

IPM for Yellowjackets and Paper Wasps

There are two types of common stinging wasps in Oregon school environments: paper wasps (*Polistes* spp and *Mischocyttarus flavitarsis*) and yellowjackets (*Vespula* spp. and *Dolichovespula* spp). These wasps often nest in, on, and near school structures, as well as on playgrounds and sports fields. They are also able to sting multiple times (unlike honeybees), making paper wasps and yellowjackets a significant pest for many school districts.

Colonies of both paper wasps and yellowjackets begin with a single queen each spring. The queen overwinters in various natural and man-made protected habitats. She emerges in early to mid-spring; the timing varies interannually based on weather conditions and therefore may occur as early as March in some years. Upon emerging, the queen selects a nest site, begins construction, and lays the first generation of eggs. Once the first generation of workers reaches maturity, they assume various roles including foraging, nest construction and maintenance, defense, and tending the young. The queen is then able to focus more of her energy on egg-laying and colony growth from that point on.

Paper wasp and yellowjacket colonies continue to grow in nest size and number of individuals throughout the summer, reaching a maximum nest size in August-September; however, some yellowjacket species may persist into November. In late summer colonies begin to produce a limited number of male wasps to fertilize new queens. As cooler fall weather sets in, workers and males die leaving only the inseminated queen to overwinter and begin the cycle anew the following spring.

Nests are not reused in Oregon by either paper wasps or yellowjackets. Paper wasps exhibit a high fidelity to specific nest sites, and are known to construct new nests in the same location each year. In some cases, if the old nest is still present, paper wasps may attach a new nest onto the previous year's nest.

Beyond these basic life history features, paper wasps and yellowjackets differ significantly in their biology, temperament, and particularly their management. Therefore, identification to determine which wasp type you have is a critical first step when assessing a wasp issue. [Note: bees are not wasps, and care should be taken with identification for this reason as well. Many species of bees are critical pollinators of both urban and agricultural environments.]

Characteristics of yellowjackets and paper wasps		
	Yellowjackets	Paper wasps
		
Appearance	Workers are ½" long; stocky body, black and yellow or black and white; anterior portion of thorax at right angle	Workers are ¾" long; thin body, long legs trail in flight; anterior portion of thorax tapers backward
Basic life cycle (inseminated queen overwinters, emerges following spring, begins new nest and colony)	same	same
Nest type	Encased in paper envelope, with multiple tiers of comb	Exposed, single comb attached to a surface by a thin, short stalk
Nest location	Variable – most likely to notice and have problems with ground nests, but may be in buildings, or enclosed spaces	Highly variable – under protected eaves, in pipes, handrails, playground equipment, utility boxes, etc.
Behavior	Aggressive, likely to sting in proximity of nest	Less aggressive, less likely to sting unless provoked

Paper wasps

While paper wasps are generally regarded as less aggressive than yellowjackets, their habit of nesting in the eaves outside of school entrances, playground equipment, inside utility boxes, etc., gives them a high level of visibility. Paper wasps have a slender body ½-¾" long. Their legs trail in flight, giving them a floaty-flier appearance that helps to differentiate them from yellowjackets and bees. The paper wasp nest is a single-layer comb that lacks a paper envelope surrounding it and is therefore completely exposed. The nest faces downward and is attached to a surface via a slender stalk. Nest location

may vary in height from head-level to more than two stories. Nest size is typically 100 cells (the European paper wasp) to 200 cells (native paper wasps), but may reach up to 400 cells in size. In ideal conditions, paper wasps may take as little as 40 days to develop from an egg to adult. Paper wasp females can and will sting if provoked (e.g., as when wasps become trapped between clothing and skin, if nest destruction is attempted, etc.).

There are several species of paper wasps in Oregon that may be found in school environments. The European paper wasp, *Polistes dominula*, was introduced to the United States east coast in the 1970's, and since spread to most areas of the West by the early 2000's. The European paper isp wasp is slightly smaller than other paper wasps. It is also synanthropic (associates strongly with human environments) and as such often nests in protected spaces in and on man-made structures such as areas under eaves, in and around playground equipment, bird houses, utility boxes, pipes, handrails, etc. Nesting in these types of habitats is not exclusive to the European paper wasp, but this wasp is more consistent at nesting in and around human structures and equipment than Oregon's native paper wasps.

Other species of paper wasp that may be found in school environments in Oregon include *Polistes fuscatus*, the golden paper wasp, which has narrow yellow bands and may appear overall more dark. *Mischocyttarus flavitarsis* has a long, narrow petiole (or "waist") that clearly distinguishes it from yellowjackets and other types of paper wasps. *M. flavitarsis* is more variable in its selection of nest sites. Nests located in natural habitats are commonly positioned in tight places such as cracks in rocks or the underside of rocks, boards, logs, etc. In urban environments, *M. flavitarsis* nests may be more hidden than other paper wasps'.

Paper wasps do not exhibit a preference for human foods, and are not the pic-nic-crashers that yellowjackets are so well known for being. Adult paper wasps frequent flowers to feed on nectar. Adults are considered a beneficial insect for their role in biological control of soft-bodied insects (including several species of caterpillar pests, aphids, etc.) and spiders, all of which they grind up and feed to the developing wasp larvae (Cranshaw -- CO state, 04/08). They have also been known to scavenge for dead insects and spiders for the young as well.

Yellowjackets

Yellowjackets are stocky in appearance with a ½" long body length. They have a sleek look and are fast fliers. Yellowjackets may initially appear similar to bees, but yellowjackets lack the fuzzy (hairy) appearance of bees, and also do not forage for nectar on flowers.

In Oregon school environments, yellowjackets include aerial (e.g., tree) nesters (*Dolichovespula* spp.) and those that most often nest in the ground, structures, or cavities (*Vespula* spp.). The two aerial, or tree-nesting, *Dolichovespula* typically seen include *D. maculata* – a black and white wasp also known as the “bald-faced hornet” – and *D. arenaria* – a yellow and black wasp that typically nests in trees.

Ground nesting (*Vespula* spp.) yellowjackets comprise the great majority of yellowjackets responsible for stinging incidents and management concerns in Oregon school environments. Perhaps the most commonly encountered ground-nester in Oregon is the Western yellowjacket, *Vespula pensylvanica*, which is native to western North America. The common yellow jacket, *Vespula vulgaris*, is also native, and in spite of its name it is less commonly encountered in urban environments. The common yellowjacket prefers to nest in the ground or logs, and is more typical of forested areas. The German yellowjacket, *Vespula germanica*, was introduced to the East coast of North America in the mid-1800’s and arrived in Oregon in the mid-1990’s. Its occurrence seems to be correlated with areas of high urban population along the I-5 corridor as well as areas along the Oregon coast. While a ground-nester, the German yellowjacket also shows a preference for nesting in structures between walls, in attics or other cavities, abandoned cars, etc. German yellowjackets are behaviorally different from our native yellowjackets; they tend to be less responsive to mowing activities, wall-pounding (for wall void or attic nesters), and other forms of disturbance.

Queens select ground nests by searching for indentations in the soil, which may occur from old mammal burrows. She, and later the workers, will additionally excavate the space to make room for the growing nest. At their peak size, bald-faced hornet nests may reach several hundred individuals, and ground-nesting (or cavity-nesting) yellowjackets may reach several thousand individuals. Unfortunately, by the time cavity and ground nests become noticeable, they are quite large and more likely to sting in defense of their nest. Nests reach peak size in late summer to early fall, and colonies tend to persist longer than paper wasps. German yellowjackets, for example, reach a peak colony size in October to early November.

Yellowjackets are aggressive in their foraging habits and are known for their eager invasion of outdoor lunch areas. They are particularly fond of fish (including sandwiches) and sweet beverages (fruit and soda). Yellowjackets will readily land on food as it is being eaten, and often crawl inside pop or juice cans to drink. They may also land on human skin to consume the salt in our perspiration. While this foraging behavior often leads to close encounters between yellowjackets and students or staff, these wasps sting less readily when foraging and away from the nest (unless swatted at or otherwise threatened). They have been documented to forage up to 165 feet from their nest and unfortunately have demonstrated a keen memory for food sources. After just one successful feeding from a student lunch or open garbage can, they may return repeatedly – even after the food source has been removed.

Wasp Management

Following identification to determine whether it is a paper wasp or yellowjacket, the threshold for the wasp should be considered. Thresholds define at what point action is taken to manage a pest. Each pest should have a threshold associated with it that is based on their ability to proliferate, cause harm to humans or the environment, damage resources/structures, and the likelihood of them coming into contact with students or staff. Thresholds may also take into consideration the values and tolerance levels of your school district, or even the individual school site.

1. Thresholds

There are numerous situational factors that may also affect thresholds and whether or not action should be taken (and what type of action that should be). Among these factors are weather and the time of year. In late summer or early fall, for example, the approaching cold weather will reduce or eliminate wasp activity for the year, so a wasp nest located in a low-traffic area of the school could be “waited out” in some cases.

Consider the following when crafting your thresholds for paper wasps and yellowjackets:

- a. Type of wasp (e.g., the level of aggression likely to be exhibited if staff or students come into contact it)
- b. A nest versus foraging wasps. For each wasp type, it may make sense for your district to establish thresholds for foraging wasps, and another set of thresholds for the nest.
- c. type of nest and its location on the school property (e.g., in a tree, in the ground, or in a swing set, etc.) and its likelihood to be encountered
- d. time of year and near-term seasonal weather
- e. The level of wasp knowledge of students and staff, and their ability to cooperate with instructions to avoid being stung. Note: when educating staff, students, and parents about your district’s thresholds, it is important to include information about the biology of the wasp to support your choice of action. Education is often instrumental in reducing concern.

When responding to a paper wasp or yellowjacket complaint, it is therefore critical to begin by assessing the situation *in person*, knowing which wasp type you have, whether it includes foragers or a nest, etc., etc., and from there deciding whether any thresholds are being reached.

2. Preventative Maintenance

- a. Brush up, know your pest. As a facilities or maintenance personnel, learning about your pest is the single most valuable thing you can do to manage it effectively.
- b. Inspect. Regular inspections consist of walking around your structures and looking for nests tucked under eaves, in/on playground equipment, inside utility boxes, etc. Early detection and removal is less likely to result in stings of students, staff, and those removing the nest.
- c. Rodent management: collapse rodent burrows once/year – particularly in areas where there is regular rodent burrow activity and human foot traffic. This is best done December – February to avoid stirring up ground-nesting yellowjackets.

3. Chemical-free methods

Chemical-free methods are most effectively employed at night or near-dawn, when most wasps are in the nest and activity is at its lowest. Any action taken against a nest will incite some degree of response from the wasps that may take many hours to subside – particularly later in the season when nests are larger, and particularly in the case of yellowjackets. Therefore, any action against a nest should take place outside of regular school hours when students are not expected to return for at least several hours.

- a. Paper wasp nests that are less than 10' off the ground can simply be knocked down with a long-handled tool (e.g., a rake or shovel). Caution: you will need to do this when students are not present. If you do not have a bee suit, be prepared to move away quickly after agitating the nest. If you are unsuccessful, let the nest calm down and approach it at a later date.
- b. Vacuuming is commonly used for ground-nesting yellowjacket nests. A vacuum hose may be placed near the nest entrance. Careful observation of nest response may convey the size of the nest and therefore how long it may take (2-3 hours). Yellowjackets may begin to ignore the vacuum, so it may be effective to turn the vacuum off for 20 minutes after the first hour, then resume vacuuming. A bee suit is strongly recommended.
- c. Soapy water poured down a nest hole, or sprayed/hosed onto a paper wasp nest. Water alone will simply bead up on the exterior of their waxy cuticle, but the soap will facilitate not only suffocation, but make it difficult for them to fly as well. This knock-down method allows you to vacuum up the wasps and remove the nest.
- d. Aerial wasp nests (those in trees, for example) may be enclosed in an extra-thick plastic bag, frozen for 24 hours, and discarded.

4. Products and applications

- a. Yellowjacket traps attract foraging wasps with formulated lures, soda pop, etc. While there is no scientific evidence that trapping queens reduces the number of nests, traps can be used to help draw foraging wasps away from buildings and high traffic areas.
- b. If pesticides are used, the district is responsible for following the proper posting and notification requirements, using “caution” label products only (except in cases involving a declared pest emergency), and making sure any pesticides used are applied by licensed applicators.

5. Preventative approaches

Staff and student awareness of wasp behavior as well as the importance of sanitation is going to make any facilities and maintenance personnel job easier. A wasp “Pest Press” for staff and students is available from Oregon State University’s School IPM Program.

- a. The presence of foraging wasps (e.g., there is no identified nest) is often an educational issue. Soda (spilled or in cans), juice and other sweet beverages, and a variety of meaty or sweet foods will attract wasps. Quick clean-up is necessary, and prevention is even better given the keen memory for food sources that yellowjackets have.
- b. If foraging wasps are a recurring problem in a given area, encourage those in charge to corral food and drink to a given area of the school.
- c. Make sure trash cans have tight-fitting lids. During the fall, these lids should be hosed off regularly to discourage foraging yellowjackets.
- d. Take a proactive approach. Educate staff at the start of each school year (when wasp colonies are at their largest): who to notify for wasp complaints; who to notify in the event of spilled food and beverages outdoors; staff and students should never swat at wasps, but rather move away slowly from aggressive foragers (swatting is perceived as a threat and may induce stinging); avoiding the color yellow and perfumes in late summer through early fall may also help discourage wasps from landing on students and staff.

For further reading on paper wasps or yellowjackets, please visit:

- University of California yellowjacket curriculum.
apps.cdpr.ca.gov/schoolipm/training/curricula/yellowjackets.pdf

- Washington State University Cooperative Extension publication: Yellowjackets and Paper Wasps. *<http://www.pesticide.org/solutions/home-and-garden-toolbox/pest-solutions/yellow-jackets>*

Complete in-text citations available upon request.

Acknowledgements

Colorado State University (W. Cranshaw), Washington State University (Todd Murray, A. Antonelli and R. D. Akre), USDA (P. J. Landolt), Jim Digiulio, US EPA Office of Pesticide Programs, Iowa State University (J. Hahn, P. Pellitteri, and D. Lewis).

This document was created with funding support from the USDA/NIFA E-IPM grant program