

CHAPTER 19

IPM FOR YELLOWJACKETS AND HORNETS IN SCHOOLS

INTRODUCTION

Yellowjackets and hornets are both beneficial and problematic. They are predators and scavengers, helping to control pests and recycle organic materials, but they can also sting humans and their pets. Yellowjackets persistently search out protein-rich and sugary foods and drinks, so care must be taken whenever food is served outside. Although often grouped together with bees, yellowjackets pose a more serious threat to people. Because they have only tiny barbs on their stingers, yellowjackets can insert them repeatedly into a victim whereas a bee can sting only once. Multiple stings from yellowjackets are common because they vigorously defend their nest when it is disturbed.

IDENTIFICATION AND BIOLOGY

“Yellowjacket” and “hornet” are the common names given to wasps in the genera *Dolichovespula*, *Vespula*, and *Vespa*; for the sake of simplicity, we will use the term “yellowjacket” in the following discussion. Note that these common names are not reliable indicators of whether or not they are pests (see Table 19-1 for more specific information).

Yellowjackets are relatively short and stout compared with paper wasps and other wasps (see Table 19-2). Paper wasps are more slender and have long, dangling legs. All yellowjackets are either white and black or yellow and black, are rapid fliers, and are more aggressive than other types of wasps. Their nests can be in the ground, in wall voids, or hanging from eaves or tree branches, but the nests are always completely enclosed (except for a small entrance hole at the bottom) with a papery envelope.

The queen begins her nest by building a small comb of chewed wood. She lays eggs in the cells and, after the eggs hatch, tends them herself. When some of the larvae develop into adult workers, they expand the nest into tiers, built one on top of the other (Figure 19-1). In the late summer or early fall, males and new

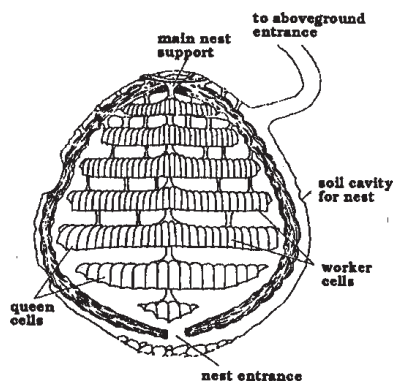
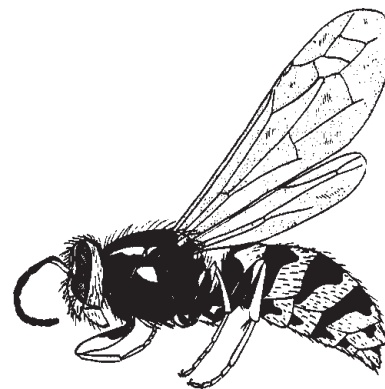


Figure 19-1. Yellowjacket Nest

queens are produced. After mating, the queens seek a sheltered place to spend the winter and, except in perennial colonies, all the worker wasps die. The nest is not reused and eventually disintegrates.



The Western Yellowjacket

Yellowjacket colonies seldom exceed 15,000 workers with a single queen, although they can become larger and can include multiple queens in perennial colonies. Early in the warm season, colonies are small and yellowjackets are usually not a problem. Later in the season when colonies are at their peak, these insects become pestiferous. They are attracted to garbage cans, dumpsters, lunch counters, and playgrounds, where they scavenge for protein and liquid sweets.

STINGS

Insect stings are the leading cause of fatalities from venomous animals, and most of these stings are inflicted by yellowjackets. The people who die from yellowjacket or bee stings are people who experience large numbers of stings at once (hundreds in adults) or who suffer severe allergic reactions to the inflammatory substances in the insect venom. These allergic reactions include soreness and swelling not only at the site of the sting but also on other parts of the body that may be distant from the site. Other symptoms include fever, chills, hives, joint and muscle pain, and swelling of the lymph glands and small air passageways. In severe cases, the individual may suffer a sudden drop in blood pressure and lose consciousness. Individuals who experience allergic reactions have become sensitized over time by previous stings, so this hypersensitivity is found more often in adults than in children.

Ordinary reactions to stings include localized pain, itching, redness, and swelling for hours to a day or two after the event.

See Box 19-A for first aid treatment for yellowjacket stings.

Table 19-1. Major Yellowjacket and Hornet Species in North America^a

Please find this table at end of chapter.

^a From Akre et al., 1981.

^b Those species that are scavengers are more likely to be pests around garbage cans and where food is eaten outside.

NEST DISTURBANCE

Yellowjackets that are foraging for food will usually not sting unless physically threatened in some way, such as being squashed or caught in a tight place. But if they feel their nest is in danger, they will vigorously defend it. All wasps defend their colonies, but some yellowjackets are more sensitive to nest disturbance and more aggressive in their defense. Disturbing the nests of these species can result in multiple stings. This can occur when someone accidentally steps on an underground nest opening or disturbs a nest in a shrub or in a building. Sometimes merely coming near a nest, especially if it has been disturbed previously, can provoke an attack.

Underground nests can be disturbed by vibrations detected by the wasps. Thus, mowing lawns or athletic fields can be hazardous, and operators may need to wear protective clothing when mowing during the late summer season when colonies are large. Such clothing should include a bee suit with a protective bee veil or, at the very least, a veil and wrist and ankle cuffs taped or carefully tied to keep the insects out of sleeves and pant legs. A heavy sweatshirt can also be protective.

It can be very frightening to be the victim of multiple wasp stings. The first response may be to run away, but since it is impossible to outrun the wasps, running will only make the situation worse by exciting the wasps more. The best strategy is to back slowly away from the colony until you are at least 6 to 8 feet away.

It is important to educate children about the beneficial role of these wasps (they feed on pest insects, particularly caterpillars) and to remind them repeatedly of ways to avoid stings. Since problems with yellow-jackets are most common in late summer and fall, teachers can be provided with this information at the beginning of the fall term. See Box 19-A for tips on avoiding stings.

DETECTION AND MONITORING

If there is a chronic problem with yellowjackets around outdoor lunch areas or school athletic fields, inspect the area methodically to locate the nests. Nests can be found in the ground, under eaves, and in wall voids of buildings. Ground nests are frequently (but not always) located under shrubs, logs, piles of rocks, and other

Table 19-2. Distinguishing Yellowjackets, Wasps, Bees, and Hornets

Please find this table at end of chapter.

protected sites. Entrance holes sometimes have bare earth around them. Nest openings in the ground or in buildings can be recognized by observing the wasps entering and leaving.

MANAGEMENT OPTIONS

The objective of a yellowjacket management program should be to reduce human encounters with the wasps, but not to eliminate them from the entire area since they are beneficial predators of caterpillars. The two most productive and least environmentally destructive ways to do this are to modify the habitat to reduce yellowjackets'

access to food in the vicinity of human activities, and to use physical controls such as trapping and nest removal. Area-wide poison-baiting should be used only as a last resort when other methods have failed and stings are frequent.

Physical Controls

Habitat Modification

Garbage cans on school grounds should have removable domed tops with vertical spring-loaded swinging doors. The cans should be emptied frequently enough to prevent the contents from impeding the closure of the

Box 19-A.

Avoiding and Treating Stings

Children should be taught to stay calm when confronted by a foraging yellowjacket. Impress upon them that sharp, jerky motions will frighten wasps and make them more likely to sting. Stillness, or slow, gentle movements, which can be described to children as “moving like the swaying branches of a tree,” will greatly decrease the possibility of being stung. Slowly and carefully brushing off a yellow-jacket that has landed on someone, or waiting until it flies off is better than hitting or constraining it since aroused yellowjackets will sting. It is important to avoid smashing yellowjackets because when crushed, they give off a scent that can cause other yellowjackets to attack.

If soft drinks or fruit juices are being consumed on school grounds where there are many yellowjackets, warn the children to look into the cup or can before each sip, because someone can accidentally drink in a wasp and get stung in the mouth or throat. Tell them not to panic if they find a wasp taking a drink. They should wait patiently until the wasp leaves by itself, then place a napkin or similar barrier over the cup between sips. Children can also use a straw for drinking or place the drink in a paper bag and poke a hole through it for the straw. Alternatively, eating and drinking outside can be prohibited during yellowjacket season.

Gardeners or custodians should wear protective clothing when mowing grass where underground nests are suspected.

First Aid for Stings

- If the sting is to the throat or mouth, medical attention must be sought immediately, because swelling in these

areas can cause suffocation. Dial 911 immediately and give the victim an ice cube to suck.

For hypersensitive individuals

- Anyone who is hypersensitive or is showing respiratory reactions, dizziness, or color changes should be treated by the school nurse or taken to a doctor immediately. The nurse should have an emergency kit containing pre-loaded syringes of epinephrine for use with hypersensitive individuals. An antihistamine such as diphenhydramine (e.g., Benadryl) can stop or slow symptoms, but it must be given immediately.
- Keep the affected part down, below the level of the victim's heart.

For all others

- Wash the area around the sting with soap and water and apply an antiseptic. Washing can help remove the protein venom from the wound which will help reduce the pain and swelling from the sting.
- As soon as possible, treat the sting either with ice contained in a cloth or plastic bag, commercially available products for easing the pain of wasp or bee stings, or a paste of meat tenderizer mixed with water. Ice will help reduce the swelling, and the commercial products will relieve pain as well as swelling. Meat tenderizer works by breaking down the venom, thus reducing swelling and pain.
- Antihistamines given every few hours, according to label directions, can also prevent pain and swelling.
- Have the victim rest, and do not administer sedatives such as alcohol.

lid. The lids and cans should be periodically cleaned of food wastes. Disposable liners can be used and replaced when soiled or damaged.

When these practices are not followed, school garbage cans become a food source for all the yellowjackets in the area. With a large number of wasps around the cans, students become afraid to get close enough to place garbage all the way inside, and spilled food attracts more wasps.

Dumpsters should be cleaned frequently by washing them with a strong stream of water. If the dumpster service company has a cleaning clause in their contract, make sure it is enforced.

To limit yellowjacket infestations inside the school buildings, repair windows and screens and caulk holes in siding. Building inspections for yellowjackets can be done at the same time as inspections for other pests such as rats, mice, termites, etc.

Trapping

Trapping with a sturdy trap and an attractive bait can significantly reduce yellowjacket numbers if a sufficient number of traps are used. There are a variety of traps on the market. In general, cone-type traps are more useful for long-term (many weeks) trapping because it takes longer for the yellowjackets to find their way out of the trap. In some schools, unbaited yellow sticky traps (like those used to catch whiteflies) affixed to fences near underground nests have provided sufficient control to protect children from stings.

When traps are full they can either be placed in a freezer for a day to kill the wasps or enclosed in a heavy-duty plastic garbage bag and placed in the direct sun for several hours. A third way of killing the wasps is by submerging the traps in a bucket of soapy water until the wasps drown.

A homemade, cone-type fly trap (Figure 19-2) can be used to catch yellowjackets simply by using the captured flies inside the trap as bait (see Chapter 9 for a discussion on how to catch flies). The yellowjackets enter the trap to get the flies and become trapped themselves (see Box 19-B for tips on this kind of trapping). You can also try using baits such as dog food, ham, fish, and other meat scraps, or, toward the end of the warm weather, sugar syrups, fermenting fruit, and jelly.

Box 19-B.

Tips on Trapping Yellowjackets in a Homemade Cone-Type Fly Trap

Yellowjackets can be caught in a cone-type fly trap (Chapter 9, IPM for Flies in Schools, includes bait recipes and plans for making such a trap) using only the trapped flies as bait. The following tips will help improve yellowjacket trapping:

- Use this trapping method where students cannot gain access to the traps or at a time when students are not in school.
- Mix the fly bait according to the instructions in Chapter 9 of this manual.
- Set up the fly trap with the fly bait in the area where the yellowjackets are a nuisance.
- If after a day or two in one spot the trap is still attracting only flies, move it to a new spot around the perimeter of the nuisance area.
- If your trap stops catching yellow-jackets at some point, but is still catching flies, try switching to a sweet bait such as fruit punch, jam, or grenadine.

NOTE: To avoid being stung, you should replenish the fly bait or move the trap in the cool parts of the day—early morning or late evening. To kill everything in the trap before emptying, put the trap into a large plastic garbage bag and seal the bag. Place the bag in direct sunlight for several hours or in a freezer overnight. You can also loosely tie the bag to the exhaust pipe of a gasoline engine and run the engine for a minute or two.

Top is also made of screening. Top should be hinged (to empty the trap) and closed with a hook and eye. Weather-stripping or a strip of foam or cloth glued to all 4 sides of the underside of the lid will prevent flies from squeezing out.

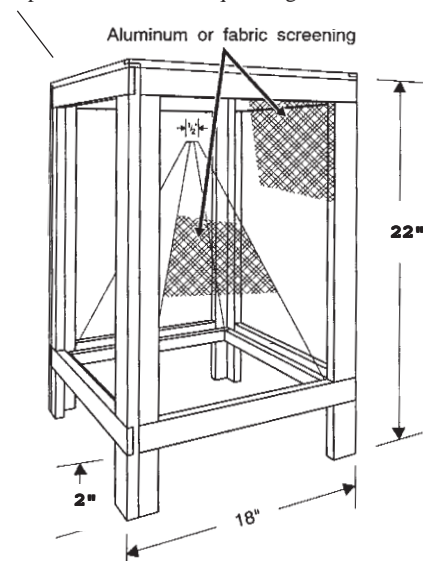


Figure 19-2. Cone Trap. Bait pan is placed beneath bottom of the cone. Make sure the top edge of the bait pan is above the bottom edge of the trap.

Take care to place traps out of the children's reach as much as possible; however, the traps should be placed near the nest if it can be found, and/or near the area where the yellowjackets are troublesome. Teachers can be instructed to make a short presentation on the purpose of the traps to satisfy the curiosity that students will undoubtedly have. Show students the traps, explain how they work, and try to impress upon them the importance of the traps in maintaining the safety of the playground.

The traps should be out only during the period that yellowjackets are a problem, usually late summer and early fall. When the traps are taken down for the year, they should be cleaned with soap and water and stored.

Nest Removal

A nest can be destroyed through physical removal (vacuuming) or by using a pesticide (see Chemical Controls). Either way, care is essential because any disturbance around a nest can cause multiple stings. It is best to have a professional pest control operator or other person experienced with these techniques remove the nest, and it should be done at night when the children are out of school and the yellowjackets are in their nests. When illumination is needed, use a flashlight covered with red acetate film so it will not attract wasps. Adequate protective clothing (see Box 19-C) and proper procedure can minimize problems and stings. People who are sensitive to wasp stings should not attempt control procedures.

Vacuuming

We do not recommend vacuuming out entire nests unless it is done by a professional experienced in handling stinging insects.

Vacuuming can be particularly effective where nests occur in wall voids, in emergencies where nests have already been disturbed, and in environmentally sensitive areas where nests should not be treated with insecticides. Use a lightweight, powerful vacuum with a removable bag. Before the bag is completely full of wasps, vacuum up 2 tablespoons of cornstarch to incapacitate the insects. Leaving the motor running, detach the hose from the canister to reveal the opening in the vacuum bag. Stuff this opening with newspaper, paper towels, or a rag. With the motor still running, open the canister and tape over the bag opening with duct tape. With the motor off, take out the bag and place it inside a cardboard box. Seal the box and place it in a freezer at least overnight.

Box 19-C.

Protective Clothing for Nest Destruction

It is important to wear protective clothing when removing wasp nests. Complete body coverage is essential because yellowjackets and other wasps can find even the smallest exposed area. Use clothing made for beekeepers. This includes:

1. A bee veil or hood that either contains its own hat or can be fitted over a light-weight pith helmet or other brimmed hat that holds the veil away from the head. A metal-screen face plate that extends around the head is a desirable feature. Check the veil carefully for tears before each use.
2. A bee suit or loose-fitting, heavy-fabric coverall with long sleeves. This is worn over regular pants and a long-sleeved shirt to provide extra protection from stings.
3. Sturdy high-topped boots with pant legs secured over the boots with duct tape to prevent wasps from getting into trousers.
4. Gloves with extra-long arm coverings so sleeves can be taped over them to protect the wrists.

Before vacuuming an underground nest, check for secondary entrance holes (these can be identified by the wasps flying in and out) in a 40 to 50 foot area around the main opening. If these secondary entrances are not covered with a good quantity of soil before vacuuming begins, they will provide outlets for angry wasps.

Vacuuming the nest is a job for two people, both covered with protective clothing. While one person operates the vacuum, the other excavates the nest with a trowel. The vacuum operator doesn't actually insert the hose into the nest; instead, the wand is positioned 3 or 4 inches away from the nest opening to suck in yellowjackets as they fly in and out. When no more wasps are seen entering or leaving, the underground nest structure should be dug out, placed in a plastic garbage bag, and set in the sun for several hours.

In some cities there are companies that will perform this service for free so they can collect the wasps to sell to pharmaceutical companies for their venom. If the school is interested in this, take time to find a reputable company.

Chemical Controls

If non-chemical methods alone prove insufficient to solve the problem, then integrating a pesticide into your management program may be warranted. For information on the hazards of various pesticides and on how to select an appropriate pesticide for your situation, consult Appendix G for a list of resources.

Pesticides must be used in accordance with their EPA-approved label directions. Applicators must be certified to apply pesticides and should always wear protective gear during applications. All labels and Material Safety Data Sheets (MSDS) for the pesticide products authorized for use in the IPM program should be maintained on file. Do not apply these materials when buildings are occupied, and never apply them where they might wash into the sanitary sewer or into outside storm drains.

When an insecticide is considered necessary for the control of yellowjackets, the best approach is to confine

it to the nest itself. Anyone applying insecticides should use special clothing that protects against the chemical as well as against wasps. This should include a respirator, goggles, coveralls, and rubber gloves, as well as a bee suit with a veil (see also Box 19-C). Apply insecticides in the evening or very early morning when children are out of the school, the wasps are in their nests, and cool temperatures reduce the insects' ability to move around.

Of the main insecticides registered for use against yellowjackets, the following are most appropriate for use in schools.

Pyrethrin Aerosol

Pyrethrin can be used to quickly knock down guard wasps at the nest entrance and to kill yellowjackets in an aerial nest once the nest has been cut down and is inside a plastic bag. Only very small amounts of this material are necessary to kill the wasps and there is no need to

Box 19-D. How to Destroy Nests Using Pesticides

Application of pesticides to yellowjacket nests should be made in the evening or early in the morning, and the pest control operator should always wear protective clothing (see Box 19-C).

Aerial Nests

1. If necessary, use a pole-pruner to trim branches away from the nest. Be extremely careful if you do this.
2. Using a ladder, climb near enough to the nest to squirt a half-second blast (no more is necessary) of aerosol pyrethrin (0.3% or 0.5%) around the nest entrance hole to kill the guard wasps.
3. Cover the nest with a large, heavy-duty, black plastic garbage bag and cut off the branch from which the nest is hanging or cut the nest off the branch.
4. On a sunny day, twist the top of the plastic bag, fold the twist over and secure with a twist tie. Leave the bag in the sun for 2 or 3 hours to kill the wasps.

On a cool or cloudy day, you may need to use insecticide to kill the wasps. Gather the top of the plastic bag together, insert the nozzle of the aerosol pyrethrin (0.3% or 0.5%), and squirt in another half-second blast. Do not over-treat. This small amount of pyrethrin is enough to kill the yellowjackets.

5. Dispose of the bag in the garbage.

Ground Nests

1. Check the area 40 to 50 feet around the nest before treating. If another entrance is found, use a half-second

blast of aerosol pyrethrin (0.3% or 0.5%) to kill the guard wasps, stuff the hole with newspaper or paper towels, and cover it with soil.

2. Use a half-second blast of the aerosol pyrethrin to kill the guards at the main entrance.
3. Using a 4-way tip on the aerosol, spray inside the entrance hole for 5-10 seconds. Do not over-treat. Stuff the hole with newspaper or paper towels but do not cover it with soil.
4. After waiting a few minutes, remove the paper from the entrance hole. Use a bulb duster to apply silica aerogel plus pyrethrin to the interior of the cavity and the nest. A few pumps should apply sufficient material. If the nest is located some distance back from the ground opening, attach a length of PVC tubing to the bulb duster to extend its reach.
5. Stuff a piece of coarse steel wool or copper mesh that has been treated with a light dusting of silica aerogel plus pyrethrin into the entrance hole. Any wasps trying to get in or out will chew on the steel wool and be killed by the insecticide.

Nests in Wall Voids

Wasp colonies in wall voids can be eliminated using the same procedure detailed above for ground nests.

After removing the colony, make any necessary structural changes to prevent wasps from reinfesting.

use more (consult Box 19-D for the specific procedures for poisoning nests).

Silica Aerogel and Pyrethrin

Silica aerogel combined with pyrethrin is an effective insecticidal dust that can be used to destroy an underground nest or a nest in a wall void after the guard wasps have been killed (see Box 19-D). Silica aerogel is made essentially from sand and works by absorbing the outer waxy coating on insect bodies. Once this coating is gone, the insects cannot retain water and die of dehydration.

Products with Components That “Freeze” Wasps

In emergency situations when nests must be destroyed in the daytime, it is helpful to carry one of these products as a safety precaution. These aerosol products are designed to project their spray a distance of 10 to 20 feet and contain highly evaporative substances that “freeze” or stun the yellowjackets.

Do Not Use Gasoline

Many people pour gasoline into underground nest holes. This is a fire hazard, contaminates the soil, and prevents growth of vegetation for some time. It is a very dangerous procedure.

Avoid Area-Wide Poisoning

Mass poisoning is seldom, if ever, necessary, and is expensive due to the labor involved in the frequent mixing and replacement of bait. The effectiveness of bait mixtures is also questionable, since the baits face considerable competition from other food sources attractive to scavenging yellowjackets.

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Table 19- 1. Major Yellowjacket and Hornet Species in North America^a

Species	Common Name	Distribution	Habits^b
<i>Dolichovespula arenaria</i>	aerial yellowjacket	transcontinental	does not ordinarily scavenge for protein, but in late summer may be attracted to sweets
<i>D. maculata</i>	boldfaced hornet	transcontinental	predator and occasional scavenger; not as sensitive to nest disturbance; not a pest unless colony located close to human activity
<i>Vespa crabro Germana</i>	European hornet	forested areas of eastern North America; native to Europe	predator; sometimes girdles branches and twigs of trees and shrubs; primarily a forest species, so has less contact with people and is therefore less of a stinging hazard
<i>Vespula acadica</i>	forest yellowjacket	forested areas of Canada, Great Lakes states, much of western U.S., & Alaska	strict predator; primarily a forest species so less contact with humans, but can be quite aggressive when nest is disturbed
<i>V. atropilosa</i>	prairie yellowjacket	prairies and open forest areas of much of western U.S. & Canada	strict predator; nests in yards, golf courses, pastures, etc., and can also nest in walls; usually not a problem unless nest is disturbed
<i>V. consobrina</i>	blackjacket	forested areas of Canada, northern U.S.	strict predator; primarily a forest species so less contact with humans, but can be aggressive when nest is disturbed
<i>V. germanica</i>	German yellowjacket	transcontinental; native to Europe	predator and scavenger; nests mainly in structures, but can nest in the ground or in trees; colonies can be perennial; exploits a variety of food sources, so is usually a pest; can be aggressive when nest is disturbed
<i>V. maculifrons</i>	eastern yellowjacket	eastern & central U.S. to the Mountain Region	predator and scavenger; nests in yards, golf courses, recreational areas, and buildings; is the primary pest yellowjacket where it occurs
<i>V. pensylvanica</i>	western yellowjacket	western North America and Hawaii	predator and scavenger; scavenges extensively for protein, especially later in the year; nests mainly in ground, but also in buildings; primary pest yellowjacket where it occurs; can be aggressive when nest is disturbed
<i>V. squamosa</i>	southern yellowjacket	eastern, southeastern U.S. to Central America	predator and scavenger; parasitic on <i>V. maculifrons</i> ; will scavenge for protein; nests mainly in the ground in disturbed areas, but also in buildings; perennial colonies possible in subtropical locations; can be aggressive when nest is disturbed
<i>V. vidua</i>	none	eastern U.S.	predator; nests mainly in the ground in disturbed areas but also forests, sometimes in buildings; not a stinging hazard unless nest is located where it can be disturbed by human activity
<i>V. vulgaris</i>	common yellowjacket	Transcontinental, Hawaii; prevalent in heavily forested areas in the West	predator and notorious scavenger of nearly any protein or sugar source; nests mainly in the ground, but also in buildings; colonies can be very large

^a From Akre et al., 1981.

^b Those species that are scavengers are more likely to be pests around garbage cans and where food is eaten outside.

Table 19-2. Distinguishing Yellowjackets, Wasps, Bees, and Hornets

	Appearance	Habits	Nests	Feeding Behavior
Bees	Hairy, stout bodies with thick waists; workers & reproductives are winged	Noisy flight; sting mainly while defending nest; foraging workers seldom sting	In hives, trees, or buildings	Collect pollen and nectar, feed pollen to young & share food with other adult bees
Wasps	Bodies vary; all winged	Colorful, rapid fliers; solitary & social varieties	Aerial or ground nests; can also be in structures	Scavengers and/or predators
Solitary wasps	Thin- or thick-waisted	Visit flowers & other vegetation; relatively docile	In mud, or in holes in ground	Predators; provision nests with prey for young to feed on
Yellow-jackets	Stout, colorful	Rapid fliers; aggressive; individuals capable of inflicting multiple stings; social in large colonies which they defend vigorously	Multi-layered, papery nests mostly in ground, although some aerial or in structures; nests have an outer papery covering called an “envelope”	Mostly beneficial predators, but scavenger species become pestiferous
Paper (umbrella) wasps	Long bodies with thin waists, long dangling legs	Social; search vegetation for prey; visit flowers for nectar; not particularly aggressive	Single layered, papery nests without an envelope; attached to fences, eaves, boards, branches; shaped like an umbrella	Beneficial predators; feed prey to developing young in nest