

## IPM for Spiders and Ticks in Schools

### Spiders

#### INTRODUCTION

Despite their small size, spiders have evoked fear and revulsion in humans throughout history. Nursery rhymes and horror films malign them, but fears about spiders are largely unwarranted since most spiders are too small or have venom too weak to harm humans. In fact, they provide a great benefit to mankind by consuming vast numbers of insects in and around our homes and schools.

Spiders have 8 legs and 2 body regions, the cephalothorax (a head joined with a thorax) and abdomen. They lack wings and antennae. Almost all spiders have fangs and venom, but only a few are considered dangerous to humans, so it is important to be able to differentiate between relatively harmless spiders and those that should be avoided and/or controlled.

The species of spider that causes the most concern in the home or school environment in Pennsylvania is the black widow spider. Since there have been reports of the brown recluse spider being found in Pennsylvania, some information concerning it will be included. Both of these spiders are potentially dangerous to humans, and their bites may cause severe reactions or even death. However, these spiders usually will bite only if provoked, and then only under certain circumstances.

Other spiders that may produce painful bites or be of health importance may be grouped as:

1. Active hunters: some wolf spiders, jumping spiders and sac spiders.
2. Web builders: some cobweb spiders and funnel weavers (Mallis, 1997).

It is prudent to use caution when handling any larger spiders, even though most are harmless. Generally, spiders are not aggressive. Most bites occur when a spider accidentally becomes trapped against the skin or when a person picks it up.

#### REMOVING A RELATIVELY HARMLESS SPIDER

Most spiders found in and around a school can be used as an educational opportunity to teach some interesting facts about these fascinating creatures. If any spider found in the classroom creates anxiety on the part of the teacher or children, and the teacher wishes to remove it, invert a container of some sort over the spider, slide a stiff piece of paper over the mouth of the container, and then release the spider outside.

Most of the information in this chapter is from:

*IPM for Schools: A How-to Manual*. United States Environmental Protection Agency. EPA 909-B-97-001. March 1997.  
Green, S. G., and C. W. Rutschky. *Poisonous Spiders*. The Pennsylvania State University. Entomology-Public Health 85-1.

Illustrations on pages 87–89, by Cristol Gregory.

#### GENERAL SPIDER MANAGEMENT

You can manage the number of spiders in an area by reducing their food supply. If flies are getting in, screens should be installed or repaired. Security lighting may attract insects at night, and spiders feed on them, so outside lighting should not be placed directly over a doorway. Insects also may be attracted to poorly stored food or mishandled organic wastes. Eliminating the food source for these insects will reduce the food source for the spiders.

Removing debris and excess clutter also will reduce the number of harborage sites available. Debris and stacks of wood, pallets, blocks, and similar materials should be moved a distance from schools and elevated off the ground as much as possible. Vegetation should be removed from the sides of buildings and grass should be kept mown. For spiders already in residence, removing their webs and egg sacs discourages subsequent infestation. In most cases, vacuuming and reducing the spiders' food source will be sufficient to manage the problem.

The two potentially dangerous spiders—the black widow and the brown recluse—nest in undisturbed areas, often near the floor; therefore, thorough vacuuming in these areas from time to time also can help in their control.

A wide variety of chemicals are available for the control of spiders. **Pennsylvania law allows pesticide applications in schools only by certified applicators, registered technicians, or by non-certified applicators or non-registered technicians under the direct supervision of a certified applicator. Notification must be given to all staff and parents or guardians of students who request it 72 hours prior to pesticide use. Warning signs must also be posted in the vicinity 72 hours prior to and for 48 hours after the application. The law also mandates a 7-hour reentry period for common access areas whenever pesticides are applied.** Misapplied chemical treatments may cause more harm than the real or perceived threat from spiders. Crack and crevice treatments may be necessary for the hunting spiders.

### Black Widow Spiders

#### IDENTIFICATION AND BIOLOGY

There are several species of widow spiders in the United States, but the black widow (*Latrodectus mactans*) is the only native species found in Pennsylvania.

The adult female black widow is normally a shiny, jet-black spider about  $\frac{1}{2}$  inch in body length. With legs extended, the female measures about  $1\frac{1}{2}$  inches long. The female has the well-known reddish hourglass marking on the underside of her abdomen. Because their webs are near the ground and the spiders hang upside down in the web, their distinctive marking is readily apparent. The adult male, which is not dangerous, is small (about  $\frac{1}{6}$  inch long) and patterned with black and white body markings.

Black widows like dry, undisturbed places, such as lumber and rock piles, stacked pots or baskets, rodent burrows, water meters, the underside of bricks and stones, and dry crawl spaces. Females stay in the web.

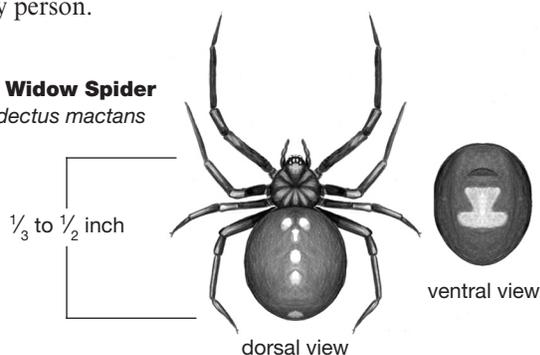
The female black widow spider spins an irregular, tangled web. The webs are typically constructed in quiet, undisturbed locations that are usually—but not always—close to the ground. The female spends her entire life in the web. If disturbed, she may drop to the ground to escape. Her eggs are placed in white, spherical sacs within the web. After hatching, the young spiders stay near the sac for a few hours to several days, and then climb to a high point, wait for suitable air currents, and spin a silken thread so they can float on the breeze like a kite. This method of “ballooning” distributes them over a considerable distance. Once they land, the spiders begin to construct their own webs. The abdomen of a young black widow is patterned with red, white, and yellow, but has the black legs and general appearance of the adult.

## BITES

Black widows are shy, retiring creatures that bite reluctantly, and then only in self-defense when threatened. However, when a female is defending her egg sac, she can become quite aggressive.

A bite may not cause pain at first. However, after a few minutes, the bite site becomes quite painful. Symptoms from the bite of a black widow include headache, general body ache, nausea, chills, slight fever, shortness of breath, intense muscle pain, and rigidity of the abdomen and legs. Seek medical attention. If reactions are mild, treatment usually is not administered. However, medicine is available if symptoms do become severe. The bite of the black widow is usually more serious for a small child or an elderly person.

**Black Widow Spider**  
*Latrodectus mactans*



## First Aid for Spider Bites

Wash the area around the bite, calm the victim, and consult a doctor as soon as possible. Those particularly at risk are the very young, the elderly and sick, or people with high blood pressure. Although the illness and lesions from bites of some of the spiders discussed here can be serious, deaths are rare.

If possible, capture the spider so the specimen can be taken to a doctor. Proper treatment may depend on identifying the species. Even the squashed remains of the spider can be useful for identification purposes.

## DETECTION AND MONITORING

Monitor for black widows at night with a flashlight or headlamp. This is the time when they move to the center of their webs and will be most visible. When making your inspections, focus on areas that are dark and undisturbed during the day, but not necessarily close to the ground.

Look in and around the following places:

- small crevices anywhere from the foundation to the eaves of buildings
- the undersides of outdoor wooden furniture (for example, beneath the seats in the corners where the legs are braced)
- piles of wood, bricks, stones, or similar materials
- the openings of rodent burrows
- water meters
- cellar doors
- outhouses
- storage rooms

Black widow webs have high tensile strength and, with a little experience, can be identified by the way they “pop” when broken. An experienced pest manager can use this information to find webs during the day.

## Brown Recluse Spiders

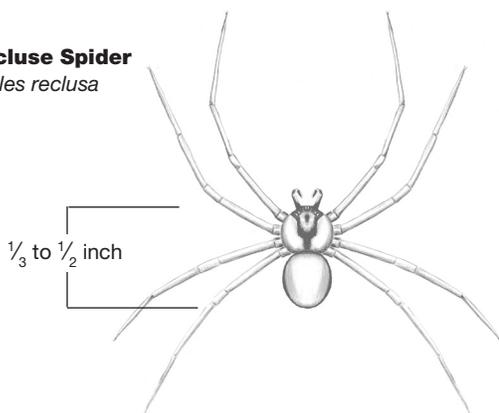
### IDENTIFICATION AND BIOLOGY

Brown recluse spiders (*Loxosceles* spp.) are extremely uncommon in Pennsylvania and probably are found only in boxes brought in from the south. One species, *Loxosceles rufescens*, may be found in basements and utility tunnels. Brown recluse spiders, *L. reclusa*, are identified by their long, thin legs, an oval-shaped abdomen which is light tan to dark brown in color, and a very distinctive violin-shaped mark on their back. This marking, with the violin

“body” near the eyes and the “stem” of the violin extending backwards gives rise to their other common name, violin spiders. They have six eyes in three groups of two. Their overall size is  $\frac{3}{4}$  inch to  $1\frac{1}{4}$  inches long with the legs extended. The males are slightly smaller than the females.

As the common name “recluse” suggests, these spiders are shy, retreating from humans when possible. They prefer to build their webs in dark, undisturbed places on or near the ground. Unlike the black widow, brown recluse spiders hunt for prey some distance from their webs. They usually come into contact with humans because they have taken temporary refuge in clothing or bedding. Items left lying undisturbed on the floor, such as supplies, toys, or clothing, are perfect daytime refuges for these spiders. Such objects should be shaken out thoroughly if they have been on the floor for any length of time, particularly in regions where the brown recluse is prevalent.

**Brown Recluse Spider**  
*Loxosceles reclusa*



**BITES**

Brown recluse spiders avoid areas of human activity. Bites are rare and are usually the result of unused rooms suddenly being put to use, or accidental contact resulting from pressing the spider between the body and either clothing or sheets. The bites are almost always very unpleasant, producing an ulcerous wound called a necrotic lesion that turns dark within a day and takes a long time to heal. Young children, the elderly, and the infirm are most likely to be affected severely. Victims should seek medical attention.

**DETECTION AND MONITORING**

The brown recluse spider wanders at night searching for prey. It seeks dark, uninhabited areas for protection. Brown recluse spiders usually are found on floors and baseboards. Only rarely are they seen on desks and tables.

Searches for this spider should concentrate on uninhabited areas close to the floor, particularly in boxes, around piles of paper, clothing, and debris, in closets, and under furniture. Periodic checks outdoors should focus on storage sheds, piles of debris or wood, cracks in the

soil or in foundations, walls, and window wells, especially if small children play near these places. Employing sticky traps in monitoring is useful in establishing the extent of brown recluse infestations, and also is helpful in providing a measure of control.

**AVOIDING SPIDER BITES**

If either of these spiders is found around your school, it is important to be cautious when working near these places. Gardeners and custodians should be careful about where they put their hands when doing outdoor work, and wear gloves and a long-sleeved shirt when working around woodpiles and other items stored outdoors that are likely to harbor the spiders.

Make sure students and staff can identify any dangerous spiders in your area and know their likely nesting and hiding places. Children should be taught not to tease spiders in their webs or poke at them, and not to put their hands in dark crevices without looking first. The dangers of spider bites should be explained without exaggeration to avoid unnecessary fears. Teach students and staff that black spiders they see walking around are not likely to be black widows, since the females do not travel away from their webs and the males are not dangerous.

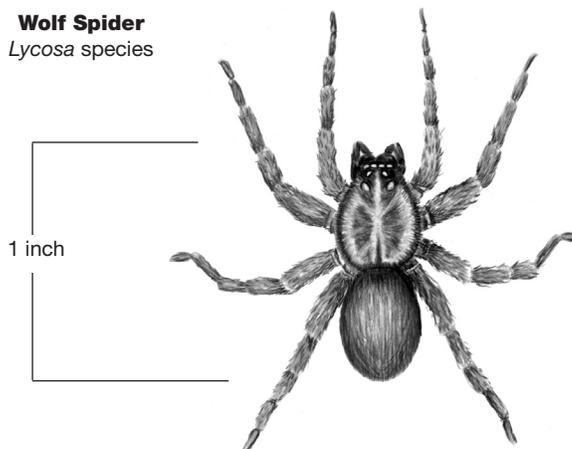
**Other Spiders of Concern**

**Wolf spider (Lycosidae)**

These large spiders are sometimes found indoors in basements in late summer and fall when cooler temperatures arrive. They do not construct webs, but run rapidly after prey. They are not aggressive, but may bite if handled. The bite is generally not dangerous.

These and other spiders are best managed by cleaning and exclusion—keep screens in good repair, fix gaps around doors, and caulk cracks around window frames, as well as around pipes and wires coming into the building.

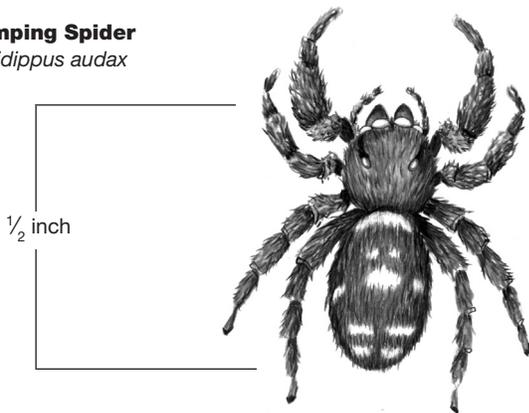
**Wolf Spider**  
*Lycosa species*



### Jumping spider (*Phidippus audax*)

These spiders move in jumps or short rapid runs. They are hairy, stocky, and about  $\frac{1}{2}$  inch long. This species is black with spots of orange or red on the top surface of the abdomen. At times, they are confused with black widow spiders, which are not at all hairy. Active during the day and usually outdoors, sometimes they are found inside on walls, windows, and screens. They can bite. Generally, they do not appear in large numbers and can be removed individually.

**Jumping Spider**  
*Phidippus audax*



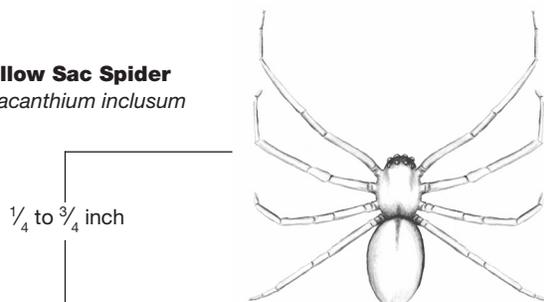
### Yellow sac spider (*Chiracanthium spp.*)

These spiders have been associated with numerous cases of spider bites and cause a small irritating spot which may not heal for 8 to 10 days. They are suspected of being responsible for most indoor bites (Lyon, 1995).

This yellow spider, which is about  $\frac{1}{4}$  to  $\frac{3}{4}$  inch long, may have a greenish tinge to the abdomen. The jaws are brown and the legs are very smooth, with the front legs longer than the rear. The egg sac is a white, paper-like disk usually placed in a protected area, such as under a stone.

They enter buildings principally in the early fall and are active for several months. They make small white webs in confined spaces where they spend the winter. In spring, they usually emerge from their white web cells and find their way outside. Outdoors, they do not build webs but instead construct a flat tubular sac opened at both ends inside rolled leaves or crevices, or under loose bark or stones.

**Yellow Sac Spider**  
*Chiracanthium inclusum*



## MANAGEMENT OPTIONS

### Physical Controls

To achieve some kind of permanent control of black widow spiders, you must attempt to eliminate not only the spiders but their preferred habitats as well. If this is not accomplished, another black widow may locate the same habitat and move in. If black widows regularly build their webs in certain locations indoors, try to modify these areas by increasing the light, caulking crevices, or reducing the insect population the spiders are feeding upon. As previously mentioned, check window and door screens for holes that give insects access, and make sure that foods and organic wastes are stored properly to prevent insect infestations. To reduce or eliminate possible web sites outdoors, debris and litter should be removed and discarded. All crevices in foundations and walls that are child-height and wide enough to stick a finger into should be caulked closed.

Because many spiders prefer undisturbed places for nesting and hiding, periodic, thorough cleaning can help reduce their numbers. Floors should be kept well vacuumed. Boxes of paper and other items stored in closets, or anywhere else that is dark and undisturbed, should be handled carefully when first inspected. A small hand-held, battery-powered vacuum also can be used while checking through stored items. If a spider is vacuumed up, the vacuum bag can be placed into a plastic bag and then into a freezer. Most bites from spiders probably occur when a spider is disturbed or handled. Wearing leather gloves while searching through stored items can help prevent bites.

## Ticks

### INTRODUCTION

Ticks are important because they can transmit human diseases. They are not insects but relatives of spiders. Adult ticks have 8 legs and insects have 6. Ticks are ectoparasites, and thus must take a blood meal from a host for each stage of their life cycle in order to survive and reproduce. Their life cycle includes egg, larva, nymph, and adult stages. The larval stage has 6 legs, but when it molts to the nymph stage, there are 8 legs. Ticks cannot fly or jump. Many tick species can transmit organisms such as parasitic worms, viruses, bacteria, spirochetes, and rickettsias to humans. The most important of these diseases in Pennsylvania are Lyme disease, caused by a spirochete, and Rocky Mountain spotted fever, a rickettsia. Some other diseases for which ticks are vectors include tularemia, babesiosis, ehrlichiosis, Powassan encephalitis, tick-borne typhus, and tick paralysis. Information about these diseases is available from many sources.

### TICK LIFE CYCLE

Ticks have few natural enemies and a wide range of hosts. They typically take one blood meal in each of the three parasitic stages: larva, nymph, and adult. Both sexes are blood feeders, with the female becoming greatly distended with blood after mating and then producing many eggs.

**Larvae.** Normally thousands of tiny larvae (“seed ticks”), with only 6 legs, hatch from an egg batch and crawl randomly in search of a host. When they find a small mammal or other host, they attach themselves and feed for a few hours up to three days, depending on the species. During feeding, the host wanders and the tick is transported where, when engorged, it drops off.

**Nymphs.** After molting, nymphs have 8 legs and climb grass leaves or plant stems to wait for a host to walk by. Because they are higher than ground level, they tend to attach to larger hosts than before. After several days of feeding they drop off and again molt.

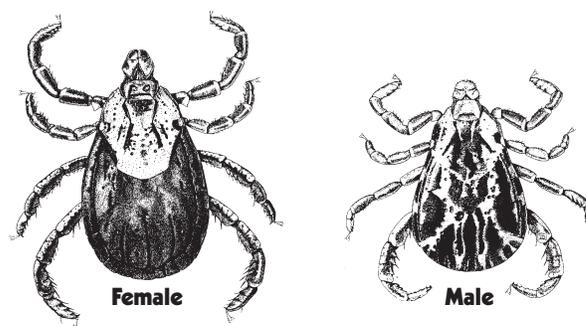
**Adults.** Ticks sometimes can wait for months to more than a year for a suitable host. They seek the host by climbing vegetation and wait for vibrations or shadows to announce the presence of a host. The first pair of legs is extended and used to grasp the host when contact is made. This behavior is known as questing.

The height at which questing occurs determines the size of the host. When finally engorged, they drop off to lay as many as 6,000 to 7,000 eggs.

When feeding, the tick uses its “teeth” (chelicerae) to cut the victim’s skin and then inserts its mouthparts. The feeding tube (hypostome) has many rows of barbs that anchor the tick to its host, making it difficult to withdraw by external force. Blood is pumped by a muscular pharynx and the salivary glands produce an anticoagulant that allows long periods of feeding without the host’s blood coagulating. Pathogenic organisms are most often introduced into the host in the tick’s saliva.

### TYPES OF TICKS

Four species of ticks are most commonly encountered in Pennsylvania. They are the American dog tick, *Dermacentor variabilis*, the blacklegged tick, *Ixodes scapularis*, (formerly known as the deer tick), the lone star tick, *Amblyomma americanum*, and a groundhog tick, *Ixodes cookei*.



**American Dog Tick (*Dermacentor variabilis*)**

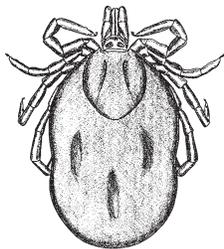
(Illustrations from *Ticks of Veterinary Importance*.  
USDA Ag Handbook No. 485.)

**American dog tick** is the most commonly encountered tick in Pennsylvania. The immature stages often are found on rodents, while the adults frequently are found on dogs. The American dog tick has distinctive white markings on its back and is about 5 mm long with short, stout mouthparts. When feeding, the adult becomes greatly engorged.

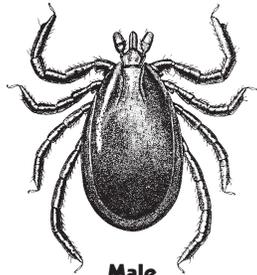
The American dog tick is the major carrier of Rocky Mountain spotted fever. It can also transmit tularemia, and cause tick paralysis. It cannot transmit Lyme disease spirochetes.

Some of this material has been adapted from:

Jacobs, S. B. *Four Common Ticks of Pennsylvania*. The Pennsylvania State University. [www.ento.psu.edu/extension/factsheets/common\\_ticks.htm](http://www.ento.psu.edu/extension/factsheets/common_ticks.htm). 1998.  
Klass, C. *Integrated Pest Management for the Deer Tick*. Cornell University.  
*Public Health Pesticide Applicator Training Manual*. University of Florida. American Mosquito Control Association Public Health Pest Control Web site: [vector.ifas.ufl.edu](http://vector.ifas.ufl.edu)



Female



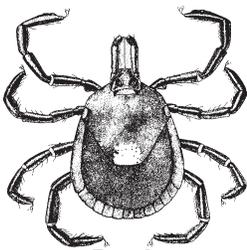
Male

### **Blacklegged Tick (*Ixodes scapularis*)**

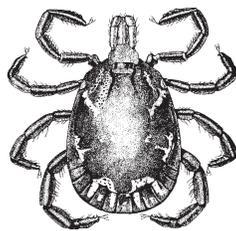
(Illustrations from *Ticks of Veterinary Importance*.  
USDA Ag Handbook No. 485.)

**Blacklegged tick** is found in over half of the counties in Pennsylvania. Larvae and nymphs feed on small animals and birds such as squirrels, mice and grouse. Adults prefer deer. Any stage can feed on humans. The adult female is reddish and is about 2–3 mm in length with long mouthparts.

This tick is well known as the vector of Lyme disease and has been known to carry babesiosis, an uncommon, generally mild febrile disease. This tick typically requires more than 24 hours of attachment before it can transmit the Lyme disease spirochete.



Female



Male

### **Lone Star Tick (*Amblyomma americanum*)**

(Illustrations from *Ticks of Veterinary Importance*.  
USDA Ag Handbook No. 485.)

**Lone star tick** is found most often in the southern counties of Pennsylvania. The larvae feed on small animals, while the nymphs feed on many small and larger animals. Adults are usually found on larger animals, and all stages can be found on deer and will feed on humans. This tick is light reddish brown, and most adult females have a central white spot on the back. This tick is about 5 mm in length with long mouthparts.

The lone star tick is known to be a vector of tularemia, ehrlichiosis, tick-borne typhus, Rocky Mountain spotted fever, and causes tick paralysis.

**Groundhog tick** is the least commonly encountered of the four species listed here. It resembles the blacklegged tick and is about the same size. It is host-specific for groundhogs, but can be found on birds, small animals, or humans. It is not considered to be an important vector of diseases since it tends to feed mostly on groundhogs, although it has been found to be a vector of Powasson encephalitis.

## **MONITORING FOR TICKS**

### **Dragging and Flagging**

Monitoring for ticks is routinely done with a tick drag, a soft, white 3' x 3' cloth stapled to a dowel to which a cord is attached, with a second dowel or board at the end to weigh the cloth down. Questing ticks grab onto the cloth as it is dragged over grass and brush. The drag is inspected for ticks at fixed intervals; for example, 10 paces in an area of relatively high tick density or 100 meters in less dense infestations. Tick drags will not work when the vegetation is damp or wet.

Flagging is similar, but a smaller cloth, the flag, is attached to one end of a pole with the other end used as a handle. The flag is brushed over higher vegetation such as thick understory in wooded areas and brush and shrubs in open areas, or in edge habitats and along property borders where vegetation is thicker. Ticks are usually found within 18 inches of the ground.

Drag or flag sampling will collect only 1 of 10 ticks in an area. Repeated sampling at different times will increase the likelihood of finding a tick. Be sure to heed the suggestions in the following section on "Prevention" if you plan to sample for ticks.

## **MANAGING TICKS**

### **Prevention**

- Wear light-colored clothing to make spotting ticks easier.
- In areas infested by ticks, wear long sleeves and long pants tucked into boots or socks.
- Walk in the center of paths, and avoid brushing against vegetation.
- Repellents greatly enhance protection. Repellents containing DEET have been found to be most effective.
- Examine yourself carefully for ticks after leaving the woods or tick-infested areas. Check especially the hair, shoulders, armpits, waist, and inner thighs.

### Removal of Ticks

- Use forceps or tweezers to remove attached ticks. Firmly grasp the tick where it attaches to the skin and pull with a slow steady motion until it is removed. It may be firmly attached; continue to pull patiently until it is out.
- Disinfect the bite with rubbing alcohol.
- Avoid removing the tick with bare fingers. If you squeeze the tick, it can force the stomach contents back up through the hypostome.
- Do not apply mineral oil, petroleum jelly, heat, or anything else to remove the tick as this may cause it to inject a pathogen into the wound.
- Save the tick for future identification should you later develop disease symptoms. Preserve it by placing it in a clean container (such as a vial or Ziploc bag) and keep it in the freezer. Identification of the tick will help a physician diagnose the disease, since many tick-borne diseases are transmitted only by certain species.

### Sanitation and Exclusion

- Manage the landscape to lower the humidity where ticks are likely to be found.
- Reduce cover for mice, the principal reservoir host of the Lyme disease spirochete. Eliminate wooded, brush-covered habitat; prune lower branches of bushes to reduce habitat for mice; and clean up storage areas, woodpiles and junk piles.
- Immature ticks are most abundant in areas where deer are abundant. Keep deer away by reducing deer habitat or fencing them out.
- Remove leaf litter and plant grass under shade trees to help reduce tick abundance.

Blacklegged ticks require high humidity. Heavily shaded, damp (but not flooded) areas covered with leaf litter are ideal. Sites where host animal activity is concentrated are also important. Blacklegged ticks are often found in woodlots or wooded areas between lots, along edge habitats, and especially in unmaintained borders as well as along rock walls, woodpiles and brushpiles. Sites generally have a heavy understory of growth. All stages are rare on maintained lawns and are rarely found in open sunny areas.

### Chemical Control

Appropriate acaricides applied at the peak of nymphal populations can reduce tick populations significantly. A second application in later September or early October may control the adult ticks.

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