifehabitats/profiles/mammals/land/raccoon/>



## What You Should Know Before Selling Your PCO Business

NORMAN COOPER, John Corrigan and Dan Gordon

### Get Professional Assistance

**D**ECIDING WHEN to sell or not to sell your pest control company is surely one of the most important financial decisions of your life. Whether you are counting on retiring, moving on to other ventures or perhaps planning to “pass the torch” to the next generation, your advisors — broker, CPA, attorney — should be able to provide you comfort and assurance that their strategy will produce a premium sale price as well as favorable contract terms and manageable risk, all wrapped up in a transaction structure that produces the highest after-tax sales proceeds amount in your pocket. Accordingly, a competent team of advisors can make all the difference at the end of the day in achieving the above objectives.

Unfortunately, PCO owners often mistakenly think that many years in the operational side of the pest management business equates to the same level of expertise when negotiating and closing their own sale transaction. Asking around to friends and colleagues in the business is not enough to ascertain the true worth of your own business. Observations and taking notes are useful but in the end not a substitute for competent advice from professionals who have a level of expertise and experience in deal making that was amassed over many years, in addition to professional training.

### Determining Your Company’s Fair Market Value

The common belief that the single determining factor for determining a PCO’s market value is its annual gross revenues is a fallacy. Potential purchasers are looking for profit, pricing structure, customer retention, employee retention and the trend for revenue and profit growth or decline over the last few years. Opportunities for consolidating service routes, eliminating overhead, adding managerial and technician expertise, adding new sales channels for existing customer accounts are the kind of assumptions purchasers analyze as part of the decision to make an offer to buy or not.

Other factors may be time horizons limiting expansion into desirable geographic areas, thereby leaving the only viable option: an acquisition locally to get that toehold instead of investing years building from the ground up and without guarantee of success.

### Avoid Legal Booby Traps In The Contract

A savvy M&A attorney representing a buyer will always seek to include what many lay people consider just “boilerplate provisions” that can be glossed over when reviewing a purchase and sale agreement of a business. A **representation** is any express statement regarding a particular fact or circumstance that serves to influence the consummation of the deal. Arguably synonymous, a **warranty** is a guaranty by one party that a particular statement of fact is true. Finally, a **covenant** is an agreement to do or refrain from doing something prospectively.

“THE DIFFERENCE BETWEEN CLOSING A DEAL FOR A ‘MAXIMUM PRICE’ VS. LEAVING MONEY ON THE TABLE GREATLY DEPENDS ON THE ADVISORS WHO REPRESENT YOUR INTERESTS”

A buyer’s attorney will seek to insert pages upon pages in the contract making the selling business and the owners of seller “jointly and severally” liable for the unconditional representations, warranties and covenants made about the business, its people, its assets and operations. This could in fact expose owners to greater personal liability than they had by operating the business inside a corporation with the liability protection afforded. If there are multiple shareholders, then the deep-pocket owner could get stuck with 100 percent of the damages because of the word “joint.”

Sellers need to protect themselves by doing the following: (1) do not agree to joint and several liabilities unless there is a cap on the damages you could be personally liable for; 2) put in introductory language that reads “to the best of my knowledge” before each representation and warranty; and (3) add Disclosure Schedules for each representation and warranty where you can disclose information about a potential danger/claim situation so as to shift the risk of a matter back to the buyer.

### Tax Deduction Differences And Consequences

In addition to getting you the best price and terms, your advisor should make you aware that the overwhelming majority of PCO deals are asset purchase agreements rather than stock agreements. Buyers would rather allocate higher value to certain tangible “hard” assets, i.e., furniture, fixtures and equipment, rather than intangible “soft” assets, i.e., goodwill, customer lists, patents and trademarks. The basic reason being that the hard assets can be depreciated/written off immediately, and the soft assets get amortized over a 15-year period.

Conversely, the seller, who has probably already depreciated the hard assets, could be forced to treat all sales proceeds as ordinary income (depreciation recapture) instead of as long term capital gain income. The marginal tax rate on this adverse differential could approximate a cost of 20 percent for the seller.

Finally, another underlying concern for the seller is that the purchase-price portion allocated to hard assets could spur a sales tax add-on and thereby create controversy between buyer and seller as to who will absorb this cost.

As you can see, there are often numerous bumps along the mergers and acquisitions road and many booby traps, which we will discuss in future columns. The best brokers and advisors, particularly those that are most familiar with the unique workings of the PCO industry, can anticipate or resolve most problems and produce the best results. **PP**

*The authors are Directors of PCO M&A and Succession Planners, LLC, an affiliate of PCO Bookkeepers. For more information visit [www.pcosuccessionplan.com](http://www.pcosuccessionplan.com) or send us an e-mail at [info@pcobookkeepers.com](mailto:info@pcobookkeepers.com).*

# Penn Study Shows Bed Bugs Can Transmit Parasite that Causes Chagas Disease

## Like the “Kissing” Bug, Bed Bugs Can Transmit Deadly Parasite Via Feces

PHILADELPHIA — The bed bug may be just as dangerous as its sinister cousin, the triatomine, or “kissing” bug. A new study from Penn Medicine researchers in the Center for Clinical Epidemiology and Biostatistics demonstrated that bed bugs, like the triatomines, can transmit *Trypanosoma cruzi*, the parasite that causes Chagas disease, one of the most prevalent and deadly diseases in the Americas.

The role of the bloodsucking triatomine bugs as vectors of Chagas disease—which affects six to eight million worldwide, mostly in Latin America, and kills about 50,000 a year—has long been recognized. The insects infect people not through their bite but feces, which they deposit on their sleeping host, often around the face, after feeding. Bed bugs, on the other hand, are usually considered disease-free nuisances whose victims are left with only itchy welts from bites and sleepless nights.

In a study published in the *American Journal of Tropical Medicine and Hygiene*, senior author Michael Z. Levy, PhD, assistant professor in the department of Biostatistics and Epidemiology at the University of Pennsylvania’s Perelman School of Medicine, and researchers at the Universidad Peruana Cayetano Heredia in Peru conducted a series of laboratory experiments that demonstrated bidirectional transmission of *T. cruzi* between mice and bed bugs.

In the first experiment run at the Zoonotic Disease Research Center in Arequipa, Peru, the researchers exposed 10 mice infected with the parasite to 20 uninfected bed bugs every three days for a month. Of about 2,000 bed bugs used in the experiment, the majority acquired *T. cruzi* after feeding on the mice. In a separate experiment to test transmission from bug to mouse, they found that nine out of 12 (75 percent) uninfected mice acquired the parasite after each one lived for 30 days with 20 infected bed bugs.

In a third experiment, investigators succeeded in infecting mice by placing feces of infected bed bugs on the animal’s skin that had either been inflamed by bed bug bites, or scraped with a needle. Four out of 10 mice (40 percent) acquired the parasite by this manner; 1 out of 5 (20 percent) were infected when the skin was broken by the insect’s bites only. A final experiment performed at the Penn bed bug lab in Philadelphia demonstrated that bed bugs, like triatomines, defecate when they feed.



DR. MICHAEL Z. LEVY



BED BUG and FECES

“We’ve shown that the bed bug can acquire and transmit the parasite. Our next step is to determine whether they are, or will become, an important player in the epidemiology of Chagas disease,” Levy said. “There are some reasons to worry—bed bugs have more frequent contact with people than kissing bugs, and there are more of them in infested houses, giving them ample opportunity to transmit the parasite. But perhaps there is something important we don’t yet understand about them that mitigates the threat.”

*T. cruzi* is also especially at home in the guts of bed bugs. “I’ve never seen so many parasites in an insect,” said Renzo Salazar, a biologist at the Universidad Peruana Cayetano Heredia and coauthor on the study. “I expected a scenario with very low infection, but we found many parasites—they really replicate well in the gut of the bed bugs.”

### WICKED COUSINS

Bed bugs and kissing bugs are distant cousins but share many striking similarities. Both insects hide in household cracks and crevices waiting for nightfall and the opportunity to feed on sleeping hosts. They are from the same order of insects (Hemiptera) and both only feed on blood. (One main difference is their size: kissing bugs are five times as big as a bed bug). With so much in common, it seemed logical to the authors that the

kissing bug’s most infamous trait, the transmission of *T. cruzi*, is also shared by the bed bug.

Other investigators have shared this suspicion. In 1912, just three years after Carlos Chagas described the transmission of the disease by kissing bugs, French parasitologist Émile Brumpt recounted that he had infected almost 100 bed bugs exposed to an infectious mouse, and then used them to infect two healthy mice. Decades later an Argentine group replicated his work. These experiments, largely ignored during the recent bed bug resurgence, missed one key point.

“Mice can hunt and eat bed bugs,” said Ricardo Castillo-Neyra, DVM, PhD, coauthor and postdoctoral fellow at the Universidad Peruana Cayetano Heredia and Penn. “The older studies were almost certainly only documenting oral transmission of the parasite. Our work shows for the first time that bed bugs can transmit the parasite when their feces are in contact with broken skin, the route by which humans are usually infected.”

### EMERGING PROBLEM

More people in the United States are infected with *T. cruzi* now than ever before. The Centers for Disease Control and Prevention estimates that the number of Chagas disease cases in the United States could be as high as 300,000.

“There have always been triatomine bugs and cases of Chagas disease in the U.S., but the kissing bugs we have here don’t come into homes frequently like the more dangerous species in South and Central America do,” Levy said. “I am much more concerned about the role of bed bugs. They are already here—in our homes, in our beds and in high numbers. What we found has thrown a wrench in the way I think about transmission, and where Chagas disease could emerge next.”

Equally worrying is the invasion of bed bugs into areas where Chagas disease is prevalent, especially in countries where traditional insect vectors of the parasite have been nearly eliminated, Levy said. In these areas, bed bugs will be repeatedly exposed to *T. cruzi*, and could respark transmission where it had been extinguished.

“Bed bugs are harder to kill than triatomines due to their resistance to common insecticides,” Levy said. “No one is prepared for large-scale bed bug control. If the parasite starts to spread through bed bugs, decades of progress on Chagas disease control in the Americas could be erased, and we would have no means at our disposal to repeat what had been accomplished.” **PP**

*Other coauthors of the study include Aaron W. Tustin, Katy Borrini-Mayori and César Náquira.*

# Looking Good:

*Care and Maintenance  
Of St. Augustinegrass*

Laurie Trenholm,  
John Cisar and  
Joseph Unruh

# Proper lawn maintenance practices are the best means for avoiding pest or stress problems and for maintaining a healthy lawn.

**S**T. AUGUSTINEGRASS requires inputs of fertilizer to maintain good cover and healthy growth characteristics. During certain times of the year, it generally requires supplemental irrigation. Pesticides may be needed periodically, but their use can be minimized if other cultural practices such as mowing, irrigation, and fertilization are done correctly and if integrated pest management practices are followed.

## Fertilization

Proper fertilization is very important for sustaining a healthy lawn. Fertilization and other cultural practices influence the overall health and quality of the lawn and reduce its vulnerability to numerous stresses, including weeds, insects, and disease. It is very important that anyone fertilizing their lawn be familiar with and follow the Florida-Friendly Landscaping™ Best Management Practices. These practices are designed to maintain healthy lawns and reduce any potential nonpoint source pollution of water resources that might result from lawn and landscape fertilization and other cultural practices. There are now state and, in some cities and counties, local regulations that cover lawn fertilization. Be sure to be aware of these regulations, and always follow the directions on the fertilizer bag.

A soil test should be done prior to planting or when purchasing a home with an existing lawn to determine what nutrients are available to the lawn and what the soil pH is. The local Extension office has instructions and supplies for taking soil samples and submitting them to the Extension Soil Testing Laboratory for analysis. In particular, phosphorus levels are best

determined by soil testing. Since some Florida soils are high in phosphorus, it may not always be necessary to add phosphorus to a lawn once it is established.

Florida Rule (5E-1.003) mandates that fertilizer application rates cannot exceed 1 pound of nitrogen per 1,000 square feet for any application. Based on the percentage of nitrogen that is in a slowly available or slow-release form in a fertilizer, UF recommendations call for applying up to 1 pound of nitrogen per 1,000 square feet of turfgrass.

As a general rule, the first fertilizer application of the year should be early April in central Florida and mid-April in north Florida. In South Florida, fertilizer applications may be made throughout the year since growth is year-round. University of Florida guidelines for lawn grass fertilization offer a range of fertilizer rates with which a particular species may be successfully maintained in the various regions of the state. These ranges account for the effect that localized microclimates can have on turfgrass growth. A range of rates allows for these environmental variations. An example of this would be a typical home lawn that is partially shaded and partially sunny. The grass growing in the shade needs less fertilizer than that growing in full sun.

Fertilization also is affected by soil type, organic matter in soils, and practices such as clipping management. Additionally, a newly sodded lawn on a sandy soil with little organic matter requires more fertilizer than a lawn that has been fertilized for years. In Florida, new homes and new developments may be next to much older, developed landscapes, and a one-size-fits-all approach to fertilization is not reasonable. These guidelines provide a base range from which the end user can begin a fertilization program. The homeowner is encouraged to initiate a program based on these guidelines and to adjust it over time based on how the turfgrass responds.

Depending on geographical location, fertilizer should be applied to St. Augustinegrass in two to six applications from spring green-up through fall, or year-round in South Florida. Do not apply too early in the growing season, particularly in north Florida, because late-season frosts may damage the grass and the root system will not be fully grown in at this time to assimilate the nutrients. Likewise, do not fertilize too late in the year after growth has subsided.

On high-pH (>7.0) soils or where high-pH water is applied, yellow leaf blades may be an indication of iron or manganese deficiency. Application of soluble or chelated sources of these micronutrients can provide a green-up in these cases.

Note that iron is not a substitute for nitrogen, which provides the building blocks for turfgrass growth and is required for turf health. While both iron and nitrogen deficiencies result in turfgrass yellowing, they are distinctly different deficiencies in plants. Applying iron does not cure yellowing due to nitrogen deficiency and iron fertilizer is not a substitute for nitrogen fertilizer. Foliar iron fertilizers, such as iron sulfate or chelated iron solutions, help alleviate iron deficiencies, and nitrogen fertilizers applied according to UF/IFAS guidelines alleviate nitrogen deficiencies.

## Mowing

Proper mowing practices are necessary to keep any lawn healthy and attractive. Standard St. Augustinegrass cultivars such as 'Bitter Blue,' 'Classic,' and 'Floritam' should be maintained at a height of 3.5–4 inches. Repeatedly mowing at lower heights increases the stress on the lawn, discourages deep rooting, increases the chance for scalping if a mowing event is missed or postponed due to weather, and may increase susceptibility to pest problems. Maintaining the right height helps the grass develop a deep root



Photograph by Laurie Trenholm, UF/IFAS

*“Scalping,” or mowing grass too short, can injure the lawn. Always mow at the highest recommended height for the cultivar and species.*

system and gives a better appearance to the turf. No more than 1/3 of the leaf blades should be removed with any mowing. If possible, mowing height should be increased during periods of moisture stress or if the grass is growing in shade. Dwarf varieties have a lower growth habit and should be mowed at 2–2.5 inches for optimum health. Mowing too infrequently or too high, overwatering, and overfertilizing can cause a thatch buildup.

A rotary mower can be used on St. Augustinegrass. It is important to keep the blades sharp and well adjusted for a clean cut. Dull blades give the lawn a brownish cast because a ragged cut shreds the leaf blades rather than cuts them. During the growing season, blades should be sharpened monthly. St. Augustinegrass typically requires weekly mowing during the growing season and less frequent mowing during the cooler months of the year. In north Florida, mowing may not be required during winter months.

Grass clippings should be left on a lawn that is mowed at the proper height and frequency. Under these conditions, clippings do not contribute to the thatch layer. Clippings put nutrients and organic matter back into the soil system. If clippings are excessive and clumping occurs, let them dry out and then disperse them over the lawn.

## Watering

Irrigating on an “as-needed” basis is the best way to maintain any established, mature grass, as long as the proper amount of water is applied when needed. Irrigation is needed when leaf blades begin to fold up, wilt, or turn blue-gray, or when footprints remain visible after walking on the grass. Apply 1/2–3/4 inch of water per application. This applies water to roughly the top 8 inches of soil, where the majority of the roots are. Be sure to follow any local watering restrictions.



*Photograph by Laurie Trenholm, UF/IFAS*

*Let your lawn tell you when to water. Look for folded leaf blades, as seen here.*

To determine the amount of irrigation supplied by a sprinkler system, place several straight-sided cans, e.g., tuna fish or cat food, throughout each irrigation zone and run each zone to determine how long it takes to fill the cans to the 1/2- or 3/4-inch level, then record the time. Each zone will likely take different amounts of time to give the same quantity of water. The recorded run times for each zone should then be programmed into the irrigation clock for automated systems. If the variation in the catch cans is great, a more thorough audit of the irrigation system is needed.

The frequency of irrigating should change seasonally, with less water needed in the fall and winter. The amount applied should not be adjusted—only the frequency.

Proper watering practices help maintain a healthy lawn that has fewer stress and insect problems. If large patch or gray leaf spot diseases are a continuous problem, excessive watering and nitrogen fertilization may be responsible. Certain weeds, such as dollarweed and sedges, also thrive in soils that are continuously wet.

## Pest Management

### Weeds

The best approach to weed control is a healthy, vigorous lawn. Weed problems in a lawn indicate that the turf has been weakened by improper management practices or damage from pests. Proper management practices can eliminate many weed problems. If weeds are a persistent problem, herbicides labeled specifically for St. Augustinegrass should be used. If an herbicide is needed, preemergence herbicides, e.g., pendimethalin, benefin, bensulide, atrazine, or others, can be applied to control crabgrass if it was present in previous years. Timing is critical for successful control. As a general rule, preemergence herbicides for crabgrass should be applied February 1 in South

Florida, February 15 in central Florida, and March 1 in north Florida. Note: Preemergence herbicides will not control weeds that are actively growing.

Postemergence herbicides, e.g., atrazine, should be applied as needed for control of summer annual and perennial broadleaf or grassy weeds. These materials should not be applied if the turf is under moisture stress or when air temperatures exceed 85°F. Your local county Extension office can assist with weed identification and provide the latest recommendations.

Many commercial “weed-n-feed” formulations provide control, but they should be used with caution because certain plant materials may not be tolerant. These herbicides can damage landscape plants whose roots may extend far under the lawn. These materials should only be used when a lawn has a uniform weed population. If weeds exist only on a portion of the lawn, weed-n-feed products should not be applied to the entire lawn. If the situation warrants the use of a weed-n-feed product, it is important to determine if the manufacturer’s recommended rate of application supplies the amount of fertilizer needed by the turfgrass and the amount of herbicide that is required for weed control. Supplemental applications of fertilizer or herbicide may be required if the fertilizer/herbicide product does not supply enough fertilizer to meet the fertility needs of the turfgrass or the amount of herbicide needed for weed control. Carefully read the label before use and follow all label directions.

### Insects

The major insect pest of St. Augustinegrass is the southern chinch bug. Chinch bugs are foliar-feeding insects that suck plant juices through a needlelike beak, causing yellowish to brownish patches in turf. Injured areas are usually first noticed as the weather begins to warm in areas along sidewalks, adjacent to buildings, and in other water-stressed areas where the grass is in full sun.

Other insect pests, including webworms, armyworms, grass loopers and mole crickets can damage St. Augustinegrass. Mole crickets damage turfgrass areas primarily by creating tunnels or soft mounds while searching for food. Additional damage may result from small animals digging through the soil profile in search of the mole crickets as food. Check for mole crickets by examining an area for tunnels or by applying 2 gallons of water mixed with 1 1/2 ounces of liquid detergent soap per 2 square feet in suspected damaged areas. Mole crickets will surface in several minutes.

White grubs are another pest of St. Augustinegrass. These can be found by lifting the grass from a depth of about 2 inches. Grubs can be seen feeding on the roots at this level.



**CHINCH BUGS AND THEIR DAMAGE**

Damage photograph by Eileen Buss, chinch bug photograph by Lyle Buss, UF/IFAS



**LARGE PATCH**



**GRAY LEAF SPOT**

Disease photographs by P. Harmon, UF/IFAS

### Nematodes

Several types of nematodes infest St. Augustinegrass lawns. Population peaks of nematodes typically occur in late April to early May and again in late August to early September. Damage symptoms include thin stand density, less vigorous growth, a weakened root system, slow recovery following rain or irrigation application, and certain weeds such as prostrate spurge and Florida pusley.

Plant parasitic nematode levels can be positively identified only through laboratory procedures. The local county Extension office can provide information on submitting soil samples to the University of Florida Nematode Assay Laboratory. There currently are no effective nematode controls for use on the home lawn. Cultural controls include encouraging deep turfgrass rooting by raising the mowing height, irrigating less frequently but more deeply, and providing ample soil potassium.

### Diseases

Large patch and gray leaf spot are two major disease problems of St. Augustinegrass. Large patch occurs in warm, humid weather and is encouraged by excessive nitrogen. It is generally most noticeable during the spring and fall. Gray leaf spot occurs during the summer rainy season and is primarily a problem on new growth. Both diseases can be controlled with fungicides.

Other St. Augustinegrass disease problems originate in the root system. Take-all root rot, *Gaeumannomyces graminis* var. *graminis*, occurs under high moisture or stress conditions. When symptoms are noticeable above ground, the disease is usually in an advanced stage. Following proper cultural practices is the best defense against this disease.

### Other Problems

Other factors also can decrease the quality of a lawn. Excessive shade, compacted soils, over- or under-watering, improper mowing, traffic, and high or low pH all can cause a lawn to perform poorly. It is important to recognize the source of the problem and to correct it if possible.

### Thatch Removal

Thatch is the layer of undecomposed, stolons, roots, and crowns intermingled with soil. Leaving clippings on the lawn does not cause thatch, because clippings are readily broken down by microbes in the soil. Thatch development is greatest in grass that is overfertilized or overwatered. An excessive thatch layer reduces water penetration and can bind up fertilizer or pesticides. In severe cases, roots may be seen actually growing above ground and rooting into the thatch layer. This is a very unhealthy condition and leaves the lawn vulnerable to many stresses.

If the thatch layer exceeds 1 inch, it may be removed by vertical mowing, or "verticutting," in early spring to midsummer. Verticutting uses vertical blades that slice through the thatch and slightly into the soil, resulting in much of the dead material being removed

from the top of the lawn. A 3-inch spacing between the dethatching blades is best for St. Augustinegrass.

Caution: Vertical mowing may result in damaged turf that requires a period of recuperation. Do not attempt vertical mowing unless the grass is actively growing. Verticut should be done in an east-to-west or north-to-south pattern, but not in all four directions. Debris should be removed by raking, sweeping, or vacuuming, followed by a conventional mowing to improve turf appearance and immediate irrigation to prevent root-zone dehydration.

One week after vertical mowing, fertilizer should be applied at the rate of 1/2 pound of nitrogen per 1000 square feet to encourage recovery. This material must be watered into the soil immediately following application to prevent plant burn. Periodic topdressing (adding a uniform layer of soil on top of the grass) with 1/4 inch of soil similar to that underlying the turf is the best method to alleviate thatch accumulation. If topdressing, be sure to use soil that is free of weed seeds and nematodes and be careful not to exceed recommended topdressing rates.

### Renovation

Large, bare areas can be replanted by broadcasting sprigs (1 bushel per 1000 square feet), by planting 2-inch plugs every 12 inches, or by sodding. These areas should be kept continuously moist with light, frequent irrigations several times daily until runners develop or sod is well rooted. Over time, irrigation frequency should be gradually reduced, but duration should be increased to apply 1/2–3/4 inch of water. **PP**

### For More Information

**BMPs** Homeowner Best Management Practices for the Home Lawn, <http://edis.ifas.ufl.edu/ep236>

**Submitting soil samples** <http://soilslab.ifas.ufl.edu/ESTL%20Home.asp>

**Watering practices** ENH9, *Watering Your Florida Lawn*, <http://edis.ifas.ufl.edu/lh025>, and ENH63, *Let Your Lawn Tell You When to Water*, <http://edis.ifas.ufl.edu/ep054>

**Weeds** ENH884, *Weed Management in Home Lawns*, <http://edis.ifas.ufl.edu/ep141>

**Insect control** ENY300, *Insect Pest Management on Turfgrass*, <http://edis.ifas.ufl.edu/ig001>

**Diseases** SS-PLP-14, *Turfgrass Disease Management*, <http://edis.ifas.ufl.edu/lh040>

**Other types of stresses** ENH153, *Environmental Stresses and Your Florida Lawn*, <http://edis.ifas.ufl.edu/ep070>

**Renovation** ENH03, *Establishing Your Florida Lawn*, <http://edis.ifas.ufl.edu/lh013>

**Pest Management University**  
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<http://pmu.ifas.ufl.edu>

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For help registering for a course  
online or technical support:  
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1-855-275-1095

## PMU Course Schedule, January – June 2015

Training from Pest Management University at the University of Florida meets Florida Pesticide Applicator Continuing Education Requirements.

### ONLINE COURSES

ABC de IPM – 2013 (Spanish)  
ABCs of IPM – 2013  
Good Neighbor Practices and Pesticidal Drift  
Introduction to Landscape IPM Online

### COURSES AT PMU, 2725 S. Binion Road, Apopka, FL 32703

#### General Household Pests (GHP)

February 11-13, 2015

**PMU Foundations of General Pest Management 101**, \$375.00  
02/11/2015 to 02/13/2015

Learn enough to do the basics of GHP work. Pest control matters!

June 25, 2015

**General Household Pests Basics**, \$175.00  
06/25/2015

This one-day class is geared for the new technician, sales or office staff.

#### Landscape and Ornamentals (L&O)

February 18-20, 2015

**Foundations of Ornamental Plant Pest Management**, \$375.00

Learn how to properly ID common southern trees and shrubs, monitor and diagnose pest and maintenance problems, ID beneficials, calibrate and operate different pesticide application equipment, and impress your instructors with your landscape IPM expertise.

March 18-20, 2015

**Foundations of Turfgrass Pest Management**, \$375.00

Learn about common turf varieties, turf diseases, IPM of turf pests, methods of sampling, equipment calibration, turf maintenance requirements and more!

#### Termites and Other Wood-Destroying Organisms (WDO)

February 25-27, 2015

**Foundations of Termite Management 101**, \$375.00

Learn how termites exploit over 50 building construction elements and how to treat them in a hands-on environment in 2 days instead of 2 years.

March 12-13, 2015

**WDO Inspections and Form 13645**, \$220.00

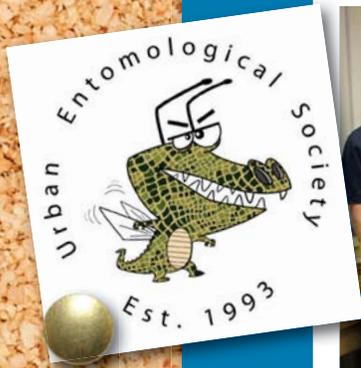
Improperly completed 13645 forms are a leading cause of litigation for pest control. Foundations recommended, but not required.

June 26, 2015

**Termite Basics 100**, \$175.00

This one-day class is geared for the new technician, sales or office staff. Will help fulfill 40-hour training requirement for new ID card holders.

# URBAN ENTOMOLOGICAL SOCIETY (UES)



**UES** is a student-run organization of graduate and undergraduate students at the University of Florida.

We aim to expose students to the pest management industry and, through research, we gain translatable experience. UES is self-funded based on support from companies and individuals in the industry, as well as the products we sell. These contributions translate to benefits for both the supporters and UES by creating opportunities for partnership in product

testing and development as well as building long-lasting relationships. The monetary contributions fund the students to travel to different conferences and give talks to communicate the ever-changing science behind pest management. Ultimately, our goal is to develop our skills to follow the current leaders in pest management, and become future leaders in this industry.



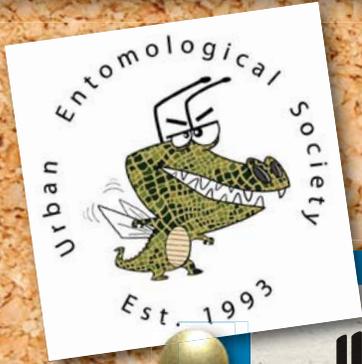
J. Cooksey  
McCall Service



M. Knox  
CSI



M. Remmen  
Bayer



# URBAN ENTOMOLOGICAL SOCIETY (UES)

## PRODUCTS WE SELL

[ENTOMOLOGY.UFL.EDU/URBAN/UESSTORE.HTML](http://ENTOMOLOGY.UFL.EDU/URBAN/UESSTORE.HTML)

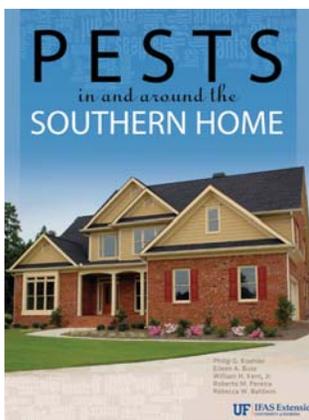
TEAL  
KIDS' INSECT  
T-SHIRT

15-



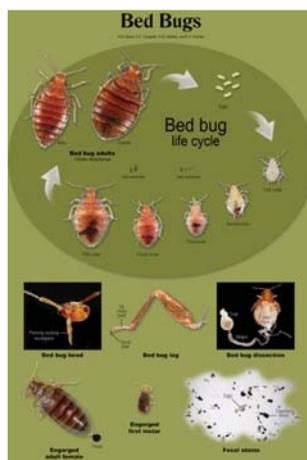
BLUE  
ADULT SPIDER  
T-SHIRT

15-



BOOK  
Pests In and Around the  
Southern Home

30-



COLOR POSTER  
Bed Bugs

5-



COLOR POSTER  
Mosquito Vectors

5-