Integrated Pest Management Policy and Treatment Options for University Housing

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UF UNIVERSITY of FLORIDA
UF Housing & Residence Education UNIVERSITY of FLORIDA
IPM Integrated Pest Management Florida
UF UNIVERSITY of FLORIDA IFAS Entomology and Nematology

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Kevyn J. Juneau[1], Jennifer L. Gillett-Kaufman[1], Norman C. Leppla[1], Kirk W. Martin[1] and A. Wayne Walker[2]

[1]Department of Entomology and Nematology
University of Florida, IFAS, IPM Florida
Natural Area Drive, Bldg. 970, P.O. Box 110620
Gainesville, Florida 32611-0620

[2]Department of Housing and Residence Education
University of Florida
P.O. Box 112100
Gainesville, FL 32611-2100

http://ipm.ifas.ufl.edu

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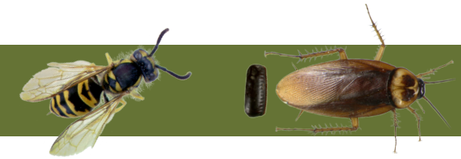


INSTITUTIONALIZING IPM

Purpose of this Manual

The purpose of this manual is to train pest management technicians of the University of Florida (UF), Department of Housing and Residence Education (DOHRE) in integrated pest management (IPM). New technicians will receive IPM training and existing employees will be provided with continuing education. Moreover, any person who applies pesticides for DOHRE will practice IPM and be licensed as a commercial pesticide applicator by the State of Florida, Bureau of Compliance Monitoring, Pesticide Certification Section. Pesticide applicators must follow state and federal regulations and apply pesticides according to the instructions on the labels. To assist DOHRE technicians and contract pesticide applicators in instituting IPM, this manual includes the DOHRE IPM policy, specific IPM objectives, responsibilities of the DOHRE Senior IPM Technician, a flow chart of IPM actions, and requirements for using pesticides and associated recordkeeping. Pest problems can be prevented by requesting that maintenance be performed, providing education for residents, conducting inspections and monitoring, and establishing appropriate landscaping. Pest-specific IPM options are provided for ants; bed bugs; bees and wasps; birds and bats; booklice, silverfish, and earwigs; cockroaches; flies; rodents; stored product pests; termites; and weeds. Selected references are provided and there are forms for assuring service, pest surveillance, and record keeping.

Integrated Pest Management Policy

It is the policy of the DOHRE to practice IPM for the buildings and grounds they manage. IPM is a systematic approach for managing pests based on long-term prevention and suppression by a variety of methods that are cost effective and minimize risks to human health and the environment. Pests can just be a nuisance or cause significant health problems, structural damage to buildings, and economic losses due to food contamination, diminished aesthetics and other impacts. By practicing sustainable IPM, risks associated with pests and pesticides can be minimized.

IPM in DOHRE housing involves standardized practices derived from community IPM. Residents are educated about preventing pest infestations and technicians are trained to select the most benign yet effective species-specific pest management methods. A combination of the most effective and economical cultural, physical, biological and chemical controls is used to manage pest infestations and minimize associated damage. Based on a thorough assessment of the problem, treatment options range from no action to non-chemical methods and, if necessary, the use of an effective, least toxic pesticide. Non-chemical methods include exclusion, sanitation, or perhaps tolerance, and least toxic pesticides are those labeled “CAUTION.” If it becomes necessary to use pesticides, they are applied during appropriate times to maximize their efficacy and minimize the possibility of human exposure. All pesticides are handled according to state and federal laws.

Integrated Pest Management Objectives

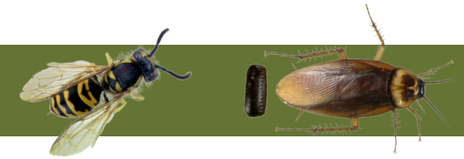
DOHRE has the following objectives for preventing or expeditiously managing pest problems:

- Protect residents from pests by preventing or suppressing pests to non-damaging levels.
- Reduce environmental pollution through selection and placement of appropriate least-toxic pesticides.
- Base pest management actions on accurate identification of pests and knowledge of their biology.
- Perform thorough assessments of pest problems and determine the best IPM options.
- Evaluate the effectiveness and reduce the cost of pest management actions.
- Educate residents about preventing pests from entering or moving within DOHRE properties.
- Maintain DOHRE properties with minimal exposure of residents to pests and pesticides.

Responsibilities of the Senior IPM Technician

The Senior IPM Technician is responsible for overseeing implementation, evaluation and improvement of the DOHRE IPM program, so must accomplish the following:

- Maintain records of all pest complaints and sightings reported by residents and DOHRE staff.
- Maintain detailed, up-to-date records of all pest management actions, especially pesticide use.
- Provide complete records of pest management actions in accordance with UF policies, if requested.
- Maintain a current and readily accessible set of material safety data sheets (MSDS) for all pesticides used or stored by DOHRE staff.
- Approve or deny the use of IPM options by DOHRE technicians, especially pesticide applications.
- Notify the DOHRE Maintenance Section when maintenance or sanitation deficiencies exist.
- Assure that signs are posted and residents notified before pesticides are applied.
- Evaluate continuously the effectiveness of the DOHRE IPM program and make improvements.
- Assure that DOHRE IPM technicians have current pesticide applicator licenses.
- Maintain a library of pertinent, up-to-date pest control and IPM literature.
- Maintain an active network of pest management professionals for consultation.
- Maintain personal pest management licenses and certifications, including continuing education.



Flow Chart of IPM Actions

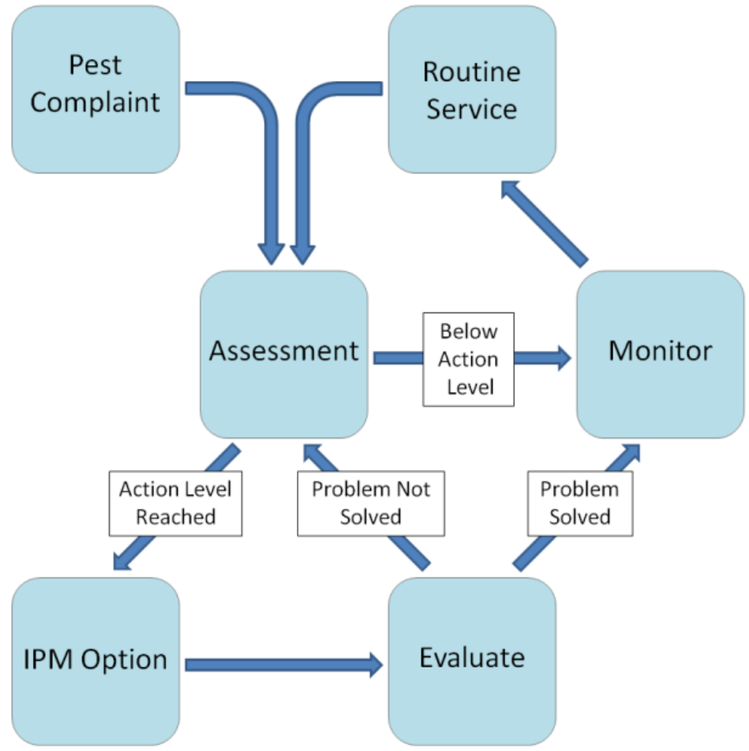


Figure 1. IPM decision-making flow chart.

IPM actions begin with a pest complaint (pest control request) submitted by a resident or a pest sighting by a DOHRE IPM technician during routine service (Fig. 1). In either case, the pest is accurately identified and a thorough assessment is made to determine if it has reached a level of abundance or caused damage that triggers an IPM action. Continued monitoring, perhaps with an increased frequency of inspection, is the only requirement if the action level has not been reached. Above the action threshold, IPM options are employed based on their effectiveness, safety and cost. IPM options include cultural, physical, biological and chemical controls used to mitigate pest infestations. A subsequent evaluation determines if the pest problem has been solved and, if not, it and the IPM actions are reassessed. This decision-making flow chart has two feedback loops: 1. Monitoring-assessment-below action level-continued monitoring and 2. Assessment-above action level-IPM options-evaluation-problem not solved-reassessment. If the pest is no longer apparent or causing damage, monitoring is resumed.

Requirements for Recordkeeping and Using Pesticides

Records of pest complaints and sightings, and IPM actions will be kept current and accessible to verify the appropriateness and effectiveness of management decisions (see forms). A detailed database on pesticide use will be maintained, including products, active ingredients and quantities. Residents shall be notified in writing five days before high-risk pesticides are used, if this treatment becomes necessary. Notices will be posted on the DOHRE website and in the main office and common areas of the building to be treated. These notices will remain in place for at least two days after a pesticide is applied. Pesticide purchases will be limited to the approximate amount needed to eliminate each pest outbreak. Pesticides will be placed in safe containers that are labeled appropriately, including the date received, and stored in a secure location not accessible to unauthorized personnel or locked in a utility vehicle. Only the amount of pesticide needed immediately will be prepared. All expired pesticides and those no longer registered by EPA will be disposed of in accordance with directions on their labels and in compliance with state and federal regulations.

Pest Prevention

Preventative measures include continuous and emergency maintenance, educating residents about sanitation and pests, routine inspection and monitoring for pests, and landscaping that discourages pests from becoming established.

Maintenance: The DOHRE Maintenance Section is an essential partner in the DOHRE IPM program. If a maintenance problem is discovered (leaking pipes, cracks in walls, etc.) by a resident or IPM technician, a work order is immediately submitted to the Maintenance Section. In addition, the Maintenance Section conducts an inspection when a resident submits a “Notice of Intent to Vacate” an apartment. General maintenance is performed at this time, including elimination of openings that might enable pests to enter (Fig. 2). An IPM technician should participate in this inspection and be present when apartments are remodeled to identify potential sources of pest problems. The DOHRE Senior IPM Technician will record work orders submitted to the Maintenance Section.

Figure 2. An improperly installed escutcheon plate can be repaired by the DOHRE Maintenance Section.

Resident Education: Residents are instructed about sanitation and pests during the orientation required to occupy an apartment. IPM policies and procedures are communicated orally and reinforced with written documents, e.g., brochures, newsletters and factsheets. Education pertaining to sanitation and pest prevention is a major emphasis of the IPM program. It is expected that the residents will follow sanitation guidelines while living in campus housing.

Information about pests is provided to establish a tolerance for less harmful species, e.g., lady beetles, and intolerance of more harmful ones, e.g., bed bugs. Residents are educated about the potential dangers of over-the-counter pesticides and cautioned to use them only if necessary, e.g., stinging insects. They will be educated about low risk pest management methods, such as swatting flies, vacuuming insects, and spraying soap solution. Residents are encouraged to collect specimens so DOHRE IPM technicians can identify pests and take appropriate action.

Inspection and Monitoring: Every apartment is inspected at least quarterly for pests and compliance with sanitation requirements. Also, cursory inspections are made when convenient, such as during the performance of repairs. Deficiencies in sanitation are reported in writing to the resident and residence director of the housing complex. During inspections, sticky-trap monitors placed in locations where insects commonly occur or near potential harborages, are examined for the presence of pests (Fig. 3). The monitors must not be disturbed by residents or affected by anything else that can hinder their performance (Fig. 4). The type and number of pests in the traps is assessed (Fig. 5) and, if determined to be above the action threshold, IPM options are selected and employed (see Pest-Specific IPM Options).

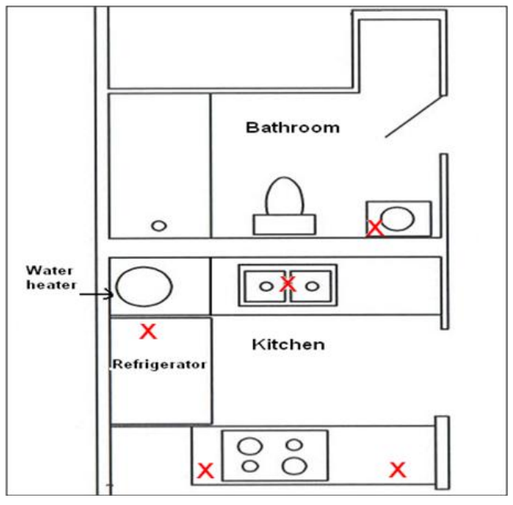


Figure 3. Areas where monitors can be placed in an apartment are marked with a red “X”.

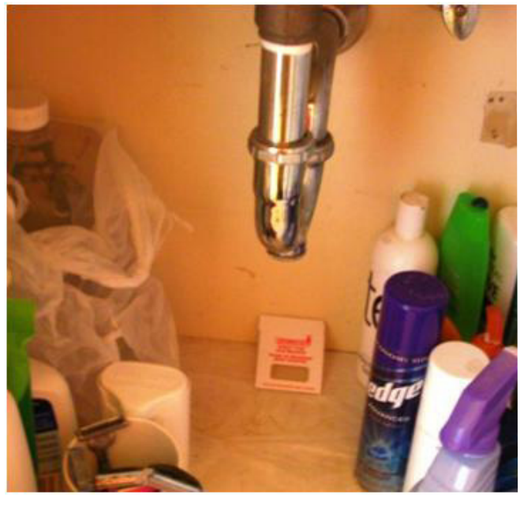


Figure 4. A sticky-trap monitor placed under a bathroom sink.

Figure 5. A sticky-trap monitor with captured German cockroach nymphs, suggesting an infestation.

Landscaping: Pest management should be considered when housing complexes are landscaped. Plants and mulch near buildings can provide food and shelter for pests (Fig. 6). Moreover, plants can provide pathways from the ground into apartments if they grow near or touch windows, vents or other openings (Fig. 7). Plant pots with standing water are ideal breeding sites for mosquitoes. Planters made of wood can feed and harbor structural pests, including carpenter ants and termites. If possible, dead trees and stumps are removed to prevent structural pests from developing colonies near buildings.

Figure 6. Landscape plants and materials too close to buildings can provide harborages and entry access routes for insects.

Figure 7. Vining plants can give insects access into buildings.

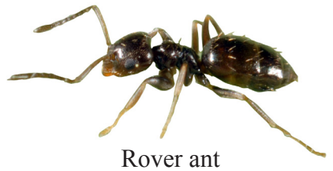
Ants

Indoor Infestations

Ant species range in length from 1/16” to 5/8” (2-13 mm). They often enter buildings to search for food, so the primary management strategies for ants are exclusion and sanitation. Chemicals used improperly can cause some species (e.g., Pharaoh ants) to form multiple colonies. With the exception of red imported fire ants and carpenter ants, these insects are generally considered nuisance pests. Educational publications describing fire ants are distributed to all residents during orientation.

Prevention and Non-chemical Options

- **Exclusion:** Determine where the ants are entering the apartment. Inspect typical locations, e.g., around windows and doors, pipes and vents. If the ants are trailing, it may be possible to follow the trail to their apartment access point. Place a barrier, e.g., caulking, escutcheon plate or door sweep, where the ants are entering. Ants may also be observed entering an apartment through cracks in walls, poorly sealed windows and doors, or other areas, during routine inspections around the outside of a building. The Maintenance Section shall be notified with a work order to repair these kinds of problems and help prevent insects from entering the apartments.
- **Sanitation:** Locate the food source to which the ants are attracted and provide the resident with food storage and sanitation suggestions. If general sanitation is an issue, the resident is provided with a copy of the DOHRE sanitation guidelines and the residence director of the apartment complex is notified.
- **Moisture:** Ants can often be found in moist areas near leaking pipes or condensation. If it is determined that sanitation is not the primary cause of the infestation, check for areas of moisture. The Maintenance Section will be contacted to repair any moisture problems.



Rover ant
Brachymyrmex patagonicus

Pharoah ant
Monomorium pharaonis

Ghost ant
Tapinoma melanocephalum

Crazy ant
Paratrechina longicornis

Monitoring: Receipt of a complaint or ants observed during a routine inspection.
Action Threshold Indoors: At least five ants trailing in a room.
Action Threshold Outdoors: Fire ant nests in close proximity to a dwelling or common area, e.g., patios, playgrounds, pool area or other high traffic areas.

Black carpenter ant
Camponotus pennsylvanicus

Big headed ant
Pheidole megacephala

White-footed ant
Technomyrmex difficilis

Odorous ant
Tapinoma sessile

- **Food storage:** Ants may be present in food that is not properly sealed in a container. If storage is determined to be an issue, the resident is provided guidelines on proper food storage and asked to follow the IPM technician's advice. Food that is attractive to ants should be stored in airtight containers. Screw top lids, e.g., those on peanut butter jars, may not always protect food from ant infestations, as tiny ants can crawl around the threads and enter the containers. Food can also be stored in a refrigerator to protect it from becoming infested.
- **Vacuum:** Visible ants and those hiding in cracks can easily be vacuumed by the resident. It is recommended that a tablespoon of cornstarch also be vacuumed to help desiccate the ants while in the vacuum bag or container. Nests found indoors, e.g., in wall voids, can also be vacuumed. The colony will collapse if the queen is located and removed. Care must be taken when removing a colony of stinging or biting ants.
- **Miscellaneous:** A small group of ants can be wiped up with a damp towel or sponge and discarded.

Chemical Options

- **Detergents:** A mixture of liquid dish detergent and water (10% soap) is useful for removing ants. Detergent can be used to control or reduce the number of ants prior to exclusion or sanitation practices. Detergents also remove scent trails used by ants.
- **Boric acid:** Boric acid can be used by the IPM technician as a least-toxic pesticide. The treatment can be blown under cabinets and into wall voids, cracks, or any other undisturbed and dry place in an apartment. Boric acid also acts as a barrier treatment to prevent ants from entering living spaces.
- **Diatomaceous earth and silica aerogel:** These chemicals kill insects through desiccation, so are used in the same fashion as boric acid.
- **Baits and bait stations:** Baits contain an attractant and a pesticide. The pesticide is ingested by an ant and brought back to the nest where it kills more ants in the colony. In the DOHRE IPM program, baits are only used to clear an apartment of an infestation, and not as a preventative treatment. Bait stations placed into an apartment are removed when the insect population drops below the action threshold. Baits not contained in a bait station are located where inadvertent human exposure is minimized, e.g., in cracks, behind faceplates and large appliances, and in locked closets accessible only to DOHRE technicians. Locations where

ants enter an apartment can usually be found by inspecting around the outside of the building, so those entrances can be baited and then sealed. Boric acid is a common ingredient in baits used for an IPM program. The bait selections should be rotated between different types in order to avoid bait aversion and resistance. Different ant species forage for different food types (protein, sugar, fat) at different times of the year, so it is important to know the pest ant's biology prior to selecting a bait.

Red imported fire ant
Solenopsis invicta

- **Botanical products:** Various botanical products (plant oils, "food grade" products) are currently on the market to control insect infestations. These are used in a fashion similar to conventional liquid pesticides but are relatively non-toxic to humans. Many companies that produce "green pesticides" make claims about their products with little or no supporting efficacy data. These products may be exempt from toxicity studies, so they must be used with caution.
- **Broadcast pesticides:** If all other options have been exhausted and an infestation cannot be controlled, broadcast application of a least-toxic insecticide may be warranted. Pesticide labels are followed and rotation between products is necessary to prevent the ants from developing pesticide resistance.

Outdoor Infestations

The red imported fire ant is the major outdoor ant pest in Florida. There are few IPM treatment options, and liability dictates that fire ant infestations be prevented. Ants, with few exceptions, e.g., Pharaoh ants, typically establish their colonies outdoors. They become pests when they enter buildings looking for food and water. If ants enter and become a significant problem, and indoor treatments are ineffective, it will be necessary to control outdoor colonies.

- **Biocontrols:** Parasitoids and pathogens that do not affect humans have been released on the UF campus to determine their efficacy in controlling fire ants. The close collaboration between DOHRE and the UF/IFAS Entomology and Nematology Department may provide additional biocontrol options in the future.
- **Direct bait application to mounds (fire ants):** A direct application of bait is applied to new fire ant mounds.
- **Broadcast bait application (fire ants):** Baits used in IPM typically consist of a chemical that kills the insect after ingestion. Some baits are also formulated with insect growth regulators which are spread throughout the colony by the foraging ants. Weather is a key factor for most bait applications. Ant activity is highest when the temperature is 70-90˚F. In north central Florida, ants are most active during spring through fall. The baits should not be applied when the ground is wet or when rain is expected. Never apply more than the label requires.

- **Aphid control:** Many sweet feeding ants feed on honeydew produced by aphids or other insects. Control of the honeydew producing insects can control the ants. Aphids can be managed by promoting predators. This may be done through landscaping by choosing plants that amplify predator populations and by releasing natural enemies in the area. Lacewings, lady beetles, and syrphid flies are well known predators of aphids. Another option is to select landscaping plants that aphids do not infest. Aphids can be controlled chemically through the use of least-toxic, systemic pesticides. These pesticides are applied to the soil around the roots and absorbed by the plant. Timing is crucial for this treatment, as it may take up to two months for the entire plant to absorb the pesticide. Knowledge of the aphid's biology and yearly seasonal occurrence will help determine when this treatment is most effective.

Bed Bugs

Adult bed bugs are oval, flat, and about 3/16" (4-5 mm) long (Fig. 8). If not eliminated immediately when discovered, they can become a tremendous problem in apartments. They are small and can hide in cracks smaller than the width of a credit card. Bed bug elimination requires a site-specific treatment plan.

Bed bug
Cimex lectularius

Prevention and Non-chemical Options

- **Education:** Resident education is the key to preventing a bed bug infestation. During orientation, residents are provided information regarding the acquisition of used furniture. Information is available on how to not transfer bed bugs to an apartment after traveling. Residents are made aware of what a bed bug is, how to inspect for them, and how to minimize their movement throughout an apartment.
- **Inspection:** When a bed bug is discovered, it is critical that a thorough inspection of the apartment be conducted to determine the extent of the infestation. Kickplates, moldings, and faceplates must be removed and inspected. Carpeting must be pulled away from the walls to determine if there are any bed bugs underneath. Furniture, such as couches, beds, dressers, and desks, is thoroughly inspected. Detection dogs are available through contractors to find bed bugs in a building.

Figure 8. Size comparison of a bed bug with a pencil.

- **Vacuum:** An entire infested apartment must be vacuumed, including beds, furniture, and other harborages, to remove any insects and eggs. Cracks in walls, electrical outlets, and spaces behind moldings are vacuumed as well.
- **Clothing and bedding:** The bedding in an infested apartment must be washed in hot water and dried with hot air. Clothing that may be infested with bed bugs also must be washed. Half loads of clothes washed on the large load setting will kill bed bugs more effectively than full loads.
- **Dry heat and steam:** At 220˚F steam is immediately lethal to bed bugs. Dry heat treatment of 113˚F for 2.5 hours assures bed bug death. The infested furniture, linens, etc., can be heated to this temperature by placing them into the center of a room, building a box of polystyrene sheets around the pile, and adding two space heaters and two box fans to produce and distribute the heat (Fig. 9). The box is sealed with tape (Fig. 10) and the temperature is measured by a digital thermometer with a long cord, e.g., thermocouple or wireless indoor/outdoor thermometer. The thermometer sensors should be placed in linen piles or under pillows to determine if well insulated areas reach the critical temperature.

Monitoring: Receipt of a complaint or bed bugs observed during a routine inspection.
Action Threshold: At least one live insect in a room.

Figure 9. Items placed in a pile at the center of a room.

Figure 10. A “heat chamber” made of insulated polystyrene sheets built around a pile of furnishings.

- **Freezing:** Freezing infested, heat sensitive items at 0˚F for 4-7 days kills bed bugs.
- **Barriers:** Sealing light switch and electrical outlet faceplates, cracks, etc., with caulking traps bed bugs and prevents others from entering. Encasing box springs and mattresses in vinyl covers prevents bed bugs from infesting them or escaping.
- **Disposal of furniture:** Infested furniture must be disinfested or destroyed rather than discarded to prevent someone from salvaging it and spreading the infestation.

Chemical Options

- **Spot treatment:** Silica aerogel containing a least toxic pesticide applied in harborages, such as behind kickplates, moldings, and faceplates will control the bed bugs while minimizing the risk of human exposure.
- **Fumigation:** An extensive bed bug infestation may warrant fumigation by a DOHRE IPM technician. Remove all furnishings from an apartment and place them into a fumigation chamber (Fig. 11). The chamber is subsequently wrapped in polyethylene and monitored closely (Fig. 12). Select the least toxic fumigant and use it responsibly and according to the label. Exposure time is calculated based on the temperature and volume of the chamber. The area must have proper signage to notify the residents about the use of a fumigant. Fumigants are never used in the apartments.

Figure 11. Items removed from an infested apartment and placed into a mobile fumigation chamber.

Figure 12. Fumigation chamber wrapped in polyethylene sheeting.

Bees and Wasps

These insects, known as social Hymenoptera, range in length from 1/2" to over 1" (12 mm-25+ mm). Care is taken when DOHRE IPM technicians remove nests because these insects can sting, possibly causing anaphylaxis. A colony is removed at a time most of the insects are in the nest and when there is little resident traffic. While personal protective equipment is recommended for any social hymenopteran nest removal, it is mandatory for Africanized honeybee hives. A goal in social hymenopteran management is to remove the queen to trigger colony collapse. Since bees and wasps are beneficial insects, they are removed only when there is a danger to people.

Honey bee
Apis mellifera

Baldfaced hornet
Dolichovespula maculata

Paper wasp
Polistes spp.

Prevention and Non-chemical Options

- **Inspection:** Inspection of potential nesting locations around the buildings is conducted on a regular basis. Electrical boxes, holes in structures and behind walls, shrubs, outdoor furniture, and infrequently used grills are common nest locations. Frequent inspections will detect nest building when nests are small and can be removed easily. Inspect exposed wood for carpenter bees by looking for woodpecker activity, holes that are approximately 15 mm in diameter, bee staining and sawdust. Carpenter bee infested wood is thoroughly inspected and, if necessary, replaced.
- **Exclusion:** Repairing cracks and holes in walls and sealing electrical boxes or other potential nesting locations will prevent social Hymenoptera from establishing colonies. Carpenter bees can be deterred by painting or finishing exposed wood. Established holes should be sealed.
- **Education**: Residents are educated to avoid nests and report their presence to property managers immediately. Residents should never attempt to remove a nest or treat one with pesticides. They are told about the benefits of bees and wasps, and that these insects usually sting only when provoked. Swarming Hymenoptera, or those heavily foraging in a particular area, are isolated from residents and signs are posted to notify them of the insect activity.
- **Sanitation:** These insects are often attracted to sweet food left outside. Beverage cans, bottles and cups with sweet liquids are to be collected, rinsed and recycled by the residents. Sweets, such as hard candy, popsicles, ice cream, or juice, that are spilled shall be wiped up even when outside. Outdoor garbage receptacles are covered to prevent these insects from accessing food. Also, removing outdoor clutter eliminates potential nest locations.

Monitoring: Receipt of a complaint or bees or wasps observed during a routine inspection.
Action Threshold: Nest building or high activity near doorways, walkways, or where people are threatened.

Bumble bee
Bombus spp.

- **Vacuum:** An occasional bee or wasp entering an apartment can be carefully vacuumed by the resident. More extensive infestations must be handled by a DOHRE IPM technician. Nests in wall voids can be vacuumed to remove the wasps and nesting material. A trowel can be used to expose and dislodge a nest. Underground populations can also be vacuumed. Any alternate entrance to the nest must first be adequately covered with soil to eliminate an escape route for the insects. For underground vacuuming, the hose is held a few inches away from the entrance to capture any insects attempting to enter or exit the nest. When no more insects are seen flying, the nest can be dug up and discarded.

Yellow-jacket
Vespula maculifrons

- **Nest removal:** Skill and care is required when removing a nest and the use of personal protective equipment is recommended. The ideal time is morning or evening in cool weather when the insects are most likely to be in the nest. Resident traffic is minimized in the immediate area. Smaller nests can be knocked down and destroyed but larger ones may require a treatment to contain the insects. An aerial nest can be placed into a heavy duty plastic bag and left in the sun for 2-3 hours. This kills any insects prior to disposal. On cool days, it may be necessary to place the bag into a freezer or add a small amount of soap solution. Only an experienced DOHRE IPM technician should remove a hymenopteran nest.

- **Traps:** These insects also can be trapped using un-baited yellow sticky traps and baited cone-type traps. Although trapping entire nesting colonies may be impossible, traps can be used to decrease the number of bees and wasps in an area. Traps also can be used to capture swarming bee colonies, including the queens, so new colonies do not become established.
- **Freezing wasps:** Some products are designed to be sprayed on and into nests to freeze these insects. Liquid nitrogen is commonly used to freeze nests, especially those in wall voids or other confined spaces.

Chemical Options

- **Silica aerogel:** This dust can be blown into ground or wall nests to desiccate the insects. Because of the nest structure, this product may not be effective for large nests.
- **Insecticide sprays:** When using an insecticide spray, it is critical that the DOHRE IPM technician be as close as possible to the nest to minimize spray drift (Fig. 13). However, the technician needs to maintain a safe distance during spraying to minimize the likelihood of being attacked by the insects. A least-toxic spray is used to knock down the guard insects and safely remove an aerial nest. For ground or wall nests where removal is not feasible, an insecticide can be applied to the main entrance after all secondary entrances are located and sealed. All insects will be killed by the insecticide, so removal of the nest is not critical. The insecticide label will describe how to apply the insecticide properly.

Figure 13. Paper wasps on a nest

Birds and Bats

Animals, such as birds and bats, may occasionally reside in or on buildings. Bats are known vectors of rabies and both bat and bird feces can accumulate and attract other pests or become health hazards. Woodpeckers and other cavity nesting birds may damage property while attempting to find nourishment or make nest holes. When controlling birds, it is important to know what species is present. Not all bird species will accumulate enough to become a problem. All native, non-game, wild bird species are federally protected, so removal of nests that contain eggs, hatchlings, or fledglings is illegal (Migratory Bird Treaty Act of 1918, 16 USC 703 through 712). Common pest species that are not listed as protected by law include the rock dove or pigeon, *Columba livia*; European starling, *Sturnus vulgaris*; and house sparrow, *Passer domesticus*. State and federal laws protect bats.

Rock dove "pigeon"
Columba livia

Bat
Order: Chiroptera

Prevention and Non-chemical Options

- **Exclusion:** The easiest way to prevent bat and bird infestations is through exclusion. Repairing holes in building exterior walls and roofs discourages these animals from establishing residence.

  Noise makers are available but are not recommended for use near residential buildings because they are loud. Spike strips can be placed on ledges or the ledges can be angled at 45 degrees to prevent an accumulation of roosting and perching birds. Plastic decoys of predator species are also available. This deterrent may be effective at first but pest birds will become accustomed to a decoy over time. In Florida, bats cannot be excluded during the mating season between April 16 and August 14. Bats discovered in occupied living spaces should be reported to the local public health officials since bats are potential vectors of rabies.

- **Feeding birds:** Many people feed birds with bird feeders. If a large accumulation of seed is spilled on the ground, pest birds may increase in the area. If this occurs, the resident will be asked to temporarily stop feeding birds. Pest birds should never be fed intentionally.

Monitoring: Receipt of a complaint or a bird or bat observed causing deleterious effects during a routine inspection.
Action Threshold: Birds: At least ten per building or areas where feces is one inch deep or greater. Any activity above doorways. Bats: At least one on or in a building.

- **Removal:** If the nest of a protected bird is to be removed, the young are given time to fledge. When it is certain that the birds have left the site, the nest can be removed and the location altered to prevent future nesting. Devices are available to remove bats and birds that reside in cavities. These devices allow movement one way, so when placed on an entrance the animal can exit the cavity but not return (Fig. 14). After all of the animals have vacated, the cavity should be repaired.

Chemical Options

- No chemicals are used to control birds or bats.

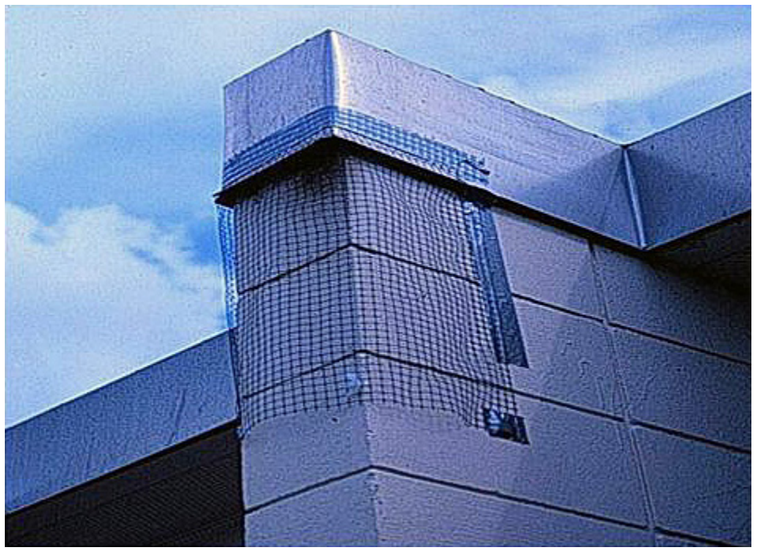


Figure 14. Devices, such as bat netting, can be placed where birds or bats reside to allow one-way movement out of the cavity, thus they can also be used for exclusion.

Booklice, Silverfish and Earwigs

Booklice are 1/32” to 1/4” (1-6 mm) in length, while silverfish and earwigs range from 1/4” to 1” (5-25 mm) in length. These insects are usually associated with moisture. Although they are considered nuisance pests, booklice and silverfish can damage books and documents by feeding on paper and glue. Within apartments, earwigs feed on living and dead plant material and some insects.

Booklouse
Liposcelis spp.

Silverfish
Lepisma saccharina

Earwig
Order: Dermaptera

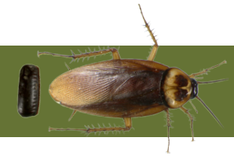
Prevention and Non-chemical Options

- **Sanitation:** Drying the areas where these insects are found will eliminate the problem. The bathroom and kitchen, especially around the sinks in both locations, should be kept dry and mold free. The bathroom vent should be in working order and used to reduce the apartment’s humidity. Shower curtains used by the residents should be kept unfolded to dry. Leaking pipes are repaired and all cracks sealed to prevent water from entering under and behind fixtures and walls. Condensation is eliminated.

Chemical Options

- **Soaps and detergents:** Soaps and detergents can be used to remove insects and clean mold that can be an insect food source.
- **Boric acid:** Boric acid is an effective, least-toxic pesticide that can be blown under cabinets and into wall voids, cracks, or any other undisturbed and dry place in an apartment. Bait products containing boric acid are formulated for managing silverfish.
- **Diatomaceous earth and silica aerogel:** These chemicals kill insects through desiccation and are used in the same fashion as boric acid.
- **Broadcast pesticides:** Broadcast pesticide treatments are not used to control booklice, silverfish or earwigs in DOHRE facilities.

Monitoring: Receipt of a complaint or pests observed during a routine inspection.
Action Threshold: Booklice: Heavy infestation. Silverfish and Earwigs: At least three live in a room.



Cockroaches

The American cockroach, *Periplaneta americana*, attains a maximum of 2 1/8” (53 mm) in length and the German cockroach, *Blattella germanica*, is 1/2” to 5/8” (13-16 mm) in length. Cockroaches tend to avoid light, so they may not be observed during apartment inspections. Look for indirect signs of an infestation, including feces, carcasses, and oothecae (egg cases). These characteristics help identify the species of cockroach and locate the problem areas.

German cockroach, *Blattella germanica,* with its ootheca

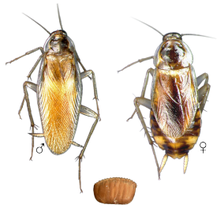
American cockroach
Periplaneta americana

Surinam cockroach
Pycnoscelus surinamensis

Prevention and Non-chemical Options

- **Exclusion:** Cockroaches can easily move from one residential unit to another. Sealing corridors, e.g., vents and plumbing, between apartments can prevent this transfer of cockroaches. Caulking cracks in walls, sealing windows and doors, and installing escutcheon plates properly prevents cockroaches from entering an apartment from outdoors. The Maintenance Section is notified with work orders to complete these kinds of repairs. Cockroaches also can enter an apartment through sewer vents and drains. Sinks and bathtubs with drain covers that have small holes exclude large cockroaches. The water within sink and bathtub traps can evaporate if they are used infrequently. Dry traps provide cockroaches direct access to an apartment.
- **Sanitation:** Cockroach food sources and harborages must be eliminated (Fig. 15). These pests are especially attracted to grease, so stoves and the surrounding areas must be cleaned frequently. Small appliances, such as toasters and toaster ovens, often are overlooked and can accumulate crumbs. Cockroaches also often feed on and reside in cardboard used for storage. If sanitation in an apartment is unacceptable, a copy of the sanitation guidelines is provided to the resident and the residence director of the apartment complex is notified.
- **Moisture:** Cockroaches are attracted to moist areas, e.g., near leaking pipes, condensation, pooled water, or spills. The Maintenance Section is contacted to repair pipe leaks or eliminate sources of condensation and the residents are asked to keep their apartments dry.

Monitoring: Receipt of a complaint or live cockroaches observed during a routine inspection. Dead bodies or cockroach fecal pellets can also provide evidence of their presence.
Action Threshold: Two live cockroaches in a room or on a monitoring board.



Brownbanded cockroach, *Supella longipalpa* (male and female with ootheca)

Australian cockroach *Periplaneta australasiae*

Wood cockroach, *Eurycotis floridana*, and ootheca

- **Food storage:** Cockroaches are attracted to food that is not sealed in a container. If food is not stored properly, the resident is provided guidelines and asked to follow the IPM technician's advice. It is recommended that food stored in cupboards or on counters be placed in airtight containers. Food can also be stored in the refrigerator to protect it from becoming infested.

Figure 15. Containers to be recycled, if not rinsed thoroughly, can provide food for cockroaches.

- **Vacuum:** Visible living and dead cockroaches, their cast skins, and oothecae, can easily be vacuumed by the resident. This reduces both the number of cockroaches and potential allergens. Vacuum cleaner attachments can be used to access harborage areas, such as cracks in walls or behind large appliances. Vacuum cleaners with HEPA filters provide the best protection from airborne particles, otherwise a dust mask, e.g., N-95, should be worn. Employees must be enrolled in an OSHA mandated respiratory protection program and medically cleared prior to using any respirator.

- **Miscellaneous:** Residents should kill and discard individual cockroaches before they become established in an apartment. Cockroaches can be removed physically, e.g., with a flyswatter or trapped. Immediate removal can prevent cockroaches from developing a reproducing population. If many cockroaches are killed, the carcasses are discarded to reduce exposure to allergens.

Chemical Options

- **Detergents:** A mixture of liquid dish detergent and water (10% soap) can be used by residents to kill solitary cockroaches and avoid filing a pest control request.
- **Boric acid:** Boric acid can be used by the IPM technician as a least-toxic pesticide. The treatment can be blown under cabinets and into wall voids, cracks, or any other undisturbed and dry place in an apartment. Boric acid acts as a barrier treatment to prevent cockroaches from entering living spaces.
- **Diatomaceous earth and silica aerogel:** These chemicals kill insects through desiccation, so are used in the same fashion as boric acid.
- **Baits and bait stations:** Baits contain an attractant and a pesticide that is ingested by a cockroach. In the DOHRE IPM program, baits are only used to clear an apartment of an infestation, and not as a preventative treatment. Bait stations placed into an apartment are removed when the insect population decreases below the action threshold. Baits not contained in a bait station are located where inadvertent exposure is minimized, e.g., in cracks, behind faceplates and large appliances, and in locked closets accessible only to DOHRE technicians. Locations where cockroaches enter an apartment are found by inspecting around the building perimeter. Insect entry points are baited and sealed. Boric acid is a common ingredient in baits. Bait selections should be rotated among different active ingredients in order to avoid bait aversion and resistance by cockroaches.
- **Botanical products:** Various botanical products, e.g., oils and "food grade" products, are currently on the market to control insect infestations. These are used in a fashion similar to conventional liquid insecticides but are relatively non-toxic to humans. However, many companies that produce "green pesticides" make claims about their products with little or no supporting efficacy data. These products may be exempt from toxicity studies, so they must be used with caution.
- **Broadcast pesticides:** If all other options have been exhausted and an infestation cannot be controlled, a broadcast application of a least-toxic insecticide may be warranted. Pesticide labels are followed and rotation between products is necessary to prevent pesticide resistance.

IPM Integrated Pest Management Florida

Flies

Fruit flies are about 1/8” (3 mm) in length, while other indoor pest flies range from 1/8” to 5/8” (3-16 mm) in length. Indoor flies are primarily considered nuisance pests but they have the ability to mechanically vector human pathogens. Since the larvae of many species develop in soft, rotting organic material, a large population of flies can indicate poor sanitation. Mosquitoes, though often present in an apartment, do not reproduce unless there is standing water. Biting flies, such as horse and deer flies, are outdoor pests seldom encountered in an apartment.

Drain fly
Psychoda spp.

House fly
Musca domestica

Fruit fly
Drosophila melanogaster

Prevention and Non-chemical Options

- **Exclusion:** Sealing doors and installing window screens that fit prevent flies from entering an apartment. Small seasonal flies can be excluded by keeping windows and doors shut during their peak activity.
- **Sanitation:** A large number of flies in an apartment indicates poor sanitation. If there is garbage containing food, it must be removed from the apartment immediately. Garbage cans should have lids and be cleaned often by the residents. Dumpsters are located away from the apartments and emptied frequently. Fruit flies breed in fruit left out on counters, so old fruit is discarded and fresh fruit is stored in the refrigerator. Drain flies can infest an apartment if the drains are clogged with hair or standing water is left in sinks. Drains are cleaned if there is drain-fly activity. Removing odors in an apartment makes it less attractive to flies.
- **Miscellaneous:** Flies can be killed by the residents with flyswatters. If flies are abundant in an apartment or building, fly traps and fly paper can be used.

Chemical Options

- Chemical treatments are not used to control flies in the DOHRE IPM program.

Monitoring: Receipt of a complaint or flies observed during a routine inspection.
Action Threshold: At least five live flies in a room.

Rodents

Rodent infestations are indicated by signs of activity, including feces, nests and evidence of chewing. In DOHRE housing, pest rodents include mice, rats, and squirrels that may reside in buildings and cause considerable damage.

Figure 16. Uncovered trash attracts rodents.

Prevention and Non-chemical Options

- **Exclusion:** Rodents can fit through holes and cracks much smaller than their apparent body size. Sealing holes and other possible entrances with foam or wood may not deter rodents, so wire mesh is used. Rodents cannot chew through wire mesh to enter a residence. All drains are capped, especially storm or overflow drains located near buildings.
- **Landscaping:** Improper landscaping can provide rodents with harborages, food and access into buildings. Avoid planting shrubbery close to buildings, and trim tall grass and weeds at least one foot from exterior walls.
- **Sanitation:** Eliminating food sources and harborages by properly disposing of waste materials makes apartments less attractive to rodents (Fig. 16). Both indoor and outdoor clutter is eliminated by the residents. Dumpsters are located away from apartments and emptied frequently. Residents are instructed to place garbage into the dumpsters, not on the adjacent ground.
- **Food storage:** Food is stored in metal or glass containers because rodents cannot chew through them to gain access. If the residents feed birds with a feeder, they are to prevent access by other animals and remove spilled seeds. Bird seed is stored in a sealed container.
- **Snap traps:** There are various types of traps that do not involve poisoning rodents. Live traps are preferred because the captured rodents can be relocated by the IPM technician. If snap traps are used, they are checked often to immediately remove captured rodents. Food should not be used to bait a trap because it can attract pests, such as ants and cockroaches. Cotton can be an acceptable alternative that rodents may attempt to take for nesting material. To improve snap trap efficiency, a stiff square of cardboard or plastic can be placed on the trigger to make it larger (Fig. 17). An enclosed snap trap can be used if the interior of the trap is visible. Traps are placed in locations where they will be encountered by foraging rodents. This includes sites along walls, obvious pathways, in front of known access points, or situations in which rodents are forced to encounter the trigger. If placed along a wall, the trap is oriented perpendicular to it with the trigger facing inward. Trapping locations and periods are varied to discourage trap avoidance.

Monitoring: Receipt of a complaint or a rodent observed during a routine inspection.
Action Threshold: One rodent indoors or outdoors when destroying property. Rodent nesting in wall voids.

Figure 17. A mouse trap with a square of plastic on the trigger to increase its effectiveness.

Chemical Options

- **Baits:** Poison baits are not used in the DOHRE IPM program. Baits are often colorful and may be eaten by children and pets. Also, baits kill rodents slowly, enabling them to return to harborages and die where they cannot be removed. This can cause an unpleasant odor as rodents decompose.

Stored Product Pests

The most common stored product pests in Florida are the cigarette, drugstore, confused flour, merchant grain, and saw-toothed grain beetles; grain, cowpea, granary, and rice weevils; and Indianmeal and angoumois grain moths. Dermestid beetles can also be included because they are known to feed on cured meats that are not properly stored. The beetles and weevils range in length from 1/16” to 1/4” (2-5 mm) and moth caterpillars are 1/4” to 1/2” (5-12 mm) in length.

Prevention and Non-chemical Options

- **Education:** These insects are usually brought into apartments in poorly preserved or packaged products. Residents are provided information on food inspection and storage. Infestations can be prevented by not purchasing contaminated products.
- **Sanitation:** Food packages in an apartment are discarded when infested with stored product pests. All packages of food are inspected to determine if they are infested. Cardboard boxes containing food are placed into air tight plastic, glass or metal containers. Storage cabinets are cleaned periodically to remove contaminated food and pests.
- **Heat or cold treatment:** Food for consumption or display can be cooked or frozen. Decorative corn, for example, is either baked at 150°F for 20 minutes or frozen at 0°F for four days before it is displayed.
- **Traps:** Sticky traps can be placed into cabinets to detect stored product pests. Sticky traps supplemented with attractants are available for capturing moths. Light traps can be used to remove certain kinds of stored product pests from pantries.

Chemical Options

- **Baits:** Bait stations are placed into infested cabinets to capture and eliminate pests that are discovered during an inspection. When no stored product pests are detected during follow-up inspections, the bait stations are removed.

Drugstore beetle
Stegobium paniceum

Rice weevil
Sitophilus oryzae

Confused flour beetle
Tribolium confusum

Sawtoothed grain beetle
Oryzaephilus surinamensis

Monitoring: Receipt of a complaint or stored product pests observed during a routine inspection.
Action Threshold: At least three live pests in a room.

Termites

Termites are social insects well known for their structure destroying habits, so early detection is critical to minimize the damage and repair costs. Swarming termites range from 1/4” to 1/2” (5-13 mm) in length. Three types are named based on their habitats: subterranean, drywood, and dampwood termites. Identification of the type is necessary to select appropriate control measures. Drywood termites are considered the most difficult to control and fumigation is often required. Florida building codes specify preventative treatments that require approved products and procedures.

Prevention and Non-chemical Options

- **Inspection and detection:** Termites can be difficult to detect, so the most definitive way to confirm an infestation is to observe them swarming in or from a building. Swarming termites are easy to collect and identify to type and perhaps to species. Inspecting cracks for soil and walls for mud tubes can reveal potential infestations, as well. Tapping on the surface and listening for hollow areas or probing with a tool can help locate an infestation in wood. Also, frass is often found near infested wood. Detection dogs can be used to locate termite infestations and help minimize invasive testing and probing.
- **Moisture:** Subterranean and dampwood termites require moisture to survive. Consequently, water must be drained away from buildings to minimize soil moisture in the area. Attics and crawl spaces are well ventilated to keep humidity and, consequently, wood moisture low. Water from lawn irrigation systems and other sources should not reach buildings. Both indoor and outdoor pipe leaks must be repaired expeditiously.

Formosan termite
Coptotermes formosanus

Eastern subterranean termite
Reticulitermes flavipes

Drywood termite
Cryptotermes brevis

- **Exclusion:** Trees are planted away from buildings so termites cannot follow roots to cracks in foundations. Wood structures must not touch the soil and are kept at least 8-12 inches above the surface. Access into crawl spaces or attics is screened to provide adequate ventilation and prevent swarming termites from entering. Swarming termites and mud tubes can originate from small cracks that must be sealed. All cracks in the buildings are filled to exclude termites and other pests.
- **Harborages:** Removing tree stumps and wood debris from the grounds can prevent termites from establishing and spreading to a building. Untreated wood is never buried, which includes fence posts, wood debris, and wood used for landscaping.

Monitoring: Receipt of a complaint or termites observed during a routine inspection.
Action Threshold: At least 20 subterranean termites in a monitoring station. A termite tube on or in a building. Termites swarming from a building. Drywood termite frass and live workers.

- **Maintenance:** A building inspector will evaluate wood heavily damaged by termites and, if necessary, recommend that it be replaced. Wood that is rotting or accessible to termites should be replaced with metal or plastic building materials. If replaced with wood, it must be resistant to termites, e.g., cedar, white oak or cypress.

Chemical Options

- **Wood treatments:** Only wood pressure treated with low risk chemicals is used at DOHRE facilities. Although borate-treated wood repels termites and kills those that feed on it, the chemical can leach into the soil. Moreover, borates work well only in areas protected from water. Pressure treated wood containing chromated copper arsenate (CCA) also is resistant to termites but contains chemicals that may pose a risk to humans and the environment. Wood pressure treated with other than borates and CCA should be used when it is in contact with the ground.
- **Baits:** Baits made of sawdust, paper, or wood treated with a pesticide are placed into plastic containers and distributed around structures. Termites are attracted to these slow-acting baits and feed on them. Once exposed, the contaminated termites re-enter the colony to spread the toxicant by feeding it to others. Baiting can take months before a colony is eliminated. Subterranean termites are baited most effectively in late spring and early summer. Baits can also be used for monitoring by checking them periodically for termites.
- **Liquid pesticides:** Termite-infested wood can be injected with a least-toxic pesticide. The size and location of holes drilled into a structure are selected to minimize damage and facilitate sealing after the pesticide is applied. Liquid pesticides used as a preventative barrier are applied during building construction, as required by the State of Florida building codes.
- **Fumigants:** Fumigation may be required to eliminate termite infestations. Fumigants are used by certified technicians as directed by the label and all safety precautions are followed. Fumigation of a single apartment is impractical and not an option at DOHRE facilities.

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Weeds

Most weeds are only considered aesthetically undesirable. However, noxious plants, such as poison ivy can cause severe rashes (Fig. 18). Plants with sharp spines or stinging hairs can be hazardous, such as thistles or nettles, respectively. In addition, some weeds are highly toxic, e.g., pokeweed, *Phytolacca americana,* and should be removed from areas near buildings managed by DOHRE. Children can be attracted to the poisonous pokeweed berries. Developing a tolerance for weeds that pose no health risks, such as dandelions or crabgrass, is preferred over chemical treatments in the DOHRE IPM program.

Figure 18. Poison ivy, *Toxicodendron radicans.*

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Monitoring: Receipt of a complaint or noxious weeds observed during a routine inspection.
Action Thresholds: No weeds of public health significance in close proximity to a structure. Nuisance or aesthetic weeds, 25% in 100 ft^2 or at IPM technician's discretion.

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Forms

Work Request Form

Welcome to iServiceDesk

Please enter the information in the form below to your best ability. Incorrect or missing information will delay the process.
If this is an emergency, please contact the Department of Housing at (352) 392-2161.

Work Request Form

Name Email

UFID - Phone Number - - Ext. please check number and extension

Select One

Please Select Your Room

No

Emergency Maintenance called?

No

Emergency Building Services called?

Please Choose the Request Type:

- **Pest Control Request:** These include problems involving ants, roaches, etc.
- **Building Services:** These include problems involving cleaning or health and safety issues.
- **Maintenance Request:** These include problems with plumbing leaks, tub and shower and toilet stoppages, appliances, doors and locks, windows, furniture, lights and air conditioning.
- **Mold and Mildew:** These include problems like Mold and Mildew.

Enter a thorough description of your request: (Please limit your response to 375 characters - 375 Remaining)

Confirm Work Request

Housing Inspection Form

Inspector:_____ Inspection Date: _____

Building:_____ Re-Inspection Date: _____

Apartment Number: _____

Housekeeping Issues[1]	Maintenance Issue[2]	Action Taken[3]

[1]Excessive clutter, prohibited animals, unacceptable sanitation, etc.
[2]Leaking pipes/faucets, windows/doors do not seal, holes in walls, etc.
[3]No action taken, verbal notification to resident, formal citation, follow-up inspection required, IPM option, etc.

Pest Monitoring Form

Building:_____ Inspector: _____

Apartment Number: _____

Dates Monitor Checked:								
Trap	Location	Date of Placement	Insect Species	#	Insect Species	#	Insect Species	#
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Comments:

Building:_____ Inspector: _____

Apartment Number: _____

Dates Monitor Checked:								
Trap	Location	Date of Placement	Insect Species	#	Insect Species	#	Insect Species	#
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Comments:

Integrated Pest Management Form

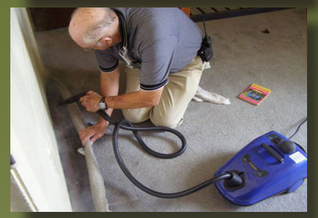
Request, Monitoring, Inspection Form			Assessment, Prevention and Non-chemical Treatment, Evaluation	Chemical Treatments			Entered in Database
Date	Building	Apt. #	IPM Options	Product	Active Ingredients	Amount	✓

Learn About Housing IPM

Housing Integrated Pest Management requires a partnership among building managers, maintenance and pest control personnel, and residents. It is important to identify pests accurately and establish threshold levels before utilizing control methods.

Housing IPM Methods

Cultural Control
Remove the food, water and environmental conditions that sustain insects.



Physical Control
Exclude pests by sealing cracks and holes leading into the residence.

Use alternatives to pesticides, such as traps and vacuuming, when managing infestations.

Biological Control
Protect and add natural enemies of pests.

Chemical Control
Use pesticides responsibly and according to the label when they are needed.

Wayne Walker
Pest Control Services
Housing and Residence Education
352-392-2171, Ext. 10917
waynew@housing.ufl.edu

Norm Leppla
University of Florida, IFAS
Entomology and Nematology
352-273-3951
ncleppla@ufl.edu

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