

## **IPM Plans for common pest problems**

This section needs to be as specific as possible.

Sample IPM plans have been developed and are found within this document. Pick the most common pests your district has experienced for the last two to three years. Develop action steps for how you would react to that particular pest problem indoors and outdoors. These action steps can help you educate your staff, teachers, and administrators about these common pests and how they can assist in the prevention of reoccurring problems.

Remember these documents are guidelines, you are free to enhance and alter as your district sees the need to do so.

# Bats

- Brazilian Free-tail Bats *Tadarida brasiliensis*
- Evening Bat *Nycticeius humeralis*
- Big brown bat *Eptesicus fucus*
- Little brown bat *Myotis lucifugus*
- Southeastern Bat *Myotis austroriparius*

## Identification:

Before attempting control of bats, it is important to know which bat species you are dealing with. A few bats are very rare and are federally protected. It is important to comply with the laws that protect these animals. While some bats are easy to identify, others require training and the use of identification keys. Your local Parks and Wildlife Department, or Bat Conservation International, may be able to determine which species of bats are most likely in your school district. Additionally, bats are identified routinely when submitted for rabies testing to the Department of State Health Services Laboratory in your state.

Direct contact with a bat may result in potential rabies exposure, so all bats that come in contact with students, faculty or staff must be tested for rabies.

## Image(s)



**Figure 1 Brazilian Free-tail Bats *Tadarida brasiliensis***



**Figure 2 Evening Bat *Nycticeius humeralis***

### General Information:

Bats are highly beneficial wild mammals. Some bat species eat insects and consume up to their weight in food each night. Others are important pollinators. Bats are not flying rodents, but belong to a unique order of mammals called Chiroptera (Latin for “hand wing”). A common myth about bats is that they are blind. Bats have good vision; however, they can also use sound waves (echolocation) to help them navigate and locate food.

Because bats are mammals, they give birth to live young. Most produce one pup a year, although a few species give birth to litters of 2 to 4 pups. Some bat species mate in the fall or winter, but fertilization is delayed and subsequent development of the fetus does not occur until spring. Other species, like the Mexican free-tailed bat, mate in the spring. Fertilization and fetal development follow, and pups are born in the spring or early summer (mid-April to September). By late summer, the pups are able to fly and feed on their own.

Bats live in a variety of places including caves, abandoned mines, hollow trees, under tree bark, in palm fronds and in the crevices under bridges. As natural habitat decreases, some species now commonly roost in buildings. Bats are creatures of habit and will return to the same roost year after year.



Figure 3  
Big brown bat *Eptesicus fuscus*



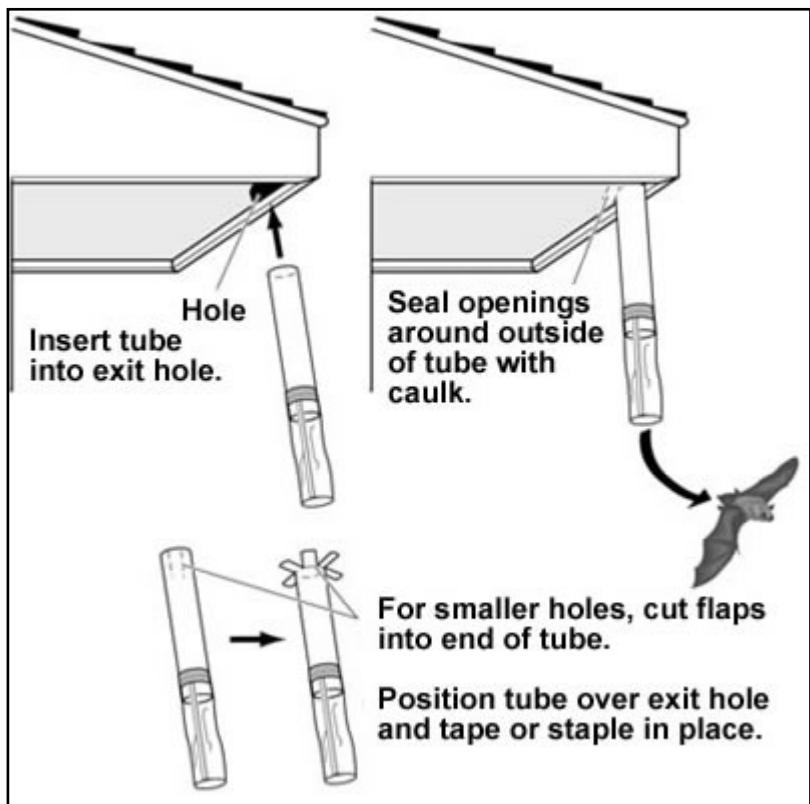
Figure 4 Little brown bat *Myotis lucifugus*

Name	Dimensions/Average Size	Description	Image
Brazilian Free-tail Bat (also known as Mexican Free-tail) <i>Tadarida brasiliensis</i> Subspecies: <i>T. b. Mexicana</i> (migratory) <i>T. b. cynocephala</i> (non-migratory)	Wingspan: 11-14 inches Length: 3 ½ to 4 inches Weight: 8 to 14 grams	Color: Gray or dark brown to rusty brown. Other: Large round ears and vertical wrinkles on upper lip; tail projects beyond the tail membrane for about a third of its length	Image is above table Figure 1
Evening Bat <i>Nycticeius humeralis</i>	Wingspan: 10 to 11 inches Total Length: 3 to 4 inches Weight: 5 to 14 grams	Color: brown to black, ears and wings are black. Other: tail completely enclosed in the tail membrane	Image is above table Figure 2

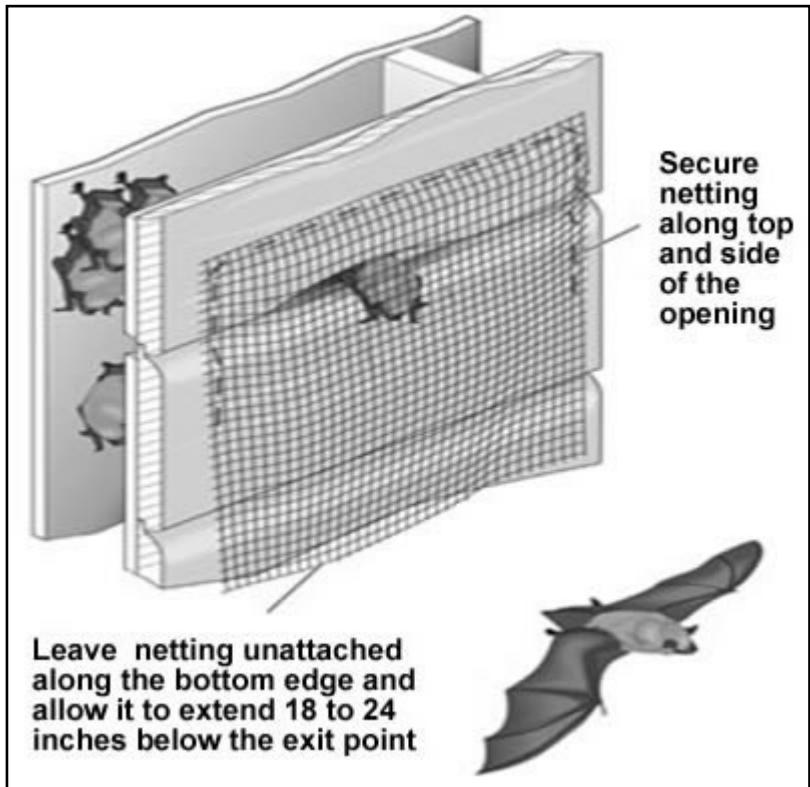
Big brown bat <i>Eptesicus fuscus</i>	Wingspan: 13 to 15 inches Total Length: 4 to 5 inches  Weight: 13 to 25 grams	Color: Light rusty to dark chocolate brown; individual hairs darker at bases than at tips. Other: Tail completely enclosed in the tail membrane	Image is in above table Figure 3
Little brown bat <i>Myotis lucifugus</i>	Wingspan: 8 $\frac{1}{4}$ to 10 $\frac{1}{4}$ inches Total Length: 3 to 3 $\frac{3}{4}$ inches Weight: 4 to 5 grams (7 $\frac{1}{2}$ to 8 $\frac{1}{2}$ just prior to hibernation)	Color: Brown to bronze. Other: Tail completely closed in the tail membrane	Image is above table Figure 4
Southeastern Bat <i>Myotis austroriparius</i> Endangered	Wingspan: 9 – 11 inches Length: 3½-4 inches	This species has brown fur on top and white fur on the bottom or underbelly.	Image is not available
Locations/Situations	Suggested Thresholds	Nonchemical Control Options	
Classroom, gym, or interior of building	1 bat found on ground	Ensure contact has not been made with anyone; Have the following items available before you approach the bat: a pair of thick work gloves, a plastic face shield, a small cardboard box and masking or duct tape; After putting on the gloves and face shield, carefully place a box or coffee can over the bat, place a sturdy piece of cardboard under the box or can, secure the box and tape it shut; take bat out side and place on a high surface or close to a tree so the bat can crawl up.	
Building – artificial roosts	1 known colony or evidence of bats inside building	After observing bat entry and exit points, seal up all other potential entry points using caulk, concrete cements for crack and crevice use, weather stripping, flashing, or hardware cloth (¼ mesh). See steps to evict bats below.	

## Steps to Evict Bats

1. To effectively evict the bats you will need to use one-way shoots (see figure 1). You can make a shoot or one-way valve out of 2-inch (diameter) PVC pipe, an empty and cleaned caulking tube with both ends cut off, plastic netting (see figure 2), or even clear sheets of plastic. Place the tube or netting over the holes in the roof or soffit used by the bats to allow them to leave, but not re-enter the building. If bats are roosting in a long horizontal crevice, place a tube roughly every 6 feet along the entire distance to make sure all bats can get out. For some large areas, netting can be used to form a drape to allow bats to exit, but not return. If using netting, make sure it has a mesh of less than  $\frac{1}{4}$  inch so bats won't get caught in it.



2. Leave these one-way devices in place for at least one week during warm weather to ensure all the bats have gotten out.
3. Once the bats are excluded from the building, begin remediation procedures. Bat guano should be removed from interior structures so as not to attract other pests like cockroaches or flies. The naturally occurring soil fungus, *Histoplasma capsulatum*, is sometimes found in bird and bat droppings.



Although it is generally associated with bat droppings in caves, where humid conditions are conducive to fungal growth, caution should be used when cleaning up guano in any confined area to prevent inhalation of fungal spores that can cause histoplasmosis.

- Employees should wear personal protective equipment. This should include leather gloves, long-sleeved shirt, long pants and either a full-face shield or goggles and respirator capable of filtering particles smaller than 2 microns in diameter.
- Bat guano can accumulate quickly in large colonies. Prior to removing these deposits, your maintenance crew can lightly dampen the guano with water and a surfactant (soapy solution) to minimize dust and fungal spore dispersal into the air.
- Like other mammals, bats can have ectoparasites such as mites, ticks, fleas, and flies. Depending on the roosting location, a licensed pesticide applicator may need to make an application of desiccant or insecticide dust after eviction to kill parasites and keep them from entering areas occupied by students and staff.
- Ensure that the area has been permanently sealed off from the outside to prevent bats or other pests from entering the area.

#### Selected References for Original Document

French, B., L. Finn, and M. Kiser, 2002, Bats in Buildings: An Information and Exclusion Guide, Bat Conservation International, Austin, TX, [www.batcon.org](http://www.batcon.org)

Kern, W. H., Jr., 2005, Bats in Buildings, University of Florida, IFAS Extension, Fact sheet ENY-268

Tuttle, M., 2003, Texas Bats, Bat Conservation International, Inc. Austin, TX

All images courtesy of Bat Conservation International, Melvin Tuttle, Austin, TX

# Fire Ants

- Imported fire ant *Solenopsis spp.*

## Identification:

Imported fire ants deliver painful stings resulting in a white, bump-like pustule. They make prominent mounds from which they emerge quickly and aggressively when disturbed. Fire ants are reddish brown to black depending on where you reside. Workers vary in size, ranging from about 1/8 inch to 1/4 inch.

## Image(s)



**Figure 1**  
Fire Ant Workers

## General Information:

Because fire ants may present a hazard to children who are allergic to their venom, fire ant control should be made a top priority around athletic fields, playgrounds and classroom buildings. Since fire ant mounds are usually located outdoors, emphasize year-round suppression of fire ant activity in landscapes in and around buildings. Fire ant baits provide excellent control and are considered a preferred treatment. Individual mounds may be treated in sites where they are not numerous with baits or contact insecticides according to label directions. Visit the [Texas Imported Fire Ant page](#) for more information.

Locations/Situations	Suggested Thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Football/ baseball fields  Other high maintenance landscapes	4-5 mounds to initiate bait application.  One mound sufficient to justify mound treatment.	None effective.	Broadcast application of IGR bait containing methoprene, pyriproxyfen; or non-IGR products containing spinosad or abamectin.	Other toxicant (indoxacarb, hydramethylnon) baits .  Liquid, granular, dust or aerosol contact insecticide treatments may be used to eliminate individual mounds.  Surface-applied slow-acting, long- residual contact insecticides such as pyrethroids or fipronil where maximum suppression is desired.
Playgrounds	One mound sufficient to justify mound treatment.	None effective.  Physical removal with a shovel.	IGR baits may be applied to turfgrass areas during spring or summer vacations. For fast control, apply non- IGR bait or contact insecticide to mounds.	Faster acting toxicant baits such as spinosad, hydramethylnon or indoxacarb should be applied around colonies or mounds that extend under sidewalks or other pavement areas.

Low maintenance areas	More than 40 mounds per acre or where complaints are received.	None effective. Regular mowing to keep mounds knocked down.	Broadcast application of IGR bait containing methoprene, pyriproxyfen, or fenoxy carb, or non-IGR baits with spinosad or avermectin.	Faster acting toxicant baits such as spinosad, hydramethylnon or indoxacarb. Contact insecticide mound treatments may be used to eliminate individual colonies.
Building perimeters	One mound within 10 feet of building sufficient to justify treatment.  Three or more mounds per building if more than 10 feet distant.	None effective.	Broadcast application of IGR bait containing methoprene, pyriproxyfen, or fenoxy carb, or use non-IGR bait with spinosad or avermectin.	Faster acting toxicant baits such as spinosad, hydramethylnon or indoxacarb. Contact insecticide mound treatments may be used to eliminate individual colonies. Barrier treatments using fipronil or other contact insecticide around perimeter walls to prevent ant foraging indoors.
Indoors	Respond to any fire ant complaints. Treat when more than one ant observed per classroom.	Check all windows and doors for tight seals. Check roof and outside areas for mounds and possible entry points.  Caulk and seal all suspected entry points.	Control ants outdoors around the building (see above). Fire ant baits applied to cracks or inaccessible voids, follow label instructions.	Pyrethrum sprays may be applied to ant entry points only in emergency situations where fast control is needed and caulking or sealing is not possible.

## **Definitions**

### **Insect Growth Regulator (IGR):**

A slow acting disruptor of the ant's reproductive systems. IGRs ant bait formulation products containing methoprene, pyriproxyfen or fenoxy carb, do not kill worker ants but rather prevent the development of new worker ants for months by affecting the queen ants. Worker ants present at the time of treatment must die off naturally. For this reason, IGR baits are slow-acting, with broadcast application providing maximum effects in 1 to 2 months when applied in spring or early summer, but late summer or early fall applications having maximum effects 2 to 6 months later.

### **Non-IGR insecticide ingredients:**

Other active ingredients are formulated in ant bait products, including spinosad, indoxacarb, hydramethylnon, and abamectin. These vary in their ability to provide maximum control when broadcast-applied, with spinosad and indoxacarb being faster-acting, requiring 1 to 4 weeks. Bait products containing hydramethylnon (e.g., Amdro®) provide maximum effects in 3 to 6 weeks following application and can be used safely, but may not qualify in some states as low in toxicity. Abamectin performs more like an IGR. However, both hydramethylnon and abamectin work faster when applied at a higher rate to individual ant mounds.

Authors: Michael E. Merchant, Janet Hurley, Faith M. Oi and Rebecca W. Baldwin of the Southern Region School IPM Workgroup

# German Cockroaches

- German Cockroach *Blattella germanica*

## Identification:

Adults are 1/2 to 5/8 inches long, light brown to tan, with two dark stripes on the shield (pronotum) behind the head. Females are often seen carrying a yellowish-brown egg capsule (ootheca) protruding from the end of the abdomen. Nymphs are generally darker with two prominent dark stripes surrounding a lighter tan spot or stripe on body midsection (thorax).

## Image(s)



Figure 1

German Cockroach *Blattella germanica*

## General Information:

German cockroaches are our most prolific cockroach species producing 3-6 generations per year. Besides its importance as a sign of poor sanitation used by health departments, the German cockroach has been implicated in the transmission of several pathogenic organisms and as a cause of allergic reactions for children and adults. Prompt attention to sanitation and control are necessary to prevent this pest from becoming abundant at school facilities. German cockroaches do not enter structures from outdoors, they are spread entirely by humans and live only indoors. German cockroaches spend most of their lives in cracks and protected void areas near sources of food and water.



Figure 2

German Cockroach Nymphs

Locations/ Situations	Suggested Thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Food Preparation Areas	One cockroach justifies baiting and monitoring efforts. More than 5 cockroaches per inspection should trigger a complete review of sanitation and control efforts and possibly a more aggressive	Caulk and seal potential harborages around water and food prep sites. Keep all food cleaned up or in sealed containers. Clean on a schedule, including less accessible areas. Use sticky traps to monitor	Containerized baits, or other baits applied to cracks and inaccessible void areas.	Insect growth regulator sprays applied to harborage areas. Boric acid dusts applied to dry, inaccessible void areas. Aggressive treatment should include all previously mentioned actions plus application of aerosol or liquid residual pyrethroids to known harborage areas, recognizing that some may have repellent properties that may affect bait retrieval.

	treatment strategy.	populations. Use a HEPA vacuum to remove heavy infestations prior to treatment.		
Bathrooms	One cockroach justifies baiting and monitoring. More than one should trigger non-chemical actions. More than 10 cockroaches per inspection should trigger review of sanitation and control efforts and possibly a more aggressive treatment strategy.	Caulk and seal potential harborages around sinks and other plumbing penetrations. Repair loose tile and seal holes in walls, etc. See above.	See above.	See above.
Food Storage	More than one cockroach justifies baiting and monitoring efforts. Increase intensity of efforts with higher numbers. More than 5 cockroaches per inspection should trigger review of sanitation and control efforts and possibly a more aggressive treatment strategy.	Inspect for source of infestations in cardboard boxes, drains, carts, shelving etc. Return, eliminate and/or report infested items.	See above.	See above.

Classrooms	One cockroach justifies monitoring. More than one justifies non-chemical actions. Bait when sticky trap catches exceed five per inspection.	Review food and pet policies in classroom. Store all pet food and other stored foods in airtight containers. Remove trash daily, particularly before the weekend. Be sure to inspect backpack storage areas. See above.	Crack and void treatment of inaccessible harborage areas with baits. Use discretion whether use of containerized baits are appropriate and can be used without being disturbed by students.	See above. Note: Liquid residual sprays should rarely, if ever, be applied to classrooms during the school year.
Utility and Other Areas	More than one cockroach justifies baiting and monitoring efforts. Increase intensity of efforts with higher numbers.	Look for sources of infestation. Correct sanitation efforts as needed.	See above.	See above.

#### **Tips to Successful Monitoring :**

1. Monitoring stations or units should always be dated to monitor activity over time.
2. Be sure to place enough monitoring units to accurately monitor an area. Monitors provide valuable information about pest activity, so be sure to use a sufficient number of them. Food service areas should have more monitors than nonfood areas.
3. If a trap is consistently empty, the trap may be relocated to another site.
4. Create a map of the area that includes the location of the traps. You may also leave space on your map to write numbers of insect per trap for each inspection. It may be helpful to use monitor locators such as stickers.
5. Monitors should be placed along walls or in corners.
6. Monitors should be kept out of view if possible. Monitors may be secured with double sided tape.
7. They should be placed in clean, dry areas close to suspected cockroach harborage.
8. If possible, monitors should be placed in between resources (harborage, food, and water) where cockroaches may travel.
9. Monitors should be replaced if full or if the monitor has been wet or is covered in dust.

## **Tips to Sanitation and Cleaning**

1. Eliminate clutter. Clutter creates harborage for pests. Harborage allows pests to eat, rest, and reproduce in the privacy and darkness of their own pesticide-free zone. Clutter makes it harder to clean.
2. Wipe surfaces with soapy water followed by a water rinse. The soapy water and rinse helps to remove cockroach allergens and aggregation pheromones left by cockroaches to attract other cockroaches to an area.
3. Eliminate food and water sources that can compete with bait applications.

## **Definitions**

### **HEPA Vacuum Cleaners**

HEPA Vacuum Cleaners are fitted with High Efficiency Particulate Air filters, capable of capturing 99.97% of airborne particles 0.3 microns and larger, tiny dust particles that would pass through a regular vacuum cleaner filter. Cleaners with HEPA filters minimize the chance of passage of allergenic particles through the collection bag.

### **Insect Growth Regulators**

Insect Growth Regulators (IGRs) include products like hydroprene and pyriproxyfen for control of German cockroaches. While toxicity of IGRs is considered extremely low, it is considered good policy to use sprays only in situations where bait applications are impractical or have provided less than satisfactory control.

In non-food and bathroom areas the action threshold may be higher, especially where food and water sources are limited and chance of heavy infestations are less. These thresholds should be considered suggestions and may be modified by the IPM Coordinator according to local sanitary conditions and stakeholder sensitivities.

**Authors of original content:** Michael Merchant, Janet Hurley, Faith Oi and Rebecca Baldwin of the Southern Region School IPM Workgroup.

# Smoky Brown and American Cockroaches

- Smoky Brown Cockroach *Blattella germanica*
- American Cockroach *Periplaneta americana*

## Identification:

Adults of both species are 1½ to 1½ inch long and have similar appearances. The main visual difference is the color of the adults. Smoky brown adults are dark brown, nearly black in coloration, while American cockroach adults are brown to reddish-brown with a cream-colored area on the "shield" (pronotum) behind the head.

Image (s)



Figure 1  
Smoky Brown Adult

## General Information:

These species are the largest cockroaches normally found in urban areas in the U.S. They can be found indoors and outdoors, especially in warmer climates and moist surroundings. The American cockroach is common in city sewers and basements, particularly around pipes and drains; while the smoky brown prefers tree-holes, loose bark and mulch. Both species can build large populations if uncontrolled and can spread bacteria. Many people have allergies to cockroaches which makes these especially problematic in sensitive environments like schools. The best way to prevent cockroach problems is proper sanitation and cleanliness.



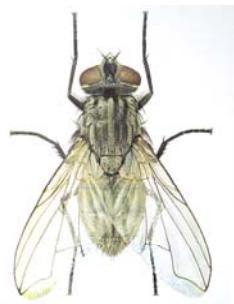
Figure 2  
Smoky Brown Nymphs

Location/Sanitation	Suggested Thresholds	Nonchemical Control Options	Preferred chemical treatment(s)	Other chemical treatment options
Kitchen and other food preparation areas	One cockroach justifies monitoring, more than one justifies baiting. More than 10 justifies an inspection to find out how they are entering the structure, to find areas that are not up to sanitation standards and to locate other conducive conditions.	Clean up any areas not up to sanitation standards. Get rid of cardboard and other debris that could serve as shelter. Caulk around sinks and cracks to close off hiding places. Ensure no gaps under exit doors.	Use bait stations in rooms not accessible to children. Use other bait formulations in inaccessible areas where cockroaches may hide. Use boric acid and silica gel in dry inaccessible voids, cracks, and crevices.	Several pyrethroids can be used around known harborage areas. Always follow the label directions. Use these pesticides with care around areas that children may come in contact with. They

				should be used as a last resort.
Bathrooms	One cockroach justifies monitoring, more than one justifies baiting and nonchemical actions. More than 5 justifies inspection of sanitation in the area.	Caulk and seal all sinks, baseboards, and cracks. Fix any holes or broken tiles.	See above	See above
Food Storage	One cockroach justifies monitoring, more than one justifies baiting. More than 10 justifies an inspection to find out how they are entering the structure, to find areas that are not up to sanitation standards and to locate other conducive conditions.	It's best to keep food in pest-proof containers that keep pests out. Inspect for cleanliness. Break down and recycle all cardboard boxes	See above	See above
Classrooms	One cockroach justifies monitoring with sticky traps. More than one justifies nonchemical options. More than 5 justifies baiting.	Enforce all food and pet policies in the classroom. Make sure all snacks are stored in plastic containers or sealed tightly. Inspect for cleanliness	See above	Pyrethroids should only be used in classrooms if all other methods have been tried and did not provide satisfactory control.
Utility and other areas	More than one cockroach justifies monitoring and baiting. Look for sources of water or food that may be attracting cockroaches to these areas.	Correct any sanitation problems. Get rid of any harborage sites.	See above	See above

## House Flies, *Musca domestica*

**Identification:** Adult house flies are 6–7 mm (about 5/16 inch) long. Their thorax is gray, with four longitudinal dark lines on the back. The underside of their abdomen is yellowish and fine hairs cover their whole body (thorax and abdomen). House fly larvae (maggots) are up to 12 mm (½ inch) long, creamy white and legless, with a worm-like, tapering body. House flies have complete metamorphosis. The pupae are reddish brown, about 8 mm (about 3/8 inch) long and similar to puffed rice in shape and size. Larvae and pupae are found close to their larval breeding sites.



**General Information:** The house fly is one of the most common flies infesting garbage and is commonly found around livestock operations, where it breeds in manure and wet feed. Adult house flies lay their eggs in decomposing vegetable matter or manure. The complete lifecycle, from egg to adult can require from 7 to 21 days, depending on temperature and quality of the food resource. Larvae require high-moisture conditions to grow; upon reaching full size they leave the breeding site to burrow into the ground or seek drier conditions where they can pupate successfully. The pupal stage typically takes 5 days to a month, depending on temperature.

Houseflies are both a potential health and nuisance problem in schools. They pose a health problem because of their ability to carry pathogens from their breeding and feeding sites (manure and garbage) to food preparation surfaces and other sites that humans contact by touch. Houseflies are especially a problem in kitchens for this reason. School kitchens and cafeterias with house fly infestations are liable to be closed by health inspectors. Houseflies are also considered a nuisance, especially when homes are situated close to livestock operations such as chicken facilities, horse barns, and livestock barns.

When house fly problems occur in buildings or kitchen areas, the most common explanation is improper maintenance and cleaning of nearby garbage receptacles. Control of houseflies, as with all flies, depends on locating and eliminating the fly breeding site. Insecticide fogs that kill flying insects provide only temporary relief of flies and do nothing to solve a fly problem, although continuously running light traps can help provide supplemental control of low-level fly problems in kitchens and other sensitive sites.

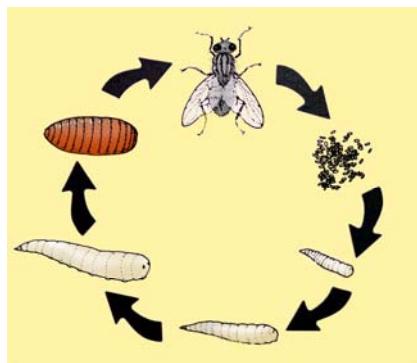
**Other Information:** House fly control in livestock barns can pose special legal issues regarding posting and exposure of students and staff. In particular, use of automatic mister systems can expose students and staff who are in the misting area when the systems turn on. Proper calibration and programming of equipment can eliminate this risk; nevertheless, we recommend that the district advise parents of students using the barn about the types of pesticides (e.g., baits, mister systems) in use prior to the school year, or prior to beginning of pesticide use. Notification of when and where pesticides are being applied should be posted in the Ag Education classrooms and at points of entry into the barn facilities using the approved pest control sign for the District.

Locations/Situations	Suggested Thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Livestock barn areas used by Ag Education program	Fly speck counts > 100 specks per week on index cards placed in Ag barn at approx 4-6 foot height. Cards should be checked and replaced weekly. (Note: Each site will have different nuisance tolerances for flies, based on worker tolerance and proximity to	Manure from Ag barn should be removed at least weekly and disposed of at a site away from school district property, preferably on agricultural land where it does not pose a nuisance or result in groundwater pollution. Alternatively, manure may be composted in an efficient composting operation	Baits placed in an inaccessible location. Fly bait, such as QuikBayt® (or Golden Malrin®-both Green category if kept inaccessible) can be painted on inaccessible surfaces or placed (granular form) in hanging jugs out of	Fly misting systems will be used only when fly populations exceed the agreed-upon threshold. Mister systems must be programmed to activate only when students and staff are not present (to meet state legal requirements). All directions and safety requirements on pesticide containers must be followed at all times. The preferred active ingredient in mister systems is

	<p>neighborhoods or other areas where fly production is undesirable. Workers, in cooperation with IPM Coordinator, will adjust this suggested threshold used to justify turning on aerosol insecticide treatment. This threshold should be reviewed for appropriateness at least once a school year.)</p>	<p>that generates minimal fly problems. High temperatures (&gt;120 degrees F) generated by efficient composting will kill all fly life stages.</p>	<p>reach of children and livestock.</p>	<p>botanical pyrethrins, a "Green category" insecticide. If permethrin or another active ingredient (that is not plant-derived) is used, the appropriate waiting period must be observed for "Yellow" or "Red" category pesticides (see state rules for more information).</p>
Kitchens	<p>More than three flies per day, or based on single complaint.</p>	<p>Replace or clean outside dumpsters, or identify and remove other fly breeding sites outdoors. Doors to the outside should remain closed between use throughout the day and evening. Garbage dumpsters should be located at least 50 feet away from all kitchen doorways or windows. If, despite these measures, flies remain a problem on a recurring basis in any kitchen, fly traps and/or air curtains will be installed. Electronic fly traps will be of non-electrocuting design to avoid contaminating kitchen surfaces; they should be placed at 4-6 foot height and should not be visible from the outside at any time to avoid drawing flies indoors. Light bulbs used in such traps may appear to be functioning correctly yet be producing inadequate UV light emission for optimal fly control. Bulbs should be replaced in all fly light traps annually.</p>	<p>Non-chemical measures should be sufficient. No pesticides for fly control are generally needed in kitchens.</p>	<p>Aerosol pyrethrin products should be used only in circumstances where quick knockdown of flies is required. This is only a temporary measure and should only be done in combination with other non-chemical, sanitary measures. Non-chemical measures should be sufficient. No pesticides for fly control are generally needed in kitchens.</p>
Garbage dumpsters	<p>Easily visible flies are common and pose a visual nuisance around dumpsters, or single complaint.</p>	<p>Replace or clean dumpster. Ensure that lids are tight-fitting to minimize garbage odors.</p>	<p>None. Chemicals are usually not needed, and should not be relied upon for controlling house flies around</p>	<p>Paint-on bait applied to inside of dumpster to provide interim control of flies only, while dumpsters await cleaning or replacement. Chemical controls should not be relied upon for controlling house flies</p>

			dumpsters.	around dumpsters.
Outdoor trash receptacles	Easily visible flies are common and pose a visual nuisance around trash receptacles, or single complaint.	Replace or clean trash receptacle. Install tight-fitting, spring-loaded lid that closes after use to minimize odors and discourage fly entry. Empty trash daily.	None. Chemicals are usually not needed, and should not be relied upon for controlling house flies around trash receptacles.	None. Chemicals are usually not needed, and should not be relied upon for controlling house flies around trash receptacles.

House fly life cycle



# Honey Bees

- Honey Bee *Apis mellifera*

## Identification:

Honey bees are about  $\frac{1}{2}$  inch in length with an orange to yellowish-brown color and black intersegmental bands on the abdomen. The legs, antenna and eyes are black and the thorax, abdomen and legs are densely covered with hairs. They build their nest of wax and nests may be located inside of structures (walls) or trees or hanging from protected locations on trees or other structures. Whether in walls or exposed, the nest is a series of double sided wax sheets that are arranged in patterns. Unlike African honey bees, they will not nest in the ground.

## General Information:

Honey bees are social insects, living in colonies containing 60 to 120 thousand individual workers, a few hundred drones and a queen. Like most bees and wasps they will defend their nests when disturbed. Honey bees can only sting once because their barbed stinger remains in the individual or animal when stung, causing the last abdominal segments of the honey bee to be ripped off. This results in the death of the honey bee. When disturbed, a few hundred bees will emerge from the nest and attack the intruders. In contrast, Africanized honey bees are often much more aggressive.

Honey bees are the primary pollinators of 2/3 of the food we eat, either directly or indirectly. They gather nectar from flowers to make honey and collect pollen from flowers during pollination and use them for food. When there are few nectar sources blooming, honey bees will forage in any source that has sugar, from trash cans to soft drink cans, to sweets like candy and fruits. Man cares for and manages honey bee colonies in hives and extracts the excess honey and pollen that the honey bees produce. The colors of honey are produced by the floral sources from which the honey bees gather the nectar from. Wax, propolis (resinous bee glue), honey bees and queens are other products that beekeepers harvest from the hives they manage. Unlike other bees and wasps, a reduced colony will overwinter, rather than just the queens.

## Image (s)



**Figure 1**  
Honey Bee (Yellow Worker)



**Figure 2**  
Honey Bee Stinging



**Figure 3**  
Damage by Honey Bees

Locations/ Situations	Suggested Thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Foraging honey bees around outdoor eating areas.	One teacher/staff complaint(s) received, or 5 or more honey bees observed near food or picnic tables.	Locate nest source of honey bees and have beekeeper remove. Good sanitation and removal of possible food attractants. If necessary wash area down.	None practical. Where treatment needed use one cup of liquid soap per gallon of water sprayed or a soapy foam to treat nest where removal is not practical.	Insect growth regulator sprays applied to harborage areas. Boric acid dusts applied to dry, inaccessible void areas. Aggressive treatment should include all previously mentioned actions plus application of aerosol or liquid residual pyrethroids to known harborage areas, recognizing that some may have repellent properties that may affect bait retrieval.
Swarms.	Anytime found or observed.	Wait to see if the swarm moves on and keep children away from the site.  Otherwise, seek removal by qualified individual or company.  Make a list of available beekeepers for assistance, with names and phone numbers.	None practical.	None practical.
Foraging honey bees near dumpsters and garbage receptacles	One teacher/staff complaint(s) received, or 5 or more honey bees observed near garbage receptacles.	Make sure covers or doors are closed and well sealed.  Use trash compactors to package and remove waste from kitchen and other food areas.	None.	With repeated incidents, try to locate nest and remove. Treat inside of containers with residual chemical to repel honeybees.
Nest located on or near school grounds or	Observance of bees coming and going from an opening in a	Have honey bees removed by qualified individual and seal all outside	Not practical.	Where nest in trees cannot be removed, treat with a pyrethroid and soap and seal hole after treatment.

in walls of school building.	tree or school structure, or report of honey bees in a classroom.	openings that honey bees may use as an entrance for nesting in walls or between floors. May need to replace lumber to eliminate nest scent.		
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## What About Stings

Wasps, including yellowjackets, paper wasps and hornets can sting multiple times while honey bees can only sting once. (Other types of bees usually don't sting, but when they do, should be treated like wasp stings.) Honey bees leave the stinger in the skin via a handy barb. Here is where the treatment difference comes in. Immediately after the sting, the stinger needs to be removed. Attached to the stinger is a poison sac that continues to pump venom into the sting site for several minutes. This stinger should not be pulled out; rather, it should be scraped off. A stiff sheet of paper or a credit card works well for this. A wasp sting does not require scraping. After you have identified the offending organism and removed the stinger, be sure to observe the patient for any signs of allergic reaction. If the patient has a history of allergic reactions, shows signs of severe swelling or has trouble breathing, a physician should be contacted immediately. If the patient shows no signs of distress, the sting area can be soothed by applying a paste of baking soda or meat tenderizer and water. An antihistamine may also be given to relieve the itching caused by the sting.

## Sting Prevention

A few tips on how to prevent or at least minimize being stung.

- Keep sweet items covered.
- Bees and wasps, like children, are attracted to sweets. (This includes recycle bins and garbage cans that contain soda cans or fruit scraps).
- It is recommended that all outside garbage cans be covered with a self-closing lid.
- Don't walk barefooted on the playground or in the yard.
- Bees and wasps are nectar collectors, so they are often close to the ground.
- Don't harass the bees.
- When a bee hive is spotted, it is best to leave it at a distance and have a professional come in and remove it at night.

**Author of original content:** Dale Pollet

**More images**

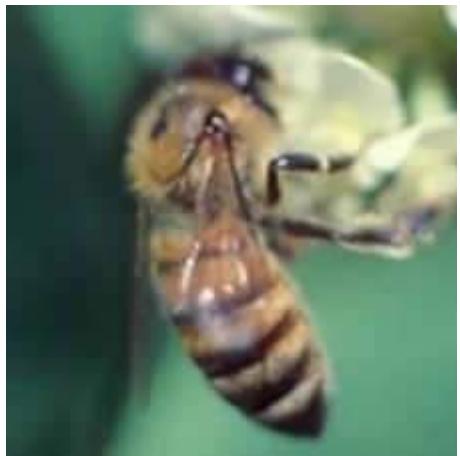


Figure 1 "Three Banded Italian" Honey Bee Honey Bee (Cordovian Colored Queen)



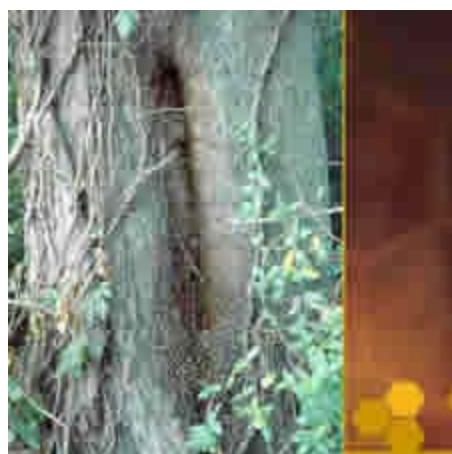
"Wild Honey Bee" Colony



Honey Bee: Black Worker Bee (Carniolan)



Honey Bee Swarm



"Wild Honey Bee" Colony

# Tramp Ants

- Argentine Ant *Linepithema humile*
- Pharaoh Ant *Monomorium pharaonis*
- Bigheaded Ant *Pheidole spp.*
- Whitefooted Ant *Technomyrmex albipes*

## Identification:

Generally small (less than 1/8 inch), persistent and abundant ants that are commonly attracted to various kitchen and classroom foods, including sweets, oils and proteins. Tramp ants are usually non-territorial, quick to spread and often found many small nests. They represent some of the most common and important indoor and outdoor nuisance ants. Odorous house ants have a pungent odor when crushed. The smallest of these ants include the Pharaoh ant, whitefooted ant, and rover ants. Each ant species has its own unique biology, food preferences and control methods, so identification can be critical to selecting the best control. The following are general guidelines for dealing with tramp ants.

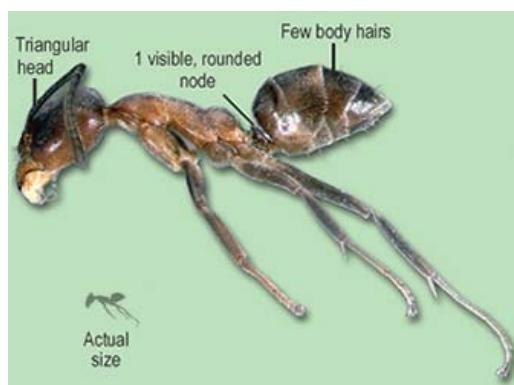
## General Information:

Ants are social insects. Their nests or colonies can be found indoors and out, although some species have preferred nesting sites. A nest contains one or more queen ants laying eggs and being cared for by worker ants. Worker ants-- sterile or non-reproductive female ants--tend the queen and brood (eggs, larvae and pupae) and forage for food. Foraging ants can invade households from colonies outdoors.

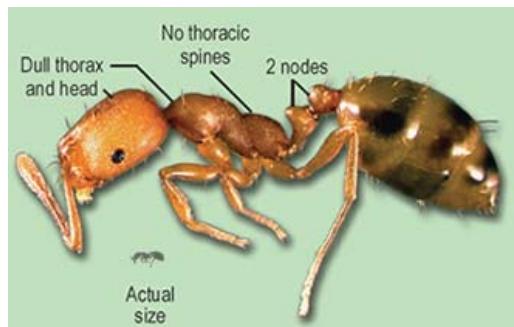
Nests often can be located by following "trails" of foraging ants. Indoors, ants nest almost anywhere. For instance, Pharaoh ants readily nest in attics, appliances, linens, heating ducts, wall voids and light switches or fixtures. Killing foraging ants rarely solves an ant problem in the home because the colony remains unaffected.

During certain times of the year, most species produce reproductives, winged male and female ants that leave the nest to mate and establish new colonies. When winged ants swarm in the home, their colony is likely to be located somewhere inside

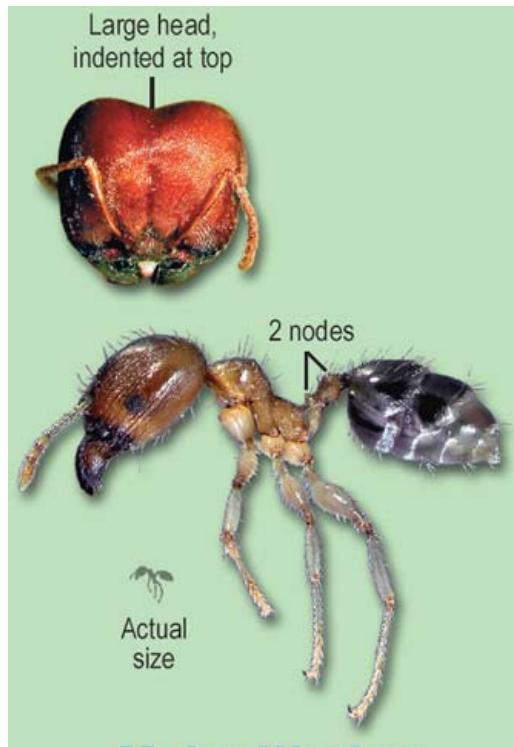
## Image(s)



**Figure 1**  
Argentine Ant *Linepithema humile*



**Figure 2**  
Pharaoh Ant *Monomorium pharaonis*



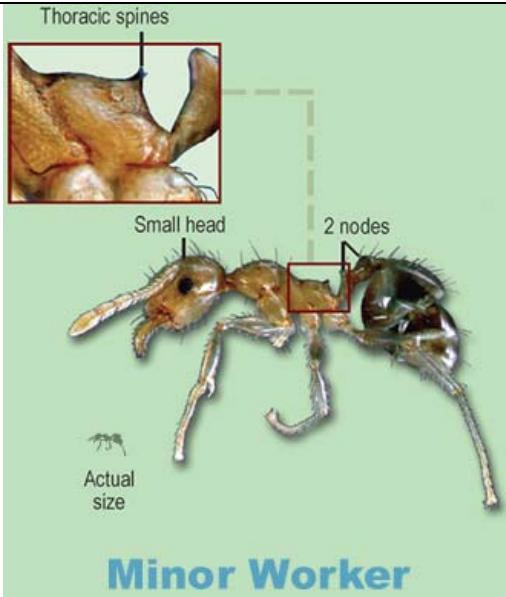
**Figure 3**  
Bigheaded Ant Major Worker *Pheidole spp.*

Ants form new colonies in several ways. Most are started by a newly mated, winged reproductive, now called the queen ant. After finding a suitable nesting site, the queen loses her wings and begins laying eggs, which hatch into legless, grub-like larvae. The queen feeds the larvae as they develop through several stages in which they molt and grow between each stage. Afterward, they form pupae and soon emerge as adult ants. Once worker ants have developed, the queen no longer needs to care for the brood.

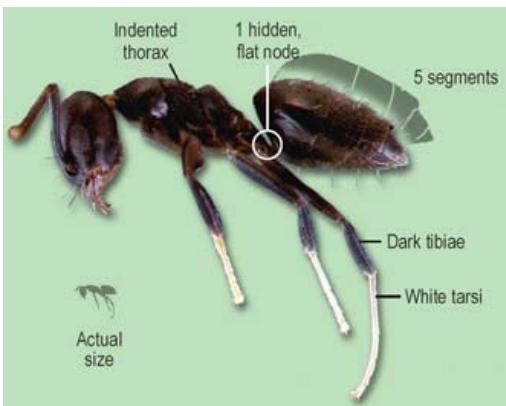
Some ant colonies have more than one queen, and mating may occur within the nest without swarming. These ants form new colonies when one or more queen ants, along with some workers and brood, leave the nest and move to a new location. Ant colonies do not nest in permanent locations; frequently entire colonies move from one nesting site to another almost overnight. Particularly during very wet or abnormally hot and dry weather, ant colonies whose nesting areas are flooded or lack food and water often migrate indoors.

Worker ants foraging for food and water become a concern when they infest food or other items in the home. Although most ants consume a wide variety of foods (they are omnivorous), certain species prefer some types of foods and some even change their preferences over time.

Foraging workers of some ants establish temporary chemical (pheromone) trails that help other ants find food and water. These species can "recruit" other ants to a resource quickly and in high numbers. Food is brought back to the colony and fed communally among the other members of the colony, including the queen(s) and brood, a process called trophallaxis.



**Figure 4**  
Bigheaded Ant Minor Worker *Pheidole* spp.



**Figure 5**  
Whitefooted Ant *Technomyrmex albipes*

Locations/ Situations	Suggested Thresholds	Nonchemica l Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Kitchen and other food preparation areas, classrooms, offices, other indoor locations.	First sign of ant trails consisting of 6 or more ants. When only winged (reproductive) ants are present in such sites, no treatment is probably necessary. However, the IPM technician should be	Remove exposed food. Seal remaining food in air-tight bags or containers. Disrupt ant trails by applying ammonia-based, vinegar-	Liquid or other baits. Liquid, sugar-based baits are best for sweet-loving ants like odorous house, Argentine, rover and white-footed ants. Protein or oil-based baits work best for pavement, fire and big-headed ants. Special protein-based baits designed specifically for	Locate and treat nests directly using pyrethrins or other low-toxicity sprays and drenches. Nest locations vary by species but may be in outdoor or potted plant soil. Look especially under mulch and sheltering debris outdoors. Nests of Pharaoh ants are often indoors and may be found in walls, storage boxes, drawers, etc. Non-repellent, residual insecticide sprays and dusts (consult with local pesticide distributors or Extension IPM experts) may be applied with care to plumbing and electrical lines, along wall edges and under equipment. For outdoor nesting species, a barrier treatment can be applied to the soil and building perimeters. This treatment is most effective when used in

	consulted to ensure that such insects are not confused with termites.	based, pine-oil-based or other general purpose cleaners. Washing trails with cleaner will remove scents that ant use to return to a site with food.	Pharaoh ants are best used for this species. Bait stations should be placed, according to label directions, along edges and utility lines where ants prefer to travel. Avoid using insecticides or cleaning agents in the vicinity of baits and bait stations, as such chemicals can repel ants from feeding on baits.	combination with baits.
Outdoor areas around buildings.	Usually unnecessary to treat outdoor nests of (non-stinging) ants, unless nest is adjacent to building and causing an indoor infestation.	Remove ant nest and soil to another location or to bucket of soapy water.	Liquid, gel or granular ant baits labeled for outdoor use should be applied in multiple locations around foraging ants. Numerous, very small bait placements are generally superior to fewer, larger placements. Bait stations that require less frequent servicing are available for some types of bait, including liquids.	Drench ant nests with short-residual, liquid insecticides.
Interior plantscapes .	First sign of ant trails consisting of 6 or more ants.	Remove infested pots. Disrupt ant trails by applying ammonia-based, vinegar-based, pine-oil-based or other general purpose cleaners. Washing trails with cleaner will remove scents that ants use to return to a site with food.	Liquid, gel or granular ant baits labeled for outdoor use should be applied in multiple locations around foraging ants. Numerous, very small bait placements are generally superior to fewer, larger placements. Bait stations should only be used in secure, out-of-sight locations.	Locate and treat nests directly using pyrethrins, or other low-toxicity sprays and drenches. In potted plants, take plants outdoors to secure area before drenching. Return plant when soil is dry.

Electrical equipment, wiring, switches, relays, air conditioning units, outdoor lighting, etc.	First sign of ant trails consisting of 6 or more ants; ant damage or debris in or around electrical switches, relays and wiring.	Vacuum debris and clean inside and around equipment carefully.	Liquid, gel or granular ant baits labeled for use in and around electrical equipment should be applied inside closed equipment housing. Insecticide-impregnated plastic barriers can also be used to protect inaccessible wiring and electrical boxes.	Look for indoor/outdoor source of ants and treat nests when located. Apply barrier of insecticide outside and inside equipment boxes to prevent ant entry into equipment. Extreme care should be used when using aerosol or liquid insecticides around electrical equipment. Where possible, electricity should be shut off during treatment. Only aerosols with low-conducting propellants, labeled for use around electrical equipment, should be used for this purpose.
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# Commensal Rats

- Norway rat (*Rattus norvegicus*)
- Roof rat (*Rattus rattus*)

## Identification:

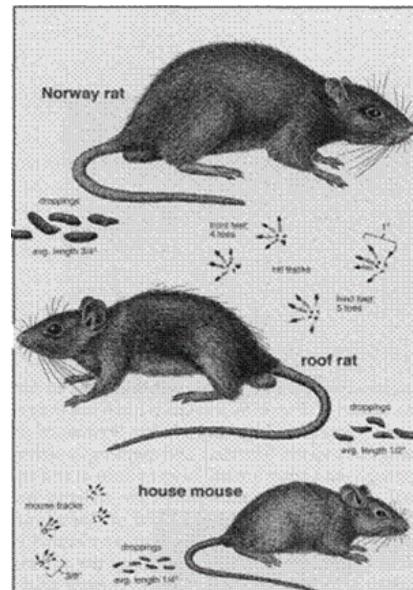
Roof rats range in color from black to gray or tan with a lighter belly. Norway rats are reddish-brown in color and are typically heavier than a roof rat. The length of the tail in a Norway rat is shorter than the length of the head and body together. The tail is also dark on top and light underneath. Roof rats have tails that are dark and are longer than the head and body of the rat. Roof rats prefer areas off the ground and are good climbers. They prosper in attics, roof spaces, and ornamental shrubbery.

Roof rats generally enter buildings from overhanging trees or power lines. Norway rats are burrowers and thrive in environments where there is clutter or garbage. They burrow along foundations and under debris. They are good swimmers and may enter buildings through plumbing access points. The home range of these rats may be as much as 50 yards.

## General Information:

The best method for managing rats is exclusion. Rodents only need a 1/2 inch opening to access an area. While inspecting, listen for scratching, look for droppings, damage, urine (with a black light), and rub marks. Rodents will forage on a variety of items, so sanitation in addition to exclusion is critical. Rodents can cause damage by chewing wood and other items. They have also been known to start fires by gnawing on electrical wires. They carry many different kinds of diseases and bacteria that can lead to food poisoning. Take precaution when removing nest material, droppings, or remains. Rats are active at night. If they are seen during the day there is likely a large population, scarcity of food, or illness within the population. They defecate wherever they go, so droppings will be spread across their foraging area. Note that Norway rats like to hoard food so they may relocate baits.

## Image(s)



**Figure 1**

Size comparison of commensal rats to house mouse.



**Figure 2 – Image of roof rat caught on snap trap**

Location/Situation	Suggested thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)
Cafeteria	One rat justifies setting traps, improving sanitation, and rodent proofing the building.	Sanitation and clutter control will do a great deal to manage rodents.	Rodenticides should not be used indoors as it can result in rodents dying inside walls and ceilings, where odors prevail.

			Outdoors—rodenticides can be used, but should be placed in a tamper-resistant bait station and secured to a concrete block. Boxes should be checked at least monthly and bait replaced to avoid staleness in the bait.
Food Storage Areas	See above.	Exclusion (rodent proofing) the building with hardware cloth, or concrete patches.	See above.
Gymnasiums	See above.	Identify runways by rub marks, urine trails, or by using a thin layer of talcum powder.	See above.
Concession Stands	See above.	Secured snap traps set at right angles to rodent runs. Traps should be checked often. Note: Traps should not be set where children may contact them.	See above.

### **Tips for Successful Trapping:**

Both the roof and Norway rat are leery of new things in their environment, so traps should be in place for several days before being set. After being set, they should remain in place for a week before being moved to a new location. Traps should be set along rodent runways to be most effective. The trigger side of the trap should be on the wall side. Because large rodents may move traps, all traps in a school should be secured, even if traps are set on weekends or during holidays.

### **Tips for Successfully Baiting for Rodent Control**

Rodent populations may have a food preference for a variety of items. They may be feeding on ketchup packages, or only on bread. If that is the case, you may use those items for bait. Generally, roof rats prefer fruit and nuts, and Norway rats prefer fish (sardines) or meat. Other baits include chocolate or dry oatmeal. Peanut butter works as a bait for both rats, but peanut allergies of the building inhabitants should be considered. You may want to use multiple baits to provide a variety of choices. For instance, you may set several traps with chocolate, several with peanut butter, and several with dry oatmeal. Another tip is to “bait” some traps with cotton balls or a ball of string. Pregnant females will scavenge for these items to make a nest. Remember rodents are neophobic (afraid of new objects) so be patient when setting traps and baits.

# Yellowjackets

- Yellowjacket Wasp

## Identification:

Yellowjacket wasps are about 1/2 inch long with distinct yellow and black markings. Compared to honey bees, yellowjackets are sparsely haired. Wings are folded lengthwise, similar to paper wasps and hornets. They make a paper nest, usually located underground.

Occasionally nests will be constructed in walls or other protected sites. Portions of the paper nest may be visible where it extends beyond its protective shelter. Unlike "aerial yellowjacket" or hornet nests, exposed yellowjacket nests are not usually symmetrical in shape.

## General Information:

Yellowjacket wasps are social insects, living in colonies of hundreds to thousands. Like other social wasps, yellowjackets vigorously defend their nest against threats, such as people who get too close to the nest entrance. Guard wasps stationed near nest entrances use chemical communication to warn the colony of intruders. Hundreds or thousands of wasps can quickly emerge from a nest and attack people or animals that venture too close.

Yellowjackets are either scavengers or predators on other insects. Some species commonly scavenge for sweets and protein foods in and around garbage cans and picnic areas. In most parts of the country yellowjacket colonies die out each winter shortly after the first frost. Queen yellowjackets survive the winter in sheltered locations like buildings or outdoors under bark, stones, loose leaves or other shelter.

## Image(s)

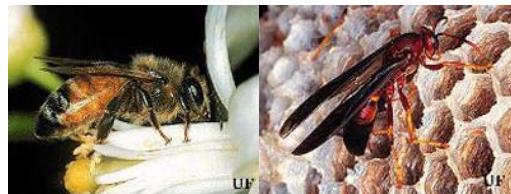


Figure 1

Honey Bee (left) Paper Wasp (right)



Figure 2

Yellowjacket Wasp



Figure 3

Yellowjacket Wasp trap

Locations/ Situations	Suggested Thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Foraging wasps around outdoor eating areas.	One teacher/staff complaint(s) received, or 5 or more wasps observed near food or	Use yellowjacket traps placed at least 20 feet from areas of high human activity to reduce the	Not practical.	Not practical.

	picnic tables.	chance of human/wasp contact.		
Foraging wasps near dumpsters and garbage receptacles.	One teacher/staff complaint(s) received, or 5 or more wasps observed near garbage receptacles.	Ensure lids and doors of receptacles are present and well sealed.	None.	In heavy infestations, insides of dumpsters may be sprayed with residual insecticide.
Foraging wasps near dumpsters and garbage receptacles	First sign of ant trails consisting of 6 or more ants.	None.	None.	Have qualified individual treat nest directly with an appropriate residual insecticide and remove nest afterwards.

**Trapping** works by killing foraging wasps and drawing foragers away from areas of high human activity.

**Traps** designed especially for yellowjacket wasps are available from a variety of sources.

- Note that some species, such as the southern yellowjacket, are primarily predators and may be less attracted to traps than other scavenger species.
- While traps may have some benefit in reducing numbers of foraging wasps, they are not generally effective in eliminating entire yellowjacket wasp colonies.

There are currently no effective, low-impact insecticides for quickly eliminating underground yellowjacket colonies. Pyrethroid insecticides work well and should pose no significant environmental or health risks when applied directly to yellowjacket nests. Nest elimination should be done during the evening hours to prevent risks to the applicator.

### What About Stings

Wasps, including yellowjackets, paper wasps and hornets can sting multiple times while honey bees can only sting once. (Other types of bees usually don't sting, but when they do, should be treated like wasp stings.) Honey bees leave the stinger in the skin via a handy barb. Here is where the treatment difference comes in. Immediately after the sting, the stinger needs to be removed. Attached to the stinger is a poison sac that continues to pump venom into the sting site for several minutes. This stinger should not be pulled out; rather, it should be scraped off. A stiff sheet of paper or a credit card works well for this. **A wasp sting does not require scraping.** After you have identified the offending organism and removed the stinger, be sure to observe the patient for any signs of allergic reaction. If the patient has a history of allergic reactions, shows signs of severe swelling or has trouble breathing, a physician should be contacted immediately. If the patient shows no signs of distress, the sting area can be soothed

by applying an over-the-counter insect bite and sting product. Home remedies include applying a paste of baking soda or meat tenderizer and water. An antihistamine may also be given to relieve the itching caused by the sting.

### **Sting Prevention**

A few tips on how to prevent or at least minimize being stung.

- Keep sweet items covered.
- Bees and wasps, like children, are attracted to sweets.

This includes recycle bins and garbage cans that contain soda cans or fruit scraps.

- It is recommended that all outside garbage cans be covered with a self-closing lid.
- Don't walk barefooted on the playground or in the yard.

Bees and wasps are nectar collectors, so they are often close to the ground.

- Don't harass the wasps.

When a paper wasp nest is spotted, it is best to leave it at a distance and have a professional come in and remove it at night.

**Publication Authors: Mike Merchant and Dale Pollet**

# Ticks

- Lone star tick *Amblyomma americanum*
- Blacklegged Tick *Ixodes scapularis*
- American Dog Tick *Dermacentor variabilis*

## Identification:

The deer tick (*Ixodes scapularis*), also known as the black-legged tick, is a small tick found almost statewide, especially central and southern Maine. It is the principal vector of *Borrelia burgdorferi*, the Lyme disease spirochete (bacterium) in the northeastern United States. Ticks must remain attached to the host for at least 24 hours in order to infect the host. The early signs of the disease usually show up as a rash at the bite site followed by flu-like symptoms. Untreated cases may lead to arthritic conditions and possible neurological problems. Medical care should be sought when a person is bitten by a deer tick or exhibits Lyme disease symptoms. For more information on deer ticks and Lyme disease, contact the Maine Center for Disease Control and Prevention (207 287-7267) or click here for more information.

The American dog tick (*Dermacentor variabilis*), also called the wood tick, is larger than a deer tick and the unengorged female has a whitish shield on its back. This tick readily attaches itself to humans and is one of the most commonly encountered ticks in Maine. Some dog ticks outside of Maine may carry the organism that causes Rocky Mountain spotted fever, a serious disease that can be transmitted to humans. Symptoms of this disease are headache, fever, and aching muscles 2 to 14 days after an encounter with a tick. Two to three days after the fever starts, a rash develops on the wrists and ankles, spreading to the palms, soles, and trunk of the body. There have been no known diseases transmitted by dog ticks in Maine. Dog ticks are most likely to be found in open areas with tall grass or brush. Adults are first noticed in late April and remain abundant through June. Although numbers seem to decline sharply after that, ticks are present all summer.

## Image(s)



**Figure 1**  
Lone star tick  
*Amblyomma americanum*



**Figure 2**  
Blacklegged Tick *Ixodes scapularis*



**Figure 3**  
Immature drywood termites

## General Information:

Ticks are sometimes of concern on school properties, especially those species that can transmit serious diseases to humans such as Rocky Mountain spotted fever, Lyme disease, babesiosis, ehrlichiosis, and Powassan encephalitis. Approximately 12 species are considered to be of major public health or veterinary concern.

Management practices include:

- a) personal protective measures (such as wearing appropriate clothing, avoiding habitats associated with ticks, and judicious use of insect repellents),
- b) landscape modifications, and
- c) if necessary, limited use of pesticides as a targeted barrier treatment.

Ticks are blood-feeding arthropods related to spiders and mites. The adult tick has eight legs compared to insects which have six legs. Ticks can feed on a variety of animals including birds, amphibians, reptiles, and mammals (including people). The primary habitats for ticks are wooded areas and the open or grassy areas at the edges of wooded areas. On school properties, ticks are most often found on playgrounds, athletic fields, cross-country trails, paths, and school yards located in and adjacent to wooded areas, especially where deer and other wildlife hosts are abundant.

As ticks go through their life stages (egg, larva, nymph, and adult), they usually change hosts. Young ticks will attach to small animals and be dispersed by them. Nymphs and adults will climb onto grasses, herbaceous plants, and shrubs which enables them to latch onto larger hosts. Adult ticks can perch on plants for months waiting for a host to come by.

On humans, ticks migrate around the hairline, the area behind the ears, or in the armpits. It takes five to six hours for a tick to become firmly attached and up to ten days for it to become fully engorged with blood. The female needs a blood meal in order to lay her eggs. Ticks have been known to survive for one year without a blood meal.

### **Managing School Properties to Reduce Tick Problems**

Landscape management practices designed to make the landscape more inhospitable to primary tick hosts may reduce a tick population. However, these practices alone will not eliminate all ticks and the risk of associated diseases. Therefore, other tick control practices must be integrated with the overall program to reduce the risk of disease. It is impractical and expensive to institute tick control measures and landscape management practices in all areas of the school grounds. Efforts should be focused on frequently used areas (playground, ball fields, area immediately surrounding the school building, etc.).

- Cut back vegetation and remove vegetative debris to reduce shade and moisture. Keep grass, weeds, and brush mowed short. Remove leaf litter and plant debris around buildings, edges of lawns, playgrounds, and ball fields. Compost or bag and remove leaf litter. Avoid use of ground cover vegetation in frequently used areas.
- Reduce cover for mice. Prune trees and shrubs. Clean up storage areas.
- Use hardscapes (pavement, stones, etc), mulches, and water-conserving landscape techniques.
- Maintain a three-foot wide or broader walkway of wood mulch or crushed stone to serve as a barrier between woods and lawns.
- Keep out stray dogs.
- Reduce deer habitat and install fencing as necessary.
- Move swing sets and playground area out and away from the woodland edge.

## **Removing Ticks**

- Use fine-tipped tweezers to remove attached ticks. Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. If this happens, remove mouthparts with tweezers or consult the school nurse.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- Apply rubbing alcohol to the bite and wash hands with soap and water

The tick may be saved for future identification should disease symptoms develop within 2-3 weeks. Place the tick in a small vial containing rubbing alcohol. Write the date of the bite on a piece of paper with a pencil and place it in the vial.

Note: Folklore remedies such as petroleum jelly or hot matches do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva, increasing the chances of transmitting a tick-borne disease. These methods of tick removal should be avoided. Also, a number of tick removal devices have been marketed, but none are better than a plain set of fine tipped tweezers.

## **Chemical Control**

Restrict application of pesticides to high-risk tick habitat such as edges of lawn and woodlands. Spraying open fields and lawns is not necessary. The product must be labeled for area-wide tick control. Pesticides may only be applied on school grounds by a licensed commercial applicator.

# Nuisance Birds

- Pigeon (*Columba livia*)
- House sparrow (*Passer domesticus*)
- Starlings (*Sturnus vulgaris*)

## Introduction:

Birds generally considered “nuisance birds” include pigeons (*Columba livia*), house sparrows (*Passer domesticus*), and starlings (*Sturnus vulgaris*). These species are not native to this country, and have caused many conflicts between them and man. Pigeons are represented in nearly all urban and suburban locations and are considered a nuisance.

## General Information:

The presence of these birds in unwanted areas can cause damage to property, and their droppings may create unpleasant odors. Bird droppings can also ruin vegetation, painted surfaces, gutters and awnings, and cause electrical equipment to malfunction. Birds may carry diseases which are capable of infecting humans, and bird droppings can promote soil conditions favoring development of such fungal diseases as histoplasmosis. House sparrows can damage rigid foam insulation, and their nests can become fire hazards.

The first step in your bird control program should be identification of the pest bird; if you cannot positively identify the bird, consult an expert before taking action. The Migratory Bird Treaty and Endangered Species Acts prohibit the trapping or killing of most birds, eggs or nests without a permit. House sparrows, starlings, and pigeons are not protected under these Acts, but may be covered under local ordinances, so be sure to consult with local wildlife authorities.

## Image (s)



**Figure 1**  
Pigeon (*Columba livia*)



**Figure 2**  
House sparrow (*Passer domesticus*)



**Figure 3**  
Birds sitting on a ledge.

Locations/Situations	Suggested Thresholds	Nonchemical Control Options	Other Chemical Treatment Options
Inside a bus barn or other area occupied by people	Droppings one inch deep or more	Habitat modification and exclusion from structures are generally the most effective ways of controlling nuisance bird populations. Note where birds are roosting, nesting, and landing; look for nests and droppings. Eliminate potential food and water sources if possible.	Polybutylene repellents can be applied to ledges or beams to prevent roosting. These repellents are non-toxic, but feel sticky and unpleasant to birds attempting to land. Apply repellent in tight wavy closely-spaced rows. Repellents must be reapplied with some frequency as they can become coated with dust or leaves and lose their sticky feel. Apply masking tape to the surface prior to using the repellent so that it may be more easily cleaned up and reapplied. Repellents are best suited for small- or medium- sized infestations.
Exterior perimeter of building	Nests found obstructing equipment, gutters or found on ledges.	For window ledges, a ledge made of wood, plexiglass, or stone install a plastic or other hard material device at 45-degree angle to prevent perching, and be sure ends are closed as well.	PiGNX® is used to prevent the roosting & congregation of pigeons in unwanted areas and has been known to work on all types of birds. PiGNX® Caulking Gel is bio-pesticide for pigeons.
Exterior perimeter of building – especially walkway awnings or overhangs	10 or more birds found per building on three successive inspections.	1/4 inch screen or net mesh is recommended to keep all bird species out of these areas.	See above.
Interiors or enclosed areas (courtyards).	Complaints from staff, 5 or more birds seen congregating.	Screen undersides of rafters with nylon netting, (cut velcro-attached panels into the netting to allow access to service equipment in the rafters).	None recommended.

#### References used in Original Document

Managing Urban Pest Bird Problems in Kentucky by Thomas G Barnes, Extension Wildlife Specialist, and Bernice U Constantin, USDA-APHIS-ADC

Illinois Department of Public Health Prevention and Control: Bird Exclusion and Dispersal

Rottler Pest Solutions [www.rottler.com/pest-library](http://www.rottler.com/pest-library) Unprotected Nuisance Birds Action Thresholds in School IPM Programs Supplemental Materials for Integrated Pest Management

IPM Training Manual, Maryland Dept of Ag, Pesticide Regulation Section

Sample Action Thresholds for Maryland Schools: Table 2

From Birds to People: the Facility Manager's Guide to Prevention of Avian Flu and Other Bird-Borne Diseases. [Www.ifma.org](http://www.ifma.org) "How to Get Rid of Roosting Birds"

"European Starlings", Ron J Johnson, Extension Wildlife Specialist, Department of Forestry, Fisheries, and Wildlife, University of Nebraska, from Prevention and Control of Wildlife Damage

"House Sparrows", William D Fitzwater, Director, New Mexico Outdoor Communicators, from Prevention and Control of Wildlife Damage

"Pigeons (Rock Doves)", David E Williams, State Director, USDA-APHIS-Animal Damage Control from Prevention and Control of Wildlife Damage

# Stinging Caterpillars

## Identification:

Caterpillars are the immature form of butterflies and moths. They are variable in form and coloration and several of them have various defense mechanisms such as, horns, spines, venomous spines, eversible glands, secretions, and body hairs. In addition their body color may help them blend into the environment (camouflage) or their ability to remain motionless and resemble small twigs all help them to protect themselves from predators, parasites and man. They can be foliage feeders on shrubs, trees, grass, ornamentals, vegetable plants or weeds or they can be borers into plants or trees. Each caterpillar goes through four or six growth stages or molts where they shed their skin to grow and complete development. This larval form is the second stage in the development of the butterfly or moth. The total process is called metamorphosis and consists of the egg, larva, pupa and adult. We will concern ourselves with those which have venomous hairs or spines that can cause a burning sensation when touched, producing a red swollen area and for people allergic to insect stings the possibility of anaphylactic shock and death.

## General Information:

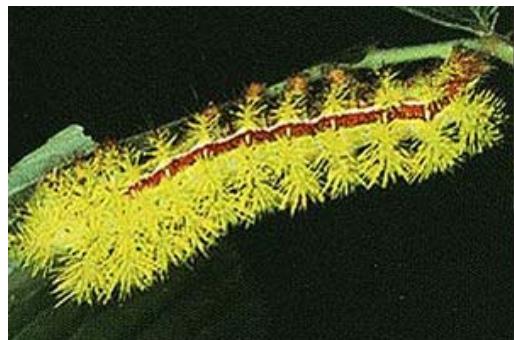
These caterpillars may live in clusters and disperse prior to pupating or they can be solitary. Host plants are sometimes specific like the buck moth caterpillar to oaks, but other caterpillar species can develop on a wide range of hosts. Some species have a single generation each year while others have multiple generations. Thus, species identification is important for making the best management decisions. One of these species, the puss caterpillar is sometimes called an "asp".

"Stinging" caterpillars have a series of hollow glass like hairs or spines on the body that contain amino acid venom. When touched the spines break off in the skin and the venom inside runs down the spine into the open wound created by the spine. This is what produces the burning stinging sensation, the reddening and swelling. Some people are very sensitive to the venom and may require medical attention.

## Image (s)



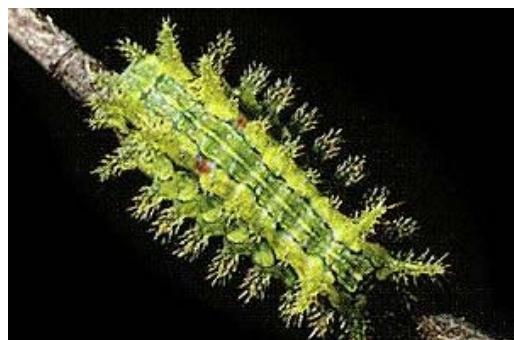
**Figure 1**  
Buck moth caterpillar



**Figure 2**  
IO moth caterpillar



**Figure 3**  
Saddle back caterpillar



**Figure 4**  
Slug caterpillar

Effects of the rash produced by these caterpillars can be reduced through the application of over-the-counter insect bite and sting products. Home remedies reportedly include several household materials such as, ammonia, Clorox, tobacco juice, toothpaste, meat tenderizer in a paste, or baking soda in a paste which are thought to neutralize the acid venom reducing its affects. If these are not available, one could attempt to remove urticating hairs by pressing a piece of tape down hard on the affected area and then rip it off. This will catch some or all of the spines and pull them out, perhaps closing the wound and preventing the venom from entering.

There are many caterpillars with hairs or spines on their bodies but not all of them contain venom. Some species mimic the stinging caterpillars in appearance so they will be left alone. Identification is important as touching the wrong caterpillar can be painful.



**Figure 4**  
Puss or flannel moth



**Figure 5**  
Puss or flannel moth spines

Locations/ Situations	Suggested Thresholds	Nonchemical Control Options	Preferred Chemical Treatment(s)	Other Chemical Treatment Options
Infested trees, shrubs or plant beds	One stinging caterpillar	Knock off and mash where possible	Spinosad, <i>Bacillus</i> <i>thuringiensis</i> var. <i>kurstaki</i> , (moderate to slow acting)	Other contact insecticides containing acephate, carbaryl, pyrethroids (permethrin, bifenthrin, cypermethrin, lambda-cyhalothrin) or others possibly mixed with an adjuvant or liquid soap can be used populations that need quick knockdown

# Mosquitoes

- Mosquito (Family Culicidae)

## Identification:

Adult mosquitoes are small and fragile, ranging in body length from 3 to 6 mm. The head is small and globular with a large pair of compound eyes. Protruding from the head are long thin piercing-sucking mouthparts and a pair of antennae which are hairy in the female and feathery or bushy in the male. The thorax is deep but thin and the wings are long and narrow and held along the body when the insect is at rest. Mosquito wings characteristically have small scales along the veins and along the hind margin. The legs are long and thin and the body is held in a perched position when at rest. The abdomen is also long and thin.

Many species are not strong fliers and avoid strong wind while other species are capable of dispersing over a great distances. Many adult mosquitoes are active at dawn, dusk, or into the evening, but, some important urban pest species fly and feed during the day. The female mosquito usually requires a meal of vertebrate blood or plant juices for egg development. Male mosquitoes do not bite and normally feed on plant juices.

## General Information:

Mosquitoes are of concern in the school environment because many species are painful biters and/or are capable of transmitting certain diseases such as malaria, filariasis, yellow fever, dengue haemorrhagic fever and encephalitis. In the United States, the threat of developing encephalitis from mosquitoes is far greater than the threat from other mosquito vectored diseases.

Encephalitis, meningitis and other diseases can develop from the bites of mosquitoes infected with certain viruses such as West Nile, St. Louis encephalitis, LaCrosse (California) encephalitis, and Eastern equine and Western equine encephalitis.

All mosquitoes undergo complete metamorphosis-egg, larva, pupa, and adult. The larvae are commonly known as wigglers, and the pupae as tumblers. Mosquitoes require water for larvae and pupae to develop, although a moist substrate may permit development of the pupa of some species. Eggs of some species may survive long periods out of water, under conditions varying from humid to dry but require water to hatch.

## Image(s)



**Figure 1**  
Mosquito adult.



**Figure 2**  
Avoid prolonged flooding of playing fields.



**Figure 3**  
Keep roadside ditches and draining areas clear of debris so that storm water drains off easily.

<b>Outdoors</b>			
<b>Suggested Thresholds</b>	<b>Nonchemical Control Options</b>	<b>Preferred Chemical Treatment(s)</b>	<b>Other Chemical Treatment Options</b>
As determined by public health authorities or one teacher, staff or student complaint.	Avoidance - Do not go outside when mosquitoes are active. Wear long pants and long sleeved shirts to avoid bites. Source Reduction - Eliminate any standing water where mosquito larvae and pupae can develop.	Repellents - Applied under parental supervision to individual before entering school property. Larvacides - If a water source cannot be eliminated, treat water with a larvicide containing methoprene, Bacillus thuringiensis israelensis or B. sphaericus bacteria. Treat only if mosquito larvae are present. Application by trained personnel ONLY.	Adulticides - Treat surfaces where mosquitoes rest, such as vegetation and the exterior walls of structures with a liquid residual adulticide. Practice area wide mosquito adult suppression through ultra low volume/fogging application of adulticides with specialized ground or aerial equipment. Adulticide application by properly trained and certified/licensed pest management professionals, public health personnel, or municipal public works personnel ONLY.
<b>Indoors</b>			
<b>Suggested Thresholds</b>	<b>Nonchemical Control Options</b>	<b>Preferred Chemical Treatment(s)</b>	<b>Other Chemical Treatment Options</b>
One teacher/staff/student complaint.	Exclusion - Maintain tight-fitting screens for doors and windows to prevent mosquito entry or keep windows and doors closed. Mechanical Control - Use flyswatter or hand to kill individual mosquitoes. Source Reduction - Eliminate any standing water where mosquito larvae and pupae can develop.	Repellents - Applied under parental supervision to individual before entering school property.	Adulticides - Use space or aerosol sprays to kill flying/resting adult mosquitoes indoors. Adulticide application by properly trained and certified/licensed pest management professionals, public health personnel, or municipal public works personnel ONLY.

Authors of original article: John Hopkins, Mike Merchant, Dawn Gouge, Kirk Smith, Carl Olson and Paul Baker



# IPM Management Plan

## Authors:

### Faith Oi

University of Florida IFAS  
Department of Entomology  
and Nematology

### Rebecca Baldwin

University of Florida IFAS  
Department of Entomology  
and Nematology

### Clay Scherer

Graduate Student  
University of Florida IFAS  
Department of Entomology  
and Nematology



Figure 1. Head louse, *Pediculus capitis* DeGeer

CREDITS: James Castner, University of Florida

## For more information:

National School IPM Information Source  
<http://schoolipm.ifas.ufl.edu/>

Southwest Technical Resource Center  
<http://schoolipm.tamu.edu>

Southern IPM Center – Schools  
<http://www.sripmc.org/schoolIPM/>

## Head Lice

### General Information

The head louse, *Pediculus capitis* DeGeer ([Figure 1](#)), infests 10-12 million people each year in the United States. Pediculosis or "lousiness" is one of the most prevalent communicable conditions in this country. Lice are primarily transferred from person to person by direct head to head contact or by several people using the same combs, brushes, hats, costumes, athletic equipment, towels, or bedding. Head lice are not found on animals or household pets and are not transmitted from pets to humans. Because of children's play activity and close contact, head louse infestations are usually found on children, but can also be spread to adults. The head louse is not considered to be a serious vector of disease in the United States although severe infestations may cause irritation, scratching, and subsequent invasion of secondary infection from germs and lice feces. Itching from large numbers of bites may make the infested individual feel tired, irritable and feverish, thus the term "feeling lousy."

### Louse Identification

Lice have three pairs of legs which makes them true insects. Lice do not have wings or powerful jumping legs so they move about by clinging to hairs with claw-like legs. Head lice prefer to live on the hair of the head although they have been known to wander to other parts of the body. Head lice feed every 4 to 6 hours so must remain in close contact with the host. While a louse may fall onto other surfaces, they cannot live there for more than 24 hours. Therefore, they do not normally live within rugs, carpet, furniture or school buses.

The eggs of lice are called nits. They are oval white cylinders (1/16 inch long). The eggs of head lice are glued to hairs of the head near the scalp. To protect the eggs from extremes in light and temperature, the female will commonly glue the eggs behind the ears and along the nape of the neck. Under normal conditions, the eggs will hatch in 7-10 days. The young lice which escape from the egg must feed within a few hours or they will die. Newly hatched lice will periodically take blood meals and molt three times before be-

coming sexually mature adults. A young louse will mature in 10-12 days to an adult (1/8 inch in length). Depending on climate and color of the host's hair, adults lice range in color from white to brown to dark gray.

Female lice lay 6-7 eggs (nits) per day. She may lay up to 140 eggs during her 30 day lifetime. Adults cannot survive more than about 24 hours without a blood meal. The nymphs and adults all have piercing-sucking mouthparts which pierce the skin for a blood meal.

The reaction of individuals to louse bites can vary considerably. Persons previously unexposed to lice experience little irritation from their first bite. After a short time, up to a few weeks, individuals may become sensitized to the bites and react with a general allergic reaction including reddening of the skin, itching, and overall inflammation. Subsequent infestations usually cause itching and redness within 24-48 hours. Some individuals never exhibit symptoms.

### Prevention of Head Lice

Children should be encouraged not to share combs, hats, and other personal belongings. Daily washing and changing of clothes and keeping hair as short as possible will also help discourage lice; however, head lice should not be solely associated with uncleanliness since they may be easily transferred from person to person. It is sometimes found that a head lice infestation can be traced back to children sharing equipment such as a batting helmet or headphones. Periodic inspections will aid in early detection of any individual lice which are more easily controlled than advanced infestations where dozens of mature lice and possibly hundreds of nits are present. During the early fall months (August - November) children should be inspected weekly because "back-to-school" seems to be when lice are most commonly transmitted. This results in widespread infestations by December and January. September is National Head Lice Prevention Month.

# Suggested Treatment Protocol

## Best Inspection Practices

- Use good lighting during your inspection. A lamp or good natural light from a window will work well.
- Use a hand lens or magnifying glass (10x). Magnification may help detect nits and lice.
- Shampoo hair. Do not use a product with conditioners in it, if you are going to use a lice treatment product following your inspection and nit removal. See product label for more specific details.
- Remove tangles with a comb or hairbrush.
- Divide the hair in sections and fasten the hair that is not being worked on.
- If lice or nits are discovered, all family members and other contacts (babysitters, cousins, playmates, Sunday school teachers, etc.) should be inspected.
- Proceed to Best Nit Removal Practices.
- Ideally, inspections and nit removal should be done daily for at least two weeks.

*If you are a health care professional, screening many children for head lice, a magnifier lamp may be helpful. The magnifier and lamp are integrated into one unit and are usually circular or rectangular. They can be purchased from suppliers of scientific equipment, office furniture, art and quilting supply stores. You will also want to use disposable gloves and wooden screening sticks to maintain proper hygiene from head to head.*

## Best Nit Removal Practices

- After removing tangles and dividing hair into manageable portions use a lice comb to remove nits and lice. Using a regular comb will not remove nits. Removing nits is a careful process where the hair is combed from root to tip with a special fine-toothed louse comb. Plastic combs are not as good as metal louse combs.
- Comb from scalp to the end of the hair.
- Dip comb in a container of hot soapy water to drown lice and remove nits.
- Look through that same section of hair for remaining nits and lice and repeat combing section, if necessary.
- Repeat all steps until all hair is systematically combed through.
- Clean nit removal comb, clips, brushes and other tools used with hot soapy water or if using a metal comb, rubbing alcohol. An old tooth brush may help dislodge hair, nits and lice that may be caught in the teeth of the comb. Plastic combs and toothbrush should be sealed in a plastic bag and discarded after use.
- Areas around the nit combing area should be vacuumed and the vacuum bag immediately discarded.
- Nit removal is key to controlling head lice because 20 to 80% of nits can still be alive after shampooing with pyrethrin or permethrin based products.

Nits are difficult to remove because they are cemented onto the hair. There are several products available that claim to loosen nits. Many products are included in lice treatment kits. Again, we do not have data to substantiate claims of effectiveness, but thought it was important to address them.

- ◆ RID products include an "egg and nit comb-out gel."
- ◆ Clear Lice Elimination System also sells a "natural lice egg remover" in the form of a "vegetable-derived enzyme mousse."
- ◆ Vinegar and water mixed in a 1 to 1 ratio is commonly applied to the head and allowed to soak for 30 to 60 minutes.
- ◆ Although difficult to wash out, alternative treatments using vegetable oil, mayonnaise or petroleum jelly is also reported to make combing nits out easier

## Cleaning the Environment

Once an infestation is detected thorough inspection, all clothes should be washed in hot soapy water (150°F). Pillow cases, sheets, blankets and other bedding material should also be washed and placed in the clothes dryer on the "high heat" cycle for at least 20 minutes to kill the lice and their eggs. Carpets, furniture, car seats, and any non-washable items such as children's toys should thoroughly vacuum and the vacuum bag immediately discarded outside of the home. Anything that cannot be vacuumed may be tightly sealed in plastic bags for at least 7-10 days to kill all stages of lice.

## Chemical Control

Pediculicides available in the United States include prescription lindane and malathion and over the counter (OTC) pyrethrins and permethrin. Note that lindane is an organochlorine that will accumulate in human tissue and if misused, may be toxic to the nervous system. Even if lice are not managed after the prescribed application of lindane, prescriptions should not be refilled. Malathion is an organophosphate which has an 8-12 hour application time. The carrier is highly flammable, so care must be taken during application. Caution must be exercised when using these prescription products and the label should be followed exactly. The OTC pyrethrins include generic products as well as those listed in **Table 1**. Many insecticides, including some pediculicides will degrade over time and excess material should not be stored, but discarded after application.

Because of the biology of the head louse and its increasing resistance to available pediculicides, no single treatment is likely to be effective in the eradication of the lice. An integrated approach including preventative measures, inspection, manual louse, and nit removal, cleaning the environment, and the judicious use of pediculicides is the best approach to managing the infestation. Note that there is no pediculicide product available that kills 100% of the louse eggs.

## Best Head Lice Treatment Practices

**Table 1** lists over-the-counter products available for head louse control. Please read the product labels carefully. Pay careful attention to warnings and disclaimers. **Table 2** lists some prescription products available for head louse control.

Prescription only products containing 1% Lindane come in topical shampoos, creams, and lotions under the names of Kwell, Kil-

(Continued on page 3)

(Continued from page 2)

dane, and Scabene to name a few. These products have the potential to adversely affect the human central nervous system if used incorrectly. These products do not kill nits effectively and there have been worldwide reports of resistance.

Several other products such as Elimite (5% permethrin; Allergan, Irvine, CA) and Eurax (10% crotamiton; Westwood-Squibb Pharmaceuticals, Buffalo, NY) have been listed on some websites as possible treatments for head lice. However, these products are not approved by the FDA at this time for lice control.

**Table 1. Over-the-counter products available for managing head lice.**

Product Name	Manufacturer	Website
A-200 <sup>1,2</sup> (33% pyrethrins and 4% piperonyl butoxide (PBO))	Hogil Pharmaceutical Corp., Purchase, NY	<a href="http://www.hogil.com/a200.htm">http://www.hogil.com/a200.htm</a>
HairClean 1-2-3 <sup>3</sup> (plant oil)	Quantum Health, Eugene, OR	<a href="http://www.quantumhealth.com/hc_content.asp">http://www.quantumhealth.com/hc_content.asp</a>
Nix <sup>4</sup> (1% permethrin)	Pfizer Consumer Health Care Group, New York, NY	<a href="http://www.nixlice.com/lice-treatment-products.cfm">http://www.nixlice.com/lice-treatment-products.cfm</a>
Pronto <sup>1,2</sup> (33% pyrethrins and 4% piperonyl butoxide (PBO))	Del Laboratories, Uniondale, NY	<a href="http://www.prontokillslice.com/">http://www.prontokillslice.com/</a>
RID <sup>1,2</sup> (33% pyrethrins and 4% piperonyl butoxide (PBO))	Bayer, Morristown, NJ	<a href="http://www.ridlice.com/products.shtml">http://www.ridlice.com/products.shtml</a>

<sup>1</sup>Kit can include comb for nit removal, gloves for washing hair, etc.

<sup>2</sup>Most are shampoos that should be left in the hair for 10 minutes before rinsing. Rinse head over a sink with cool water to minimize product exposure. Rinsing in the shower increases exposure because shampoo is distributed as water runs down body. Hot water increases exposure because it may increase penetration through skin.

May require a second treatment 7 to 10 days later because 20 to 30% of nits can survive the initial treatment.

Use gloves while washing hair with these products. Proceed to nit removal.

<sup>3</sup>Contains Coconut Oil, Anise Oil and Ylang Ylang Oil, Isopropyl Alcohol. Data cited in Meinking, T. A. 1999. Infestations. Curr. Probl. Dermatol. 11:73-120. These data indicate that HairClean 1-2-3 is as effective as Nix.

<sup>4</sup>Wash hair with non-conditioning shampoo. Work creme rinse into hair and leave on for 10 minutes. Creme rinse residue is supposed to last in hair up to 10 days, thus killing emerging nymphs. Proceed to nit removal.

**Table 2. Prescription only products for management of head lice.**

Product Name	Manufacturer	Website
Ovide (0.5% Malathion)	Medicis Pharmaceutical, Phoenix, AZ	<a href="http://www.ovide4headlice.com/">http://www.ovide4headlice.com/</a>
<ul style="list-style-type: none"><li>• Apply Ovide lotion to dry hair.</li><li>• Allow hair to dry naturally. This product contains alcohol and it is flammable.</li><li>• Shampoo hair after 8 to 12 hours or as directed by physician. Proceed to nit removal.</li></ul>		

## Suffocant Treatment as an Alternative

Suffocants such as oil, mayonnaise or petroleum jelly have been applied to the hair in an effort to suffocate head lice. There is little scientific evidence to support the effectiveness of suffocant treatments. However, people turn to alternative treatments when they feel conventional treatments do not work, when they have toxicity concerns with conventional treatments or they cannot afford conventional treatments. While we do not have data to substantiate claims of effectiveness for suffocants, we feel it is important to address them. In general, suffocants are used by:

- Applying generously to the hair.
- Covering the hair with a shower cap for several hours. Do not use this method of covering the hair overnight, as it is a suffocation hazard to the person being treated.
- Shampooing hair to remove most of the suffocant.
- Removing nits and lice as discussed in Best Inspection Practices and Best Nit Removal Practices.

Washing hair thoroughly with shampoo to remove remaining suffocant.

**Caution:** If you are planning to use a treatment containing a pesticide, it is NOT recommended that you use the suffocant method concurrently. Oils can increase the penetration of pesticide product through the skin over prolonged periods of time.

One small study that we were able to find submerged lice in olive oil for one hour (6 lice) and two hours (6 lice). Survival was compared to lice that were not submerged (6 lice). All lice that were not submerged or were submerged for 1 hour survived. Two of the 6 lice submerged for 2 hours died. This is a very small test and the researchers cautioned against extrapolating the data to infestations on humans (Spielman 2000).

### Selected References

- Frankowski, B. L., L. B. Weiner. 2002. Head Lice. Pediatrics 110: 638-643. (A clinical report by the American Academy of Pediatrics, Committee on School Health and the Committee on Infectious Diseases, issued September 2002.)
- Spielman, A. 2000. Head Lice Information. Harvard School of Public Health. <http://www.hsph.harvard.edu/headlice.html>



## Frequently Asked Questions

### 1) What's the difference between pyrethrins and permethrin?

Pyrethrins are naturally occurring compounds extracted from chrysanthemum plants. Insects possess mechanisms to break down pyrethrins so a synergist, piperonyl butoxide, is usually added to the formula which inhibits the insect's ability to break down the pyrethrins. Permethrin has the same basic chemical make-up but is synthetically enhanced to be more effective. Permethrin has much longer residual activity and does not require the use of a synergist.

### 2) Can lice be transmitted from my dog or cat to my children?

No. Head lice are specific to humans. They can only survive on a human host. If a head louse is removed from its host, it will die within a day or two.

### 3) How big are lice?

An adult head louse is approximately 2.5-3.5 mm long. A louse egg, or "nit" is roughly 0.5-1.0 mm long.

### 4) I've heard that head lice are resistant to some of the lice treatments; is this true?

In some locations there have been reports of potential resistance to several different pediculicides (lice killing agents). Experts are currently researching this issue and are trying to determine to what extent resistance exists. The best way to avoid this situation is to follow the directions on the product label closely. Improper application of pediculicides has significantly contributed to the presence of resistance in lice.

### 5) How long do lice live?

A louse egg hatches about 10 days after being glued to a hair shaft. Upon hatching, a louse will molt three times over a 10-12 day period before molting into a mature adult. An adult louse can live up to 40 days.

### 6) How long after my child contracts lice will I be able to detect them?

It only takes one adult female louse to begin an infestation. A female louse can lay several eggs each day. Within a couple of weeks a child may have dozens of immature lice living on his/her head. The more lice present, the more quickly the child will begin feeling an "itchy" scalp which would usually lead to an inspection by a parent or school official. Looking for one louse or one nit might be difficult but dozens should be readily apparent through close inspection.