Strategic Plan for Integrated Pest Management for the University of Arkansas

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UNIVERSITY OF ARKANSAS

Office for Sustainability

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Mission:

The project goal is for an intern to list pests of concern and conduct a cost comparison of the current pest management (PM) programs for grounds and buildings to more sustainable integrated pest management (IPM) programs proposed for the University of Arkansas (UA) in Fayetteville.

This IPM Plan will be implemented on the UA campus in two unique sectors: University Housing and Facilities Management. This plan should be used to analyze current pest monitoring, treatment(s), and evaluation practices on the UA campus and offer suggestions (if need be) to effectively minimalize pest occurrences while reducing negative effects on the campus and surrounding environment, and improving the health and safety of visitors, students, faculty, and staff, as well as raise the educational awareness of IPM for the community and on the UA flagship campus in Fayetteville.

University of Arkansas Campus Environment:

Founded as a land grant university in 1871**,** the UA in Fayetteville, Arkansas (AR) has been constructed at the foothills of the Boston Mountains located on the Ozark Plateau along the I-540 Northwest Arkansas Urban Corridor. With a campus population 23,000, Fayetteville population of 73,000, and regional population of 500,000 the UA is the second fastest growing Southeastern Conference member institution behind the University of Alabama.

The UA has been in fluxed by surge of students in recent years. Therefore, the campus landscape is changing due to ongoing housing, academic, and athletic construction efforts to meet the UA's commitment of becoming a United States Top 50 Research Institution. This IPM Plan should include all current and future campus construction and renovation projects.

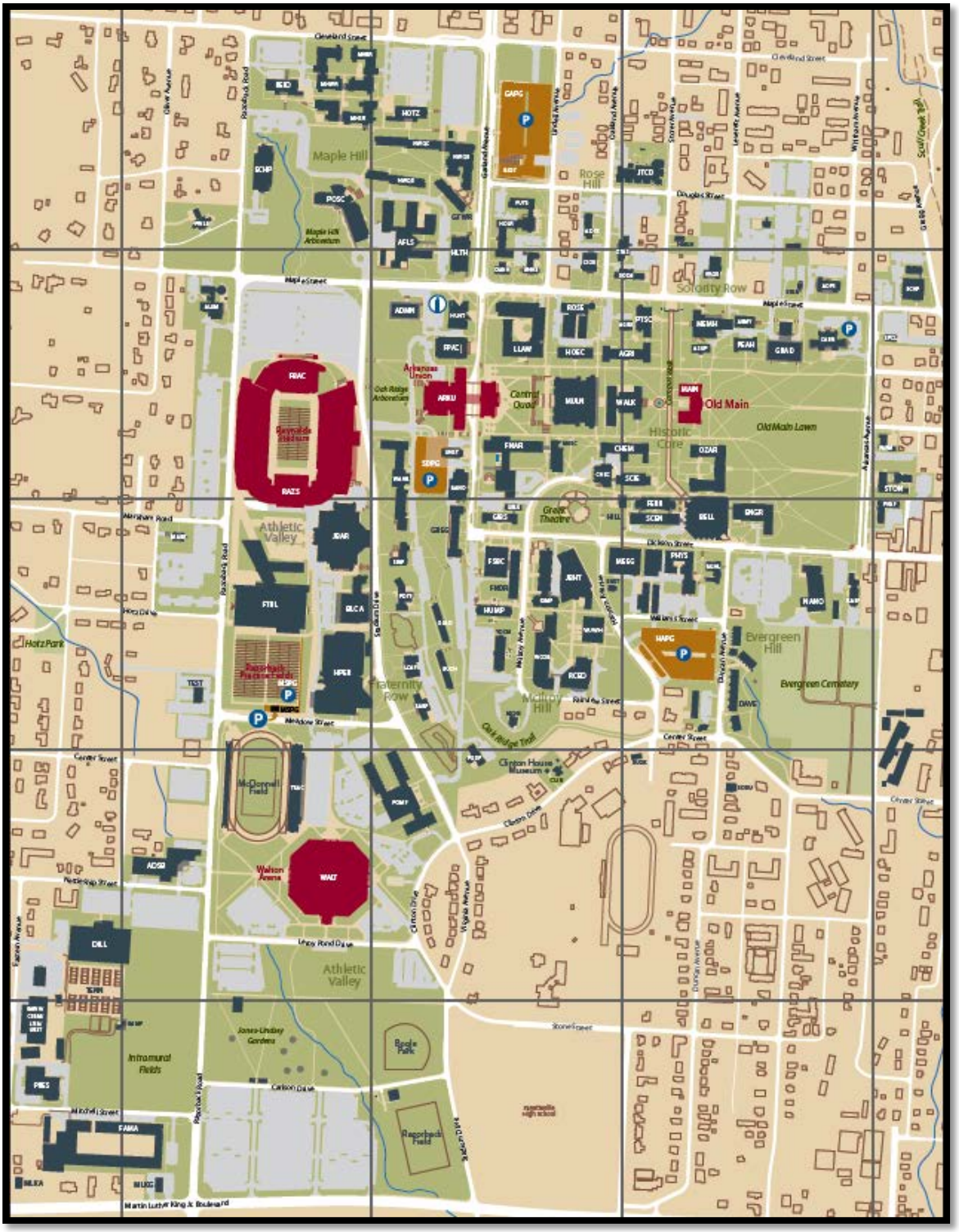
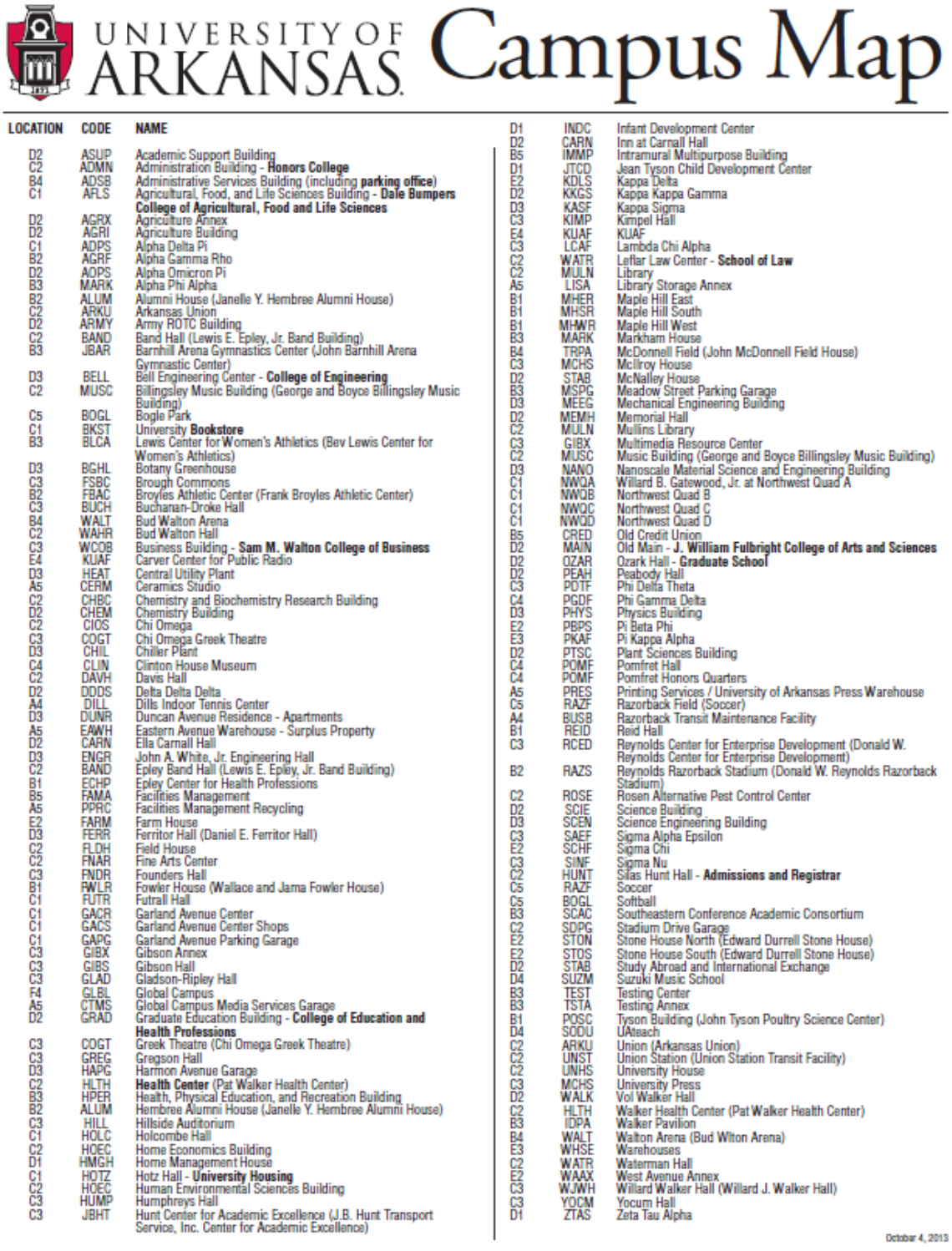


Figure 1. University of Arkansas building map (http://campusmaps.uark.edu/CampusMap.pdf).



UNIVERSITY OF ARKANSAS Campus Map

LOCATION	CODE	NAME
D2	ASUP	Academic Support Building
C2	ADMN	Administration Building - **Honors College**
B4	ADSB	Administrative Services Building (including **parking office**)
C1	AFLS	Agricultural, Food, and Life Sciences Building - **Dale Bumpers College of Agricultural, Food and Life Sciences**
D2	AGRX	Agriculture Annex
D2	AGRI	Agriculture Building
C1	ADPS	Alpha Delta Pi
B2	AGRF	Alpha Gamma Rho
D2	AOPS	Alpha Omicron Pi
B3	MARK	Alpha Phi Alpha
B2	ALUM	Alumni House (Janelle Y. Hembree Alumni House)
C2	ARKU	Arkansas Union
D2	ARMY	Army ROTC Building
C2	BAND	Band Hall (Lewis E. Epley, Jr. Band Building)
B3	JBAR	Barnhill Arena Gymnastics Center (John Barnhill Arena Gymnastic Center)
D3	BELL	Bell Engineering Center - **College of Engineering**
C2	MUSC	Billingsley Music Building (George and Boyce Billingsley Music Building)
C5	BOGL	Bogle Park
C1	BKST	University **Bookstore**
B3	BLCA	Lewis Center for Women's Athletics (Bev Lewis Center for Women's Athletics)
D3	BGHL	Botany Greenhouse
C3	FSBC	Brough Commons
B2	FBAC	Broyles Athletic Center (Frank Broyles Athletic Center)
C3	BUCH	Buchanan-Droke Hall
B4	WALT	Bud Walton Arena
C2	WAHR	Bud Walton Hall
C3	WCOB	Business Building - **Sam M. Walton College of Business**
E4	KUAF	Carver Center for Public Radio
D3	HEAT	Central Utility Plant
A5	CERM	Ceramics Studio
C2	CHBC	Chemistry and Biochemistry Research Building
D2	CHEM	Chemistry Building
C2	CIOS	Chi Omega
C3	COGT	Chi Omega Greek Theatre
D3	CHIL	Chiller Plant
C4	CLIN	Clinton House Museum
C2	DAVH	Davis Hall
D2	DDDS	Delta Delta Delta
A4	DILL	Dills Indoor Tennis Center
D3	DUNR	Duncan Avenue Residence - Apartments
A5	EAWH	Eastern Avenue Warehouse - Surplus Property
D2	CARN	Ella Carnall Hall
D3	ENGR	John A. White, Jr. Engineering Hall
C2	BAND	Epley Band Hall (Lewis E. Epley, Jr. Band Building)
B1	ECHP	Epley Center for Health Professions
B5	FAMA	Facilities Management
A5	PPRC	Facilities Management Recycling
E2	FARM	Farm House
D3	FERR	Ferritor Hall (Daniel E. Ferritor Hall)
C2	FLDH	Field House
C2	FNAR	Fine Arts Center
C3	FNDR	Founders Hall
B1	FWLR	Fowler House (Wallace and Jama Fowler House)
C1	FUTR	Futrall Hall
C1	GACR	Garland Avenue Center
C1	GACS	Garland Avenue Center Shops
C1	GAPG	Garland Avenue Parking Garage
C3	GIBX	Gibson Annex
C3	GIBS	Gibson Hall
C3	GLAD	Gladson-Ripley Hall
F4	GLBL	Global Campus
A5	CTMS	Global Campus Media Services Garage
D2	GRAD	Graduate Education Building - **College of Education and Health Professions**
C3	COGT	Greek Theatre (Chi Omega Greek Theatre)
C3	GREG	Gregson Hall
D3	HAPG	Harmon Avenue Garage
C2	HLTH	**Health Center** (Pat Walker Health Center)
B3	HPER	Health, Physical Education, and Recreation Building
B2	ALUM	Hembree Alumni House (Janelle Y. Hembree Alumni House)
C3	HILL	Hillside Auditorium
C1	HOLC	Holcombe Hall
C2	HOEC	Home Economics Building
D1	HMGH	Home Management House
C1	HOTZ	Hotz Hall - **University Housing**
C2	HOEC	Human Environmental Sciences Building
C3	HUMP	Humphreys Hall
C3	JBHT	Hunt Center for Academic Excellence (J.B. Hunt Transport Services, Inc. Center for Academic Excellence)
D1	INDC	Infant Development Center
D2	CARN	Inn at Carnall Hall
B5	IMMP	Intramural Multipurpose Building
D1	JTCD	Jean Tyson Child Development Center
E2	KDLS	Kappa Delta
D2	KKGS	Kappa Kappa Gamma
D3	KASF	Kappa Sigma
C3	KIMP	Kimpel Hall
E4	KUAF	KUAF
C3	LCAF	Lambda Chi Alpha
C2	WATR	Leflar Law Center - **School of Law**
C2	MULN	Library
A5	LISA	Library Storage Annex
B1	MHER	Maple Hill East
B1	MHSR	Maple Hill South
B1	MHWR	Maple Hill West
B3	MARK	Markham House
B4	TRPA	McDonnell Field (John McDonnell Field House)
C3	MCHS	McIlroy House
D2	STAB	McNalley House
B3	MSPG	Meadow Street Parking Garage
D3	MEEG	Mechanical Engineering Building
D2	MEMH	Memorial Hall
C2	MULN	Mullins Library
C3	GIBX	Multimedia Resource Center
C2	MUSC	Music Building (George and Boyce Billingsley Music Building)
D3	NANO	Nanoscale Material Science and Engineering Building
C1	NWQA	Willard B. Gatewood, Jr. at Northwest Quad A
C1	NWQB	Northwest Quad B
C1	NWQC	Northwest Quad C
C1	NWQD	Northwest Quad D
B5	CRED	Old Credit Union
D2	MAIN	Old Main - **J. William Fulbright College of Arts and Sciences**
D2	OZAR	Ozark Hall - **Graduate School**
D2	PEAH	Peabody Hall
C3	PDTF	Phi Delta Theta
C4	PGDF	Phi Gamma Delta
D3	PHYS	Physics Building
E2	PBPS	Pi Beta Phi
E3	PKAF	Pi Kappa Alpha
D2	PTSC	Plant Sciences Building
C4	POMF	Pomfret Hall
C4	POMF	Pomfret Honors Quarters
A5	PRES	Printing Services / University of Arkansas Press Warehouse
C5	RAZF	Razorback Field (Soccer)
A4	BUSB	Razorback Transit Maintenance Facility
B1	REID	Reid Hall
C3	RCED	Reynolds Center for Enterprise Development (Donald W. Reynolds Center for Enterprise Development)
B2	RAZS	Reynolds Razorback Stadium (Donald W. Reynolds Razorback Stadium)
C2	ROSE	Rosen Alternative Pest Control Center
D2	SCIE	Science Building
D3	SCEN	Science Engineering Building
C3	SAEF	Sigma Alpha Epsilon
E2	SCHF	Sigma Chi
C3	SINF	Sigma Nu
C2	HUNT	Silas Hunt Hall - **Admissions and Registrar**
C5	RAZF	Soccer
C5	BOGL	Softball
B3	SCAC	Southeastern Conference Academic Consortium
C2	SDPG	Stadium Drive Garage
E2	STON	Stone House North (Edward Durrell Stone House)
E2	STOS	Stone House South (Edward Durrell Stone House)
D2	STAB	Study Abroad and International Exchange
D4	SUZM	Suzuki Music School
B3	TEST	Testing Center
B3	TSTA	Testing Annex
B1	POSC	Tyson Building (John Tyson Poultry Science Center)
D4	SODU	UAteach
C2	ARKU	Union (Arkansas Union)
C2	UNST	Union Station (Union Station Transit Facility)
C2	UNHS	University House
C3	MCHS	University Press
D2	WALK	Vol Walker Hall
C2	HLTH	Walker Health Center (Pat Walker Health Center)
B3	IDPA	Walker Pavilion
B4	WALT	Walton Arena (Bud Wlton Arena)
E3	WHSE	Warehouses
C2	WATR	Waterman Hall
E2	WAAX	West Avenue Annex
C3	WJWH	Willard Walker Hall (Willard J. Walker Hall)
C3	YOCM	Yocum Hall
D1	ZTAS	Zeta Tau Alpha

October 4, 2013

Figure 2. University of Arkansas campus directory (http://campusmaps.uark.edu/CampusMap.pdf).

Figure 3. Satellite view of the University of Arkansas (Google Earth).

Definitions:

Pest Management - Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

Monitoring and Identification - Not all insects, weeds, and other living organisms require control. Many organisms are innocuous, and some are even beneficial. IPM programs work to monitor for pests and identify them accurately, so that appropriate control decisions can be made in conjunction with action thresholds. This monitoring and identification removes the possibility that pesticides will be used when they are not really needed or that the wrong kind of pesticide will be used.

Prevention - As a first line of pest control, IPM programs work to manage the crop, lawn, or indoor space to prevent pests from becoming a threat. In an agricultural crop, this may mean using cultural methods, such as rotating between different crops, selecting pest-resistant varieties, and planting pest-free rootstock. These control methods can be very effective and cost-efficient and present little to no risk to people or the environment.

Control - Once monitoring, identification, and action thresholds indicate that pest control is required, and preventive methods are no longer effective or available, IPM programs then evaluate the proper control method both for effectiveness and risk. Effective, less *risky* pest controls are chosen first, including highly targeted chemicals, or mechanical control, such as trapping or weeding. If further monitoring indicates that less risky controls are not working, then additional pest control methods should be employed, such as targeted application of pesticides. Broadcast spraying of non-specific pesticides should be a last resort.

Numbers of Pest Requests at the University of Arkansas-Fayetteville from 2007-2014

In Fig. 4, you will see how campus requests to resolve a pest problem vary by month with most of the complaints occurring soon after students return to dorms for fall semester. Ants complaints peak in August after students return, these problems get resolved and complaints remain low until ants begin foraging again in the spring and start new colonies. The reports of brown recluse peak occur mostly in August and this may be attributed to students bringing in spider-infested boxes of belongings from their home. Students need to make sure they do not introduce spiders from home. In October and November, wasps are successfully entering buildings in search of a warm overwintering site which results in many requests for wasp elimination. Similarly, there are a few complaints of crickets in September, as temperature begin to drop, when they try to move indoors to survive the winter. Mice tend to be a problem in the fall from September through November. Complaints of cockroaches (roaches) were fairly constant all year with a slight rise in complaints in August. Gnats appear to increase in September and are usually found in areas where there is moisture and organic debris such as dirty sinks and shower drains.

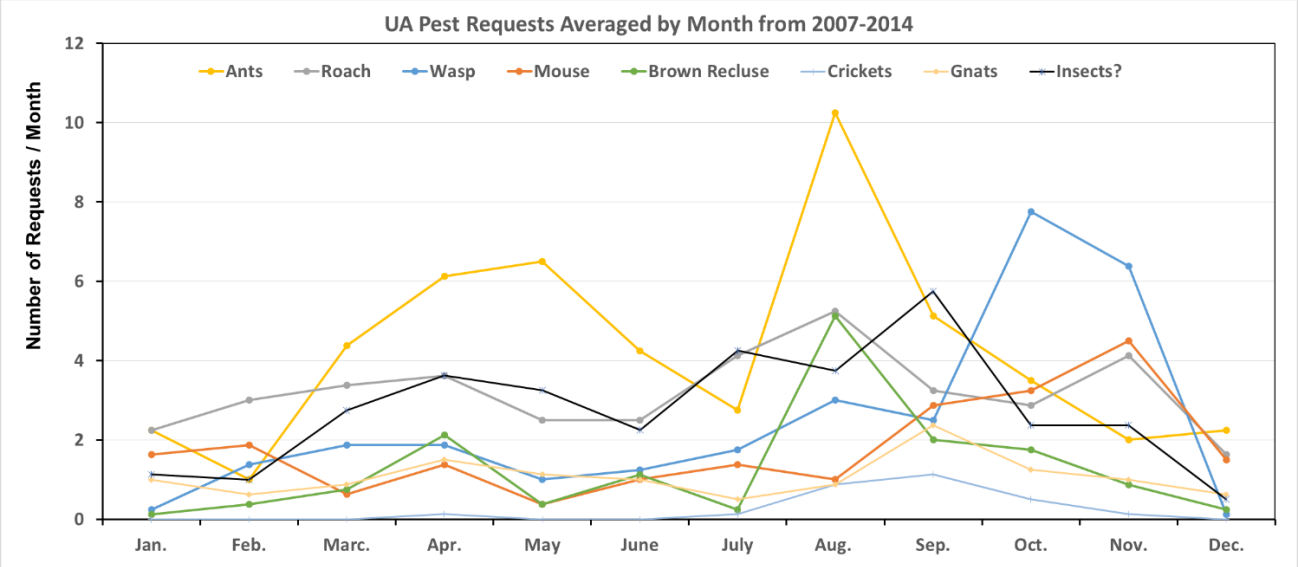


Figure 4. Monthly request of common pests on campus 2007-2014.

Ants 434, Roach 295, Wasp 223, Mouse 180, Insect (Bug) 120, Brown Recluse 109, Gnats 99, Undeclared 56, Cricket 27,

Figure 5. Drawings of common pests and total number of requests reported from 2007-2014.

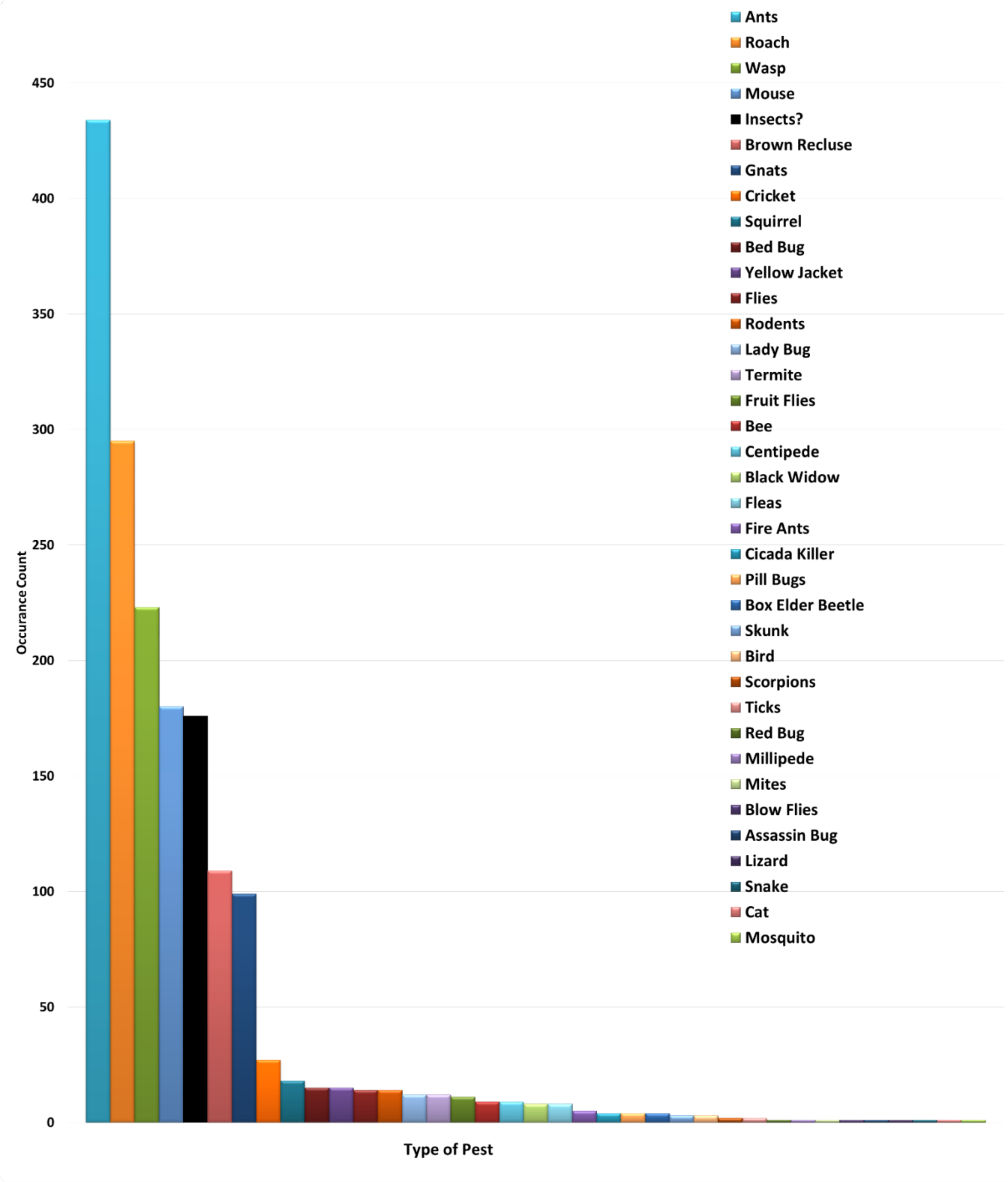


Figure 6. Number of reports for each pest in order of sightings from 2007-2014.

UA Strategic Plan for IPM Goals:

- Complete an IPM Plan that can be implemented throughout all sectors of the UA
- IPM Plan should utilize technologies and the best pest management methods available
- Alternate control methods should be utilized before chemical means
- Improve data collection for pest occurrence, treatment, and evaluation
- Utilize building executive for distribution of information to Orkin
- Implement an online pest identification pamphlet and management guidebook for the UA campus community

Educational Outreach:

- It has come to our attention that pest awareness may be lacking on campus, especially within the student body which encompasses the resident halls
- We would like to create (design) a web based pest identification and information program that could be used to identify common campus pest via photos, and give pest descriptions and treatment options for students, faculty and staff
- This program could be integrated into the current UA Housing Maintenance Request Form and would allow for more accurate information transfer among UA Housing, UA Facilities Management, and Orkin Pest Control
- With this modification, Orkin would be equipped with additional information that could allow for a more efficient treatment of UA campus pests
- Students would be made aware of control options that they could implement within their residence hall, such as a fly-swatter, blocking pest entry points or improving cleanliness and organization

Current Monitoring, Treatment Evaluation Procedures:

- Visual inspection
- Treatment Options: baits, traps, and pesticides
- UA Pest Management Contract with Orkin Pest Control
    - Orkin Pest Control
      7108 Texas Road
      Fort Smith, AR 72908
    - Technician, Jordan Risley
    - Service Manager William Dumas
    - Orkin Station Manager, Eric Westmoreland

Current Treatment Options Include:

- Treatments are implemented at the request of UA students, faculty, and staff or at the discretion of Orkin Pest Control Technicians from the request of UA Housing, UA Grounds, and UA Facilities Management.

- Treatments include traps, baits, and the use of chemicals (as a last resort). Treatment methods used by Orkin Pest Control are approved by UA Facilities.
- Traps, baits, and pesticides authorized for use against pests on the UA campus include:
    - Terminodor® - termite
    - Talstar® PL Granular Insecticide – ant, flea, and tick
    - Advance Roach Gel Bait Reservoir – cockroach
    - Deltadust DP0, 05 24X0 BOT WW - ants, bed bugs, boxelder bugs, cockroaches, crickets, fleas, firebrats, silverfish, termites, carpenter ants, carpenter bees, centipedes, ground beetles, millipedes, scorpions, spiders, sow bugs, wasps, bees, carpet beetles, and ticks
    - CY-Kick CS - spiders, ants, boxelder bugs, mosquitoes, bees, cockroaches, crickets, fleas, flies, bed bugs, silverfish, ticks, and wasp
    - Phantom Termiticide/Insecticide – termite
    - Talstar® Professional Insecticide - ants, termites, cockroaches, spiders, bed bugs, fleas and tick
    - Maxforce Granular Fly Bait – fly control

Housing:

- UA Housing currently operates an online maintenance (pest) request form which can be accessed by students, faculty, and staff with a campus identification number via the UA Housing online website
- Pest management requests are processed by UA Housing IT personnel under the supervision of Aaron England, Assistant Director of Operations and Maintenance. Orkin Pest Control responds to each request by sending a technician to investigate, make a decision and applies the best management practice to resolve the pest problem. The technician logs all site visits with descriptions of pest and action taken or pesticide applied by utilizing PowerTrak™
- UA Housing Director, Dr. Jeff Vinger confirms that PowerTrak™ is working sufficiently.
- Typical pest management tactics include: building maintenance to ensure pest exclusion; recommend improvements for sanitation; set out traps or baits; apply pesticides as a last resort in university buildings on campus and campus landscape and turf areas
- During the winter and summer break all university housing buildings and rooms are inspected and treated

Housing Improvements:

- Student pest management request forms should be altered to include an online pest identification guide that highlights the top 10 most common and least wanted pests on the UA campus
- This document should be easy to interpret, include a pest photo identification guide, and give students, faculty, and staff access to in-house pest control remedies

- Student pest management request forms should be submitted by resident assistant's (RA) or the specific building executive (if non-residential) to reduce multiple or conflicting reports of the same pest incident.
- Students that reside within on-campus residential housing should be held accountable for following recommendations for pest management provided by Orkin Pest Control Technicians. If repeated pest occurrences are a result of unsanitary living conditions, disciplinary actions should be taken by UA Housing:
  - If the pest occurrence is a repeating offense not resolved due to the student(s) unwillingness to comply with given recommendation, then there should be some kind of penalty or monetary charge to the students, such as charge student for part of the cost of the extra visits by Orkin Pest Control
- Building waste containers and dumpsters should be located further away from campus building entry ways if possible

Facilities Management:

- Orkin is responsible for treating on-campus facilities, which includes academic buildings, sidewalks, and common areas such as Mullins Library
- Orkin service receipts are delivered to Facilities Management
  - This paper document includes location, method of treatment, and pesticide applied (when applicable)

Facilities Management Improvements:

- PowerTrak™ is already included in the UA-Orkin Pest Control contract, but not fully utilized
- Recommend that Facilities Management work with UA Housing and Orkin to discuss advantages (listed below) to adopting PowerTrak™ software and implement its use

Advantages of PowerTrak™

- Develop a monthly list of pest and diseases of landscape plants and turf
- Describe best management for each scenario
- Monitor for select pest based on pest occurrence during the year
- PowerTrak™ would allow for electronic record keeping and an easier access to data to determine if you are meeting goals to reduce pest problems and management costs on campus
- PowerTrak™ would also allow Facilities Management building executives to monitor pest occurrence, if/when problem was resolved and see where else there may be a similar problem
- Online documents would keep records organized and in one location. This would allow periodical review of campus pest, treatment procedures, and evaluation of effectiveness of each pest management treatment

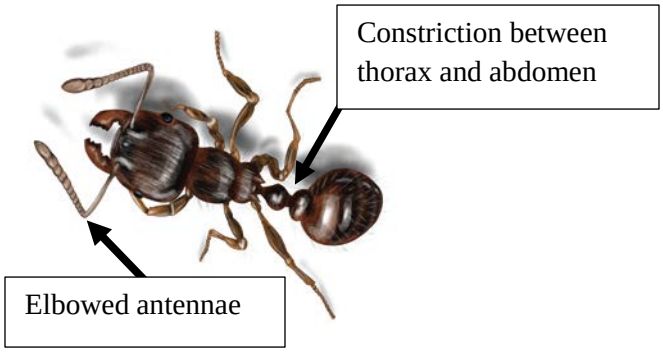
Introduction to Campus Pests, Monitoring and Management:

Ants:

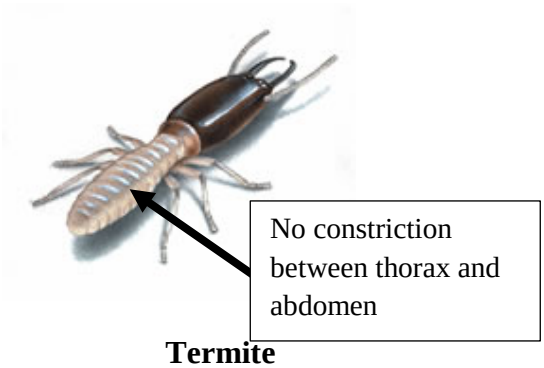
Ants have become one of the most common pests in our society. Although ants are considered a pest indoors, ants may be very beneficial outdoors. Ants play a key role in decomposition and other environmental functions (University of California, 2012). Ants are attracted to sugary drinks and food.

Focus: Ants have been identified as a pest in all University of Arkansas (UA) residence halls and in several campus buildings and facilities where food meant for human consumption is present.

Identification: Ants have six legs, elbowed antennae and a constriction between the abdomen and thorax. Note, termites do not have this constriction.



Ant



Termite

Look for signs: Ants construct nest in a variety of environments such as, near buildings and sidewalks, or in areas where food is available, and areas that are protected from the outdoor elements. Often, you can see several ants walking along a scented foraging trail that will lead either to a new food source or back to the colony.

What can you do? Searching and visual confirmation of scout ants (individual ants that search for food sources) and trails of ants should be done on a routine basis. Locate the holes and cracks in the building where ants are entering. Clean up areas where sugary substances or other food or drink may have been spilled, this will eliminate the ants' food source and the attractiveness of that part of the building.

Prevention: An initial plan is to keep ants out of buildings by using caulk to fill holes and cracks in foundation and building structures (University of California, 2012). Other entry points may include exposed pipe or electrical wire.

Baits/Traps: Ant baits can combine insecticides and food that attract workers ants. Worker ants transfer the bait to the colony which results in killing the ants. Baits should slow acting. Baits are available in liquid and solid forms. A few commonly used ant baits include: Enforcer AntMax

Bait Stations; Raid Ant Baits III; and Combat Quick Kill Formula 3. Using bait allows for the safest treatment for ant control because only a small area in a room or building is treated.

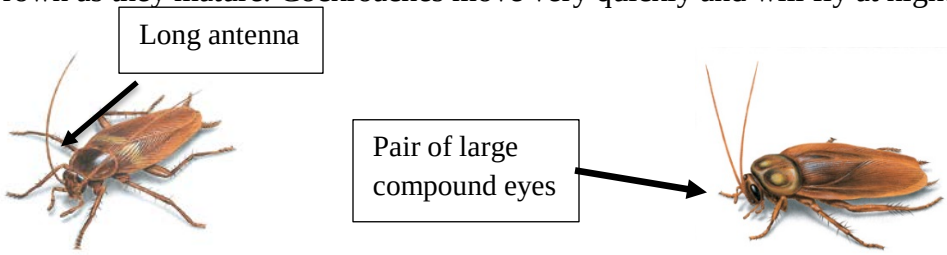
Insecticide Treatment: Indoor and outdoor insecticide sprays should only be used as a last resort in an IPM program. This is because insecticides have a greater environmental risk.

Cockroaches:

Cockroaches have become domesticated and may be found in parts of a building where they find food, shelter and water available. It is very common for cockroaches to be active at night.

Focus: Cockroaches are a nuisance to humans because they may cause allergic reactions in humans. Cockroaches are a common pest on the University of Arkansas (UA) campus at Fayetteville.

Identification: Cockroaches are a reddish brown color with antennae almost as long as its body and large compound eyes. Immature cockroach nymphs are wingless, and become more reddish brown as they mature. Cockroaches move very quickly and will fly at night.



Cochroach

Look for signs: When scouting for cockroaches look along walls in small cracks and crevices, especially under and behind sinks, kitchen cabinets and other appliances. Scouting should include visual confirmation of dead cockroaches, frass (droppings), egg cases, and live cockroaches in dark areas where cockroaches may hide. Cockroaches eat a variety of substances such as food scraps on floor or on dirty dishes, hair, paper, cloth and where there is moisture.

What can you do? Preventing cockroaches from entering a building may be difficult, but should be an important factor of an integrated pest management (IPM) plan. This can be done by limiting storage of boxes or removing cardboard boxes from a room or building. Cockroaches are known for laying their eggs on cardboard surfaces, especially on side against a wall or another box.

Prevention: Building maintenance and sanitation are extremely important in preventing because egg casings, juvenile, and adult cockroaches are commonly brought in on objects such as cardboard boxes and debris. Cockroaches can enter buildings from utility tunnels through cracks around heat and water pipes but these cracks should be caulked closed. They can also enter

underneath doors if the weather stripping is not properly secure and through cracked or open windows without screen. In addition, it is important to eliminate sources of food and water that will promote cockroach reproduction that results in an increase in cockroach numbers.

Pest Exclusion: Nonchemical methods like caulking or door stripping keep cockroaches from entering a building.

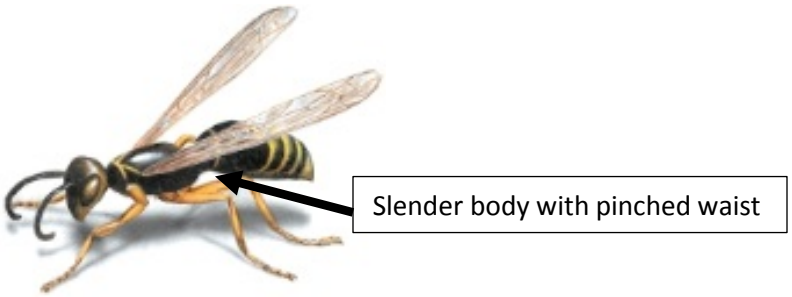
Traps: Traps such as Advance Roach Gel Bait Reservoir can be placed in dark and damp protected areas most frequented by cockroaches (described above).

Wasp:

Wasp can be categorized as social or solitary. Very social wasps live in colonies, which may number in the thousands. Female workers perform most of the colony maintenance tasks such as food foraging, feeding young, and nest building. Solitary wasps live on their own and do not lay their eggs in a colony.

Focus: Wasps are a common pest on the University of Arkansas campus. They are common near roof overhangs and underneath ledges. Mullins library is a troublesome building for wasps.

I**dentification:** The majority of wasp species are winged. Wasps have slender bodies with a pinched waist. Wasps can sting multiple times in defense of their nest. Most nuisance wasps live in colonies and if provoked will attack, but usually avoid humans.



Wasp

Look for signs: Wasps can be found in a variety of environments such as covered building overhangs, building cracks and crevasses in addition to trees and shrubbery near buildings.

What can you do? Make sure window screens are in place, kept securely shut and request that damaged screens (holes or tears) are repaired holes to prevent wasp entry. Any object such as a fly swatter or shoe can be used to kill a wasp. Make a request to have the Orkin technician deal with removal of an indoor or outdoor wasp nest.

Prevention: Maintenance and sanitation are extremely important in preventing unwanted wasp. Placing screens on exterior windows and ensuring that windows on buildings are properly secure can limit unwanted wasp entry into buildings.

Pest Exclusion: Inspect buildings and caulk or block all holes or cracks that could allow wasp entry especially along roof overhangs, windows, and doors.

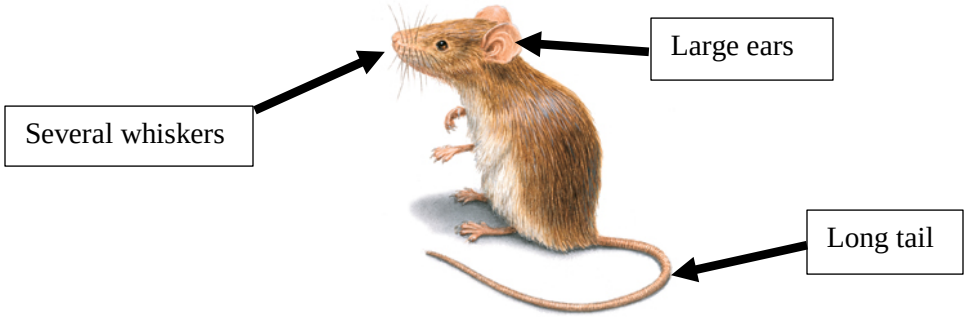
Insecticide Treatment: Deltadust DP0 and CY-Kick CS can be used to control wasps on campus.

Mice:

Mice are one of the most common pests in the United States (US). They are found in buildings, both residential and commercial, and in agricultural fields and feedlots. Given adequate shelter and food, mice can breed and produce large infestations. Mice can cause structural damage to property and destroy food meant for animal or human consumption. They easily enter buildings through cracks, holes, and other openings and can squeeze through a hole that is 1/4 of an inch wide. Mice are also known to carry serious diseases (Orkin Pest Control).

Focus: Mice do occur on the University of Arkansas campus, especially in the fall in student resident halls or areas were food and shelter are present.

I**dentification:** Mice are hairy rodents grayish to brown in color, 4.5 to 7 inches in length, with whiskers, four legs, black eyes, and round ears.



Mouse

Look for signs: Visual signs such as oval droppings indicate presence of mice. Mice tend to be most active during the evening and nighttime hours.

What can you do? Mice are attracted to food sources so maintain clean rooms and mice require places to hide for shelter and nesting so minimize clutter. Store food properly in plastic containers or keep in areas difficult for mice to reach in cupboards with tight fitting doors.

Prevention: Keep outside doors closed to minimize entry into a building and starting an infestation. Mice are small and therefore may enter building in small holes or cracks very easily.

If you observe droppings or contaminated food, look for a hole or opening in a wall and ask for technician to cover or caulk the entry.

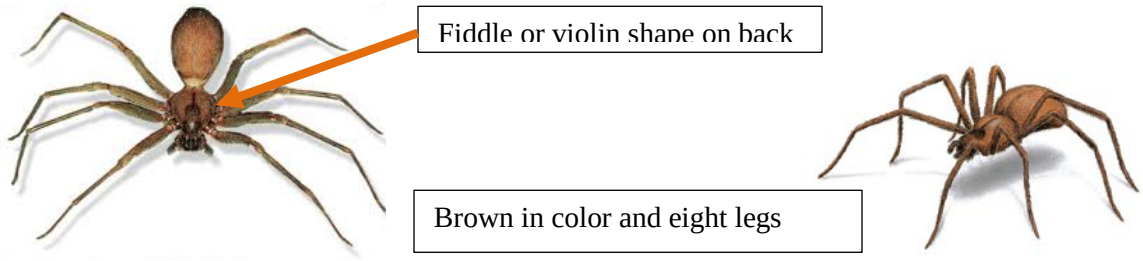
Traps: Store bought mouse traps are effective and easy to use if set along walls in area(s) where mouse activity is observed.

Brown Recluse:

The Brown Recluse is common across the southern Unites States (US). Its bite is often painless that initially causes a red spot on skin that may only blister less sensitive people or be a more extreme reaction in sensitive people causing skin tissue death which can be deadly if a bite goes without medical treatment (Orkin Pest Control). If bitten by a Brown Recluse, seek medical attention. Symptoms from a bite that you might experience include: severe pain at bite site after about four hours; severe itching; fever; nausea; vomiting; and muscle pain.

Focus: A few Brown Recluse have been reported each year in buildings on the University of Arkansas campus.

Identification: Several spider species can be confused with the Brown Recluse. Most people recognize a Brown recluse by its long legs (often span the size of a quarter) and a fiddle or violin shape on its back between the 8 legs. The Brown Recluse has a uniformly brown colored body and the abdomen is covered in small hairs. There are no spines located on the spider's legs.



Brown Recluse

Look for signs: Usually this spider is active after dusk, so before bed check for this spider on floor along baseplates of all walls or even under pillows or sheets.

What can you do? Remove clutter along walls of rooms in buildings and keep boxes separated an inch or more so because spiders frequent tight spaces between boxes. Prevent spiders from climbing onto a bed by making sure bed is not in contact with wall, blankets should not contact the floor and do not store items under the bed. If found, use a shoe or fly swatter to kill the Brown Recluse or capture spider in a cup, slip an index card under cup, turn right side up and cover cup and release spider outdoors.

Prevention: Sanitation, lack of clutter and prevention of insects (food for spider) in rooms lessens the likelihood a Brown Recluse will find shelter and food in your room. It is important to remove clutter such as trash and boxes from dark areas in buildings. Cover or seal cracks for plumbing and electrical wire in buildings, doors, and windows to prevent entry into unwanted areas.

Traps: Brown recluse spiders usually walk along walls in search for prey insects. Therefore, place sticky traps on floor along the wall on either end of bed or in corner sections of a building along a wall to capture spiders.

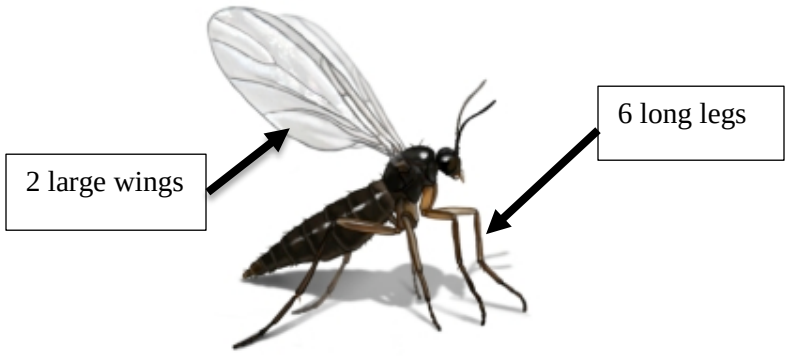
Insecticide Treatment: Talstar® Professional Insecticide applied along walls frequented by spiders.

Gnats:

Gnats are a common name for small winged insects such as fungus gnats and fruit flies. Immature gnats feed on decaying organic matter and plant roots in overwatered pots. Over ripened fruit is an ideal location for gnats (vinegar flies) to the lay eggs. Once the eggs hatch the immature feed on the decaying fruit.

Focus: Gnats are most common on the University of Arkansas campus near waste disposal bins, trash chutes and dirty wet areas like sink and shower drains.

Identification: Gnats are very small (< 1/16" long) winged insects with two wings and long legs.



Gnat

Look for signs: Weekly, look for presence of gnats near trash bins (indoors and outdoors) and chutes, wet areas (sinks and drains) or around overwatered potted plants. Gnats, specifically vinegar flies, will build up numbers quickly on and around bananas or berry fruits allowed to ferment.

What can you do? If you see fungus gnats, ask to have drains cleaned out to remove organic matter (hair, skin, etc.). Water plants only when they need water will help prevent fungus gnat

infestations. For vinegar fly, do not allow overripe or fermenting fruits to sit on counter or in your trash bin or you will attract and build up fly numbers.

Prevention: Weekly, remove trash from waste baskets and waste bins into garbage bags and tie bags shut before placement in waste chute or trash bins on a routine basis. This will reduce the potential for gnats to feed and multiply. Ensure that kitchen sinks, waste disposals, and bathroom drains are kept clean and free of organic debris. Place over ripe fruits in trash bag and place in trash bin because gnats are attracted to the scent of decaying materials (Orkin Pest Control).

Gnats can also be found in overwatered house plants. They are attracted the damp environment of the soil. To prevent this type of gnats infestation do not over water plants (Orkin Pest Control) and make sure that the water drains adequately within the planting container.

Exclusion: It is difficult to exclude gnats or vinegar flies since most window screen has a mesh size that allows flies to squeeze through and enter buildings.

Traps: Sticky traps can be placed in safe areas where gnats are common such as near waste containers and drains. Traps are inexpensive and an effective solutions to combating gnat infestations. If vinegar flies are present, you can place apple cider vinegar in a cup, add couple drops of liquid soap to break surface tension of vinegar and place a paper funnel (¼" opening at base) into cup just above vinegar to attract and kill vinegar flies.

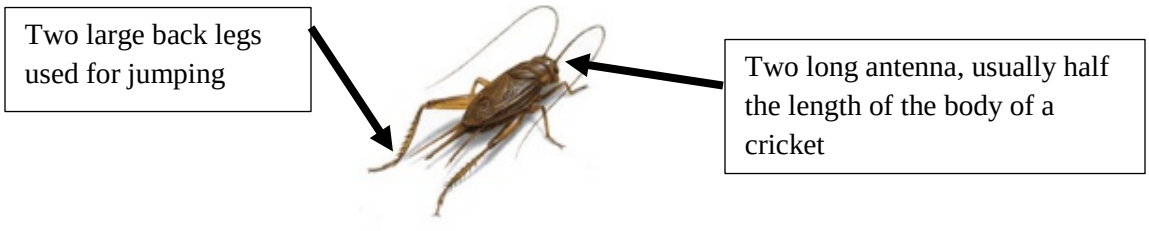
Insecticide Treatments: Insecticide treatments are not effective.

Cricket:

Crickets are a common pest in agriculture, homes, and commercial settings. They can be found in a variety of environments, but prefer damp and dark areas. Crickets are most active at night. When looking for a mate male crickets can often be heard composing a song or "chirping". The matting songs can often be problematic for humans if too loud and can interrupt sleep (Orkin Pest Control). Crickets feed on a variety of things, including plant and animal material, and can also damage clothing and fabrics.

Focus: Crickets are a pest that enters buildings on the University of Arkansas campus in the fall.

Identification: Crickets vary from brown to black in color. Crickets have two long antennae and to large back legs used for jumping.



Cricket

Look for signs: At night you may hear crickets "chirping" or see them walking on the floor.

What can you do? You can capture the cricket under a cup like the Brown Recluse above and release it outdoors or kill it using a fly-swatter or heavy shoe. Make secure all cracks are caulked, screens have no holes, and base of doors have effective weather stripping in place. Also, remove clutter which provide ideal hiding places.

Prevention: Ensure that doors are kept closed and that the weathering strip on the base of the door is properly attached to exclude entry.

Exclusion: When needed have the weather strip replaced. Routinely check screens and window to ensure that they are do not have holes and are secured properly to frame.

Traps: Sticky traps are inexpensive**,** effective**,** and can be placed near entry points to create a barrier.

Insecticide Treatments: Large cricket populations should be treated with pesticides. Treat areas where crickets may hide with CY-Kick CS or Deltadust DP0.