School Integrated Pest Management for Spiders

By Jennifer L. Snyder

Most spiders found in Oregon are not a health concern. There are nearly 4,000 species of spiders in North America north of Mexico,[1] and at least 500 species occur in Oregon.[3] Research has shown only two Oregon spiders to be of medical importance for people who are bitten: the western black widow spider (*Latrodectus hesperus*) and the yellow sac spider (*Cheiracanthium* spp).[5, 6] In spite of how spiders are perceived, the great majority of spiders in Oregon pose no significant health threat, and are therefore considered a "nuisance" pest.

Spiders can be roughly grouped into two categories: web-spinners and active hunters. Web-spinning spiders are a sit-and-wait predator: they build a web, they sit, and they wait for their prey to be caught in the web. You often see their webbing on the sides of buildings, in bushes, near cracks and crevices, or attached to overhead eves. Active hunters are also capable of spinning silk, but they do not typically do so for the purpose of capturing prey. Active hunting spiders are mobile in search of their prey, and may be most active at night or during the day. Jumping spiders are examples of active hunting spiders, and many species hunt during the day.

Spiders are commonly encountered spring through early fall. In the spring, spider egg sacs begin to hatch and the young disperse. Hatchling spiders typically disperse by climbing to a high point on a structure or vegetation, casting a line of silk into the air, and becoming airborne. They ultimately land wherever the wind carries them. This method of dispersing is called "ballooning". Adults may occasionally balloon, but more commonly they crawl. Most spider complaints from school staff occur in the fall when the adult males of many different species actively seek females for mating. The overall increase in mobility of adult male spiders in the fall results in increased sightings indoors. In addition, some spiders will be drawn to the warmth of structures when nighttime temperatures begin to turn cold, so indoor spider sightings increase in the fall for this reason as well.

Those "boxing gloves" that some spiders have are in fact a feature that males of most all spider species possess. The appendage that extends from the head is called a "pedipalp", and while females also have pedipalps, theirs do not end in a bulb like the males'.
Males' pedipalps are used in mating, among other things. Microscopic examination of fine features in the males' pedipalps are used to identify some species, but such features are not visible with the naked eye.

A male spider's pedipalps are enlarged at the tip

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Spiders frequent areas where lighting, food, clutter, and moisture (for some species) are abundant. Lighting draws flies, moths, and other nighttime flying insects, which are prey to spiders. For this reason, there are frequently spider webs and active hunting spiders around lighted areas – both indoors and outdoors. Spiders will also be drawn to areas outside that are illuminated by indoor lighting. Lights located close to exterior doors may facilitate spider movement indoors – especially if there are gaps between the door and the frame or ground.

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Human food debris draws ants and other pests, which spiders in turn eat. Classroom food sources include desk food, and cupboard snacks that are not in pest-proofed containers. Sticky food residues may be spread by students to desks and other surfaces, which can attract ants and other pests. Crumbs may accumulate along the wall base and under or behind furniture. Clutter is attractive because it often harbors insect pests, and provides plenty of surface area for web-spinning spiders to attach their webbing. Clutter also provides shelter from disturbance.

SPIDERS OF MEDICAL IMPORTANCE

Spiders of importance are those whose venom may produce one of two effects: 1) neurotoxic effects, which can result in respiratory or neurological issues; 2) necrotic effects, which can result in ulcerative sores that are difficult to heal.

The western black widow spider (*Latrodectus hesperus*) is the most notable spider of public health concern in Oregon due to a concentrated neurotoxin in the adult female's venom. A bite from a female requires immediate medical attention. The male's venom is not a significant health threat. The appearance of the western black widow spider varies considerably by gender and age. The juvenile is light tan or yellow. As it matures, pale stripes form on the abdomen that are thinly outlined in black and may include small amounts of orange. The adult male western black widow spider retains juvenile coloring and patterning, has very long legs, and has a small, narrow body that measures up to $^1/_4$ inches long.[4] The female's appearance changes dramatically from juvenile to adult (see photos below). Her stripes slowly fade as she matures, and her color darkens until she is entirely shiny black with a red or orange colored hourglass on the underside of her bulbous, black abdomen as an adult.[4] The adult female body (excluding legs) measures up to $^3/_5$ inches long.[1,4]

The western black widow is Oregon's only species of black widow spider, and is most common in dryer regions – the central, southwest and eastern areas of Oregon. This spider is a web-spinner; its hunting strategy is to identify a good habitat for a web, construct the web, and wait for prey. It hunts by hanging upside down in the web at night, and hides in a nearby hole or crack by day. Webs are made of very strong silk messily attached to corners, clutter, or stored materials. Webs are common in crawl spaces, sheds, electrical and irrigation boxes.

Yellow sac spiders (*Cheiracanthium* spp) have occasionally been implicated in ulcerative (necrotic) wounds following a bite, but research has been unable to verify this.[6] Yellow sac spider venom may produce a red welt accompanied by itching, but is said to subside within a day or two. Yellow sac spiders are typically pale yellow or gray, with a body that measures $^1/_3$ – $^1/_2$ inches long (excluding legs).[4] The two noteworthy species in Oregon (*C. mildei* and *C. inclusum*) are both active hunting spiders and are frequently found indoors – particularly in fall and winter. Adults may take refuge by day in white "sacs" that they build with their silk, often at the wall-ceiling interface, around windowsills, amid clutter, and behind baseboards.[3,4] Though yellow sac spiders are unremarkable in appearance, they are notable for their prevalence, tendency toward indoor environments, and their bite, which is comparable to the pain of a bee sting.[4]

The brown recluse spider (*Loxosceles reclusa)* and its relatives (other *Loxosceles* spp) are not native to the Pacific Northwest U.S., nor are there any introduced populations established there.

The hobo spider (*Tegeneria agrestis*, renamed in 2013 to *Eratigena agrestis*) was introduced to the Pacific Northwest United States in the 1930's, and populations subsequently expanded throughout the region. The hobo spider is a large, brown spider that is easily and often confused with other funnel weaving spiders found in Oregon.[5,6] The hobo spider is far less likely to be encountered than similar looking species (the domestic house spider and the giant house spider) in most parts of Oregon. Careful, close examination is required to tell the hobo spider apart from these other species.

Not only is the hobo spider less likely to be encountered in Oregon than similar looking species, but research shows that hobo spider bites are highly unlikely to cause necrosis either due to venom or antibiotic-resistant bacteria.[2,7] In one U.S. study presented in 1987, the hobo spider's venom was said to cause necrotic skin lesions in humans. Since then, however, numerous studies examining hobo spider venom have been unable to show skin necrosis. An analysis of patients claiming to suffer from spider bites found over 30 different health conditions associated with skin necrosis that patients or their doctors falsely attributed to spider bites. Research also shows *no significant difference* in chemistry between the venom of hobo spiders from their native Europe (where their bite is <u>not</u> a reported problem) and the venom of hobo spiders collected from Oregon and Washington. Lab studies likewise show no effect of hobo spider venom on mammalian red blood cells. Numerous spider experts have concluded that hobo spider venom does not cause skin necrosis, and cite misinformed medical professionals and urban legend as perpetuating this myth.

SPIDER MANAGEMENT

Spiders are ubiquitous, abundant, and fairly resilient to the effects of many pesticides. The most effective way to manage spiders involves prevention (using sanitation and exclusion) and staff education. Integrated pest management (IPM) employs pesticides as-needed, after non-chemical, common sense approaches alone are tried. IPM is therefore the logical and effective choice for spider management. IPM is also required by law in all Oregon schools, community colleges, federal Head Start programs, and ESDs, among other institutions (see ORS 634.700-634.750 for details).

IPM FOR SPIDER MANAGEMENT

Facilities and maintenance staff can do a great deal to prevent spiders using exclusion maintenance, sanitation, and habitat modification. But it is also critical to educate school staff (e.g., teachers, administrators, etc.) about their role in spider management. The following methods provide details for each of these non-chemical approaches.

1. Educate staff about nuisance spiders versus spiders of medical health concern. The following resources are available on the OSU School IPM website: http://www.ipmnet.org/tim/.

- The PNW Pest Press "Spiders" issue. Place hard copies in the staff lounge or main office, or submit sections of the PNW Pest Press to your school or district newsletter, e-mail copies to staff, etc.
- This technical document, or the "IPM for Spiders" handout that is part of the IPM Custodial IPM Training Guide.

2. In the fall, reassure staff that increased spider activity lasts only a few weeks. Encourage staff to be preventative and use IPM in their classrooms and offices:
   - Use breaks (especially summer) to organize and de-clutter as a way of reducing spider habitat and habitat used by their insect prey. Replace cardboard boxes for bins with lids whenever possible.
   - Move stored items from the floor onto tables or shelves, allowing custodial staff to effectively clean along the wall base.
   - Store all food products in containers with snap-tight or screw-top lids to reduce attracting insects that spiders prey on.
3. Custodial staff may use a vacuum attachment or a detached hose to regularly vacuum corners, behind doors, under tables or equipment, in windowsills, behind furniture, and other areas where dust or webbing occur.
4. In spring or summer, inspect exterior doors for gaps, worn-out door sweeps, and damaged thresholds. Replace them prior to fall to help reduce spider movement indoors, which may begin as early as September.
5. Remove debris stacked against buildings, especially near exterior doors and windows.
6. Trim vegetation (trees, shrubs) away from building so it is not touching. Reduce overhang wherever possible. This measure will also help reduce other pest traffic indoors.
7. Repair or replace window screens on windows that staff open. Tight-fitting window screens help keep out spiders as well as wasps, bees, and other flying and crawling pests. Window screens are especially important summer through mid-fall.
8. Replace bright white outdoor lights for a softer, yellow light, which is less attractive to nighttime flying insects. For particularly problematic areas, or if security prevents the use of softer light, ask your district to consider motion-activated lighting in those areas.
9. Place sticky monitoring traps indoors in spider-prone areas to monitor spider activity and guide your management approach.
10. Let your district's culture and spider tolerance levels also serve as a guide. Find common ground with their needs and your resources to prevent and manage. Consider establishing nuisance spider thresholds and adding them to your district's IPM Plan.

ADDITIONAL IPM MEASURES FOR WESTERN BLACK WIDOW SPIDER MANAGEMENT

The western black widow adult female is a recurring pest in many southern and eastern Oregon schools. Given the toxicity of the adult female's venom, this spider should be a zero-tolerance pest: even one warrants action. Staff awareness and involvement in the prevention of this pest is particularly important.

1. **Make sure your specimen is a widow spider, not one of several "mimics" such as the false black widow (*Steatoda grossa* or other *Steatoda* species)**. The western black widow adult female has a red hourglass on the underside of her abdomen, whereas the false widow spider does not. If in doubt, contact your nearest OSU Extension Office and arrange to have your specimen identified.
2. As with general spider management, staff education about their role is important; however, caution is important with the western black widow spider:
    - never place fingers – or finger tips – where they cannot be seen. During the day, widow spiders hide near their web in cracks or holes, or under ledges – such as the "lip" of a container. The sudden appearance of a finger may be perceived as a threat, and could elicit a defensive bite.
    - wear thick gloves when working with clutter or stored materials, in sheds, greenhouses, or in electrical and irrigation boxes.
3. Sanitation is critical in preventing widow spiders. Remove clutter, and occasionally inspect stored equipment. If removal is impractical, relocate clutter away from the building, and store equipment in a locked space.
4. Children's outdoor toys that are stored in bins or boxes should be inspected and brought indoors nightly to prevent widow spiders from inhabiting them.
5. Inspect the building exterior regularly. Use gloves and tools to peer inside of electrical boxes, irrigation boxes, etc. enclosed features. Note areas where widow spiders are found, as a new one may eventually take its place.
6. Hand-held vacuums, stiff brooms, and spray-washers can be used to remove adults and egg sacs from the building exterior. Vacuum contents should be carefully double-bagged, tied, and discarded in a dumpster. The best time to do this is early spring (prior to hatches) and fall (after egg sacs have been laid).

SPIDER IDENTIFICATION AND RESOURCES

Identification of the spiders mentioned here can be done using an accurate information source (see "Further Reading"), good lighting, and a hand lense or magnifying glass. School facilities staff may attempt identification themselves, or ask for professional assistance. If your identification efforts conclude that you have a spider of medical concern or is otherwise of concern to those in your district, it is best to obtain confirmation from an entomologist or other professional skilled in spider identification before investing significant resources into its management.

For professional assistance with spider identification, contact one of the following resources. You will need to obtain specific instructions on how to mail your spider specimen for identification:

- **Oregon State University County Extension Offices.** OSU maintains an Extension office in every Oregon county. Staff can assist you with your spider questions and

identification. Assistance is provided free of cost. Find your county Extension office by going online to:
http://extension.oregonstate.edu/find-us, or by calling 541-737-2713.

- **Oregon State University Insect ID Clinic**. This clinic is housed on the main campus in Corvallis, Oregon. This resource is available at cost. To learn more, go online to the Insect ID Clinic homepage, and click on "services":
http://www.science.oregonstate.edu/bpp/insect_clinic/index.htm

- **The Oregon Department of Agriculture Insect Lab**. The insect lab is a resource within the Plant Programs, Insect Pest Prevention and Management division. This resource is provided free of cost. To learn more, go online to:
http://www.oregon.gov/ODA/PLANT/IPPM/pages/oda_museum_insect_id.aspx,
or call 503-986-6459

FURTHER READING
For additional information on spiders, identification, or their management:

- Bechinski, E. A., D. J. Schotzko, and C. R. Baird. "Spiders Around the Home and Yard." University of Idaho Extension, Bul 871. Found at:
http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0871.pdf
- Hedges, S. A., and R. S. Vetter. 2012. *Field Guide for the Management of Urban Spiders* (2nd ed). Pest Control Technology. Cleveland, OH: GIE Media.
- Vetter, R., and A. Antonelli. How to Identify (or Misidentify) the Hobo Spider. Found at:
http://pep.wsu.edu/pdf/PLS116_1.pdf
- PNW Pest Press: "Spiders". Oregon State University School IPM Program. Found at:
http://www.ipmnet.org/tim/IPM_in_Schools/IPM_in_Schools-Main_Page.html
- University of California IPM Online. "Spiders." Found at:
http://www.ipm.ucdavis.edu/PMG/invertebrates/links.spiders.html

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http://www.cals.uidaho.edu/edComm/pdf/BUL/BUL0871.pdf

[2] Binford, G. J. 2001. An analysis of geographic and intersexual chemical variation in venoms of the spider *Tegenaria agrestis* (Agelenidae). Toxicon 39(7): 955-68.

[3]Oregon Department of Agriculture, "Oregon Spiders". Found at:
http://www.oregon.gov/ODA/PLANT/IPPM/pages/spiders.aspx

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[5]Vetter, R. S., A. H. Roe, R. G. Bennett, C. R. Baird, L. A. Royce, W. T. Lanier, A. L. Antonelli, and P. E. Cushing. 2003. Distribution of the Medically-implicated Hobo Spider (Araneae: Agelenidae) and a Benign Congener, *Tegenaria duellica*, in the United States and Canada. Journal of Medical Entomology 40(2): 159-164.

[6]Vetter, R. S., G. K. Isbister, S. P. Bush, L. J. Boutin. 2006. Verified Bites by Yellow Sac Spiders (Genus *Cheiracanthium*) in the United Stated and Australia: Where is the Necrosis? American Journal of Tropical Medicine and Hygiene 74(6): 1043-1048.

[7]Gaver-Wainright, M. M., R. S. Zack, M. J. Foradori, and J. C. Lavine. 2011. Misdiagnosis of Spider Bites: Bacterial Associated, Mechanical Pathogen Transfer, and Hemolytic Potential of Venom From the Hobo Spider, *Tegenaria agrestis* (Araneae: Agelenidae). Journal of Medical Entomology 48(2): 382-388.