



Ticks and Tick-borne Diseases in Iowa

More than a dozen species of ticks can be found in Iowa, but the three most commonly encountered species are the blacklegged tick or deer tick, the American dog tick or wood tick, and the lone star tick. In general, these ticks are active from March through November (Figure 1). This publication provides information and additional resources regarding these three species of common Iowa ticks, the most important tick-borne illnesses of humans and animals, and methods for preventing tick bites and exposure to tick-borne diseases.

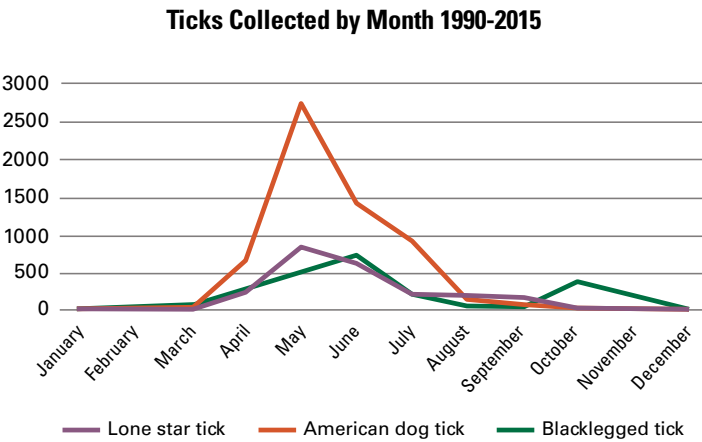


Fig. 1. Numbers of the three major Iowa tick species submitted to the Lyme Disease Surveillance Program from 1990-2015 are shown according to months of the year.

Tick Biology

The three tick species most often seen in Iowa are the so-called “hard ticks” because of a hard, shield-like structure found on their backs. The hard tick life cycle begins when a mated, blood-fed female deposits a thousand or more eggs in a mass on the ground. Larvae emerge from the eggs and develop into nymphs, which then become adults (Figure 2). Immature ticks (larvae and nymphs) must bite a host and feed on blood before they can develop to the next stage. Larval ticks (also known as “seed ticks”) can be distinguished from nymphs and adults by their small size and six legs. Nymphs and adults are larger and have eight legs. The ticks of medical importance in Iowa all feed on a variety of separate small vertebrate hosts (typically rodents or birds) as larvae and nymphs, then on larger hosts as adults.

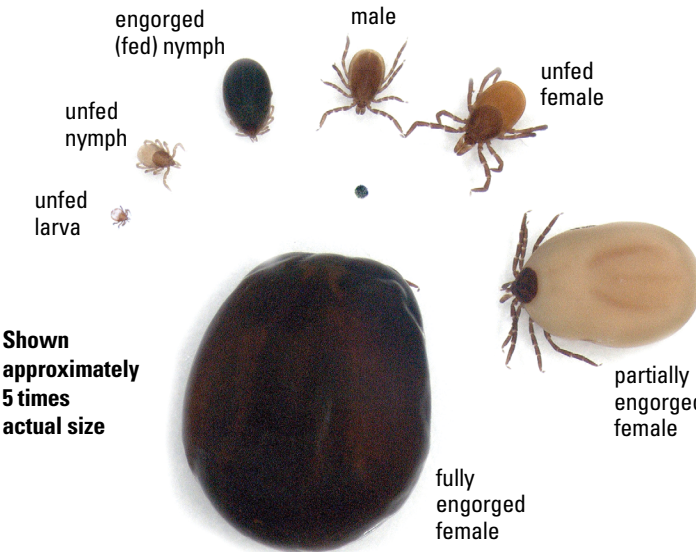
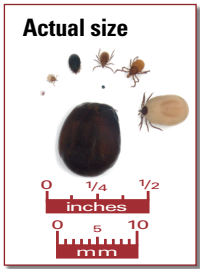
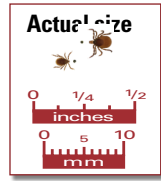


Fig. 2. Active life stages of the blacklegged tick. For size reference, ticks are placed near a period (12 point, Times New Roman font) that is approximately 0.8 mm in diameter. Photo by Jeffery Alfred, USDA/APHIS/VS/NVSL.





The blacklegged tick or deer tick

Ixodes scapularis

The blacklegged tick is of greatest importance to Iowans because it can transmit bacteria that cause Lyme disease (*Borrelia burgdorferi*). These ticks are most abundant in northeastern and eastern Iowa, but they have been reported in the majority of the state's 99 counties (Figure 3). Nationwide, this tick's range extends from the East Coast through the Midwest and Gulf States, into the Great Plains. This species often is associated with oak forests.

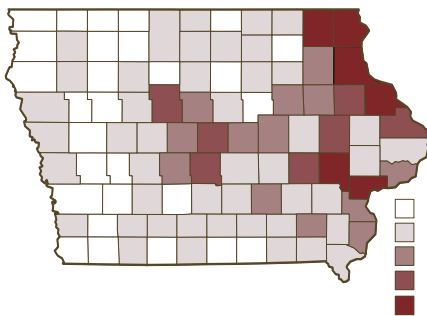


Fig. 3. Iowa counties from which **blacklegged ticks** were submitted to the Lyme Disease Surveillance Program, 1990-2015.

0 Ticks submitted
1-10 Ticks submitted
11-50 Ticks submitted
51-100 Ticks submitted
> 100 Ticks submitted

The blacklegged tick is a three-host tick (feeding on three different host individuals during its lifetime) completing its life cycle in two years in Iowa. Adults are active during the spring and fall. Nymphs and larvae are active during early and late summer, respectively. Eggs hatch in the spring or summer.

Adults and nymphs of blacklegged ticks generally have black or dark brown legs, mouthparts, and backs (Figure 2). Both larvae (about 0.8 mm) and nymphs (about 1.6 mm) are small and difficult to detect. The most commonly found are adult females, which when unfed are only slightly larger than a sesame seed (about 3.5 mm). Males are usually smaller (about 2.6 mm).

Seasonal Activity of the Blacklegged Tick

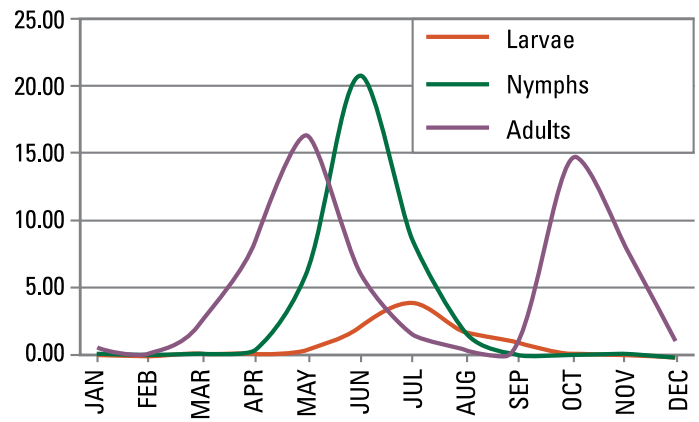


Fig. 4. Seasonal abundances of the three active life stages of the blacklegged tick are presented as a percentage of total yearly tick submissions, 1990-2009. Numbers of blacklegged ticks infected with the Lyme disease bacteria are highest in May and October for adults, and in June for nymphs. Nymphs are most likely to transmit the Lyme disease agent to people.

The seed ticks (larvae) climb short distances from the ground to wait on plants (questing) so they can attach to a passing small animal (usually mice) to feed. After feeding, larval ticks drop from the host and develop into nymphs. Nymphs will bite almost any mammal including humans, birds, or reptiles. Adults attach to a final host, usually larger mammals like deer, dogs, raccoons, foxes, or humans. After mating and feeding, adult females drop from the host, lay eggs, and die.

If a larva or nymph feeds on an animal infected with Lyme disease bacteria, it can be infected and can pass the bacteria to other animals as it feeds during its next stage. Nymphs are the real villains for humans in the Lyme disease infection cycle. They are so small that people may not know they have been bitten until the ticks have been attached for 36 hours – the minimal amount of time for transmission to occur in most cases.



The American dog tick or wood tick

Dermacentor variabilis

The American dog tick is the most commonly encountered tick in Iowa. These ticks are common throughout the eastern, southern, and midwestern United States. In addition, some populations have become established along the western coast of the U.S. Locally, every county in Iowa has this tick, which is active from late March through August. The tick's life cycle may be completed in one or two years in Iowa.

The female American dog tick is large, with a patterned, cream-colored shield covering the front portion of the body. The male is usually smaller, with a cream-colored shield that covers almost the entire upper body. Both are usually a chocolate brown color (Figure 5). Larvae and nymphs usually feed on small mammals, especially rodents. Adult ticks most often feed on dogs and other large mammals, including humans.



Fig. 5. Adult forms of the American dog tick. From left to right: male, unfed female, and engorged female. For size reference, ticks are placed near a period (12 point, Times New Roman font) that is approximately 0.8 mm in diameter. Photo by Jeffery Alfred, USDA/APHIS/VS/NVSL.

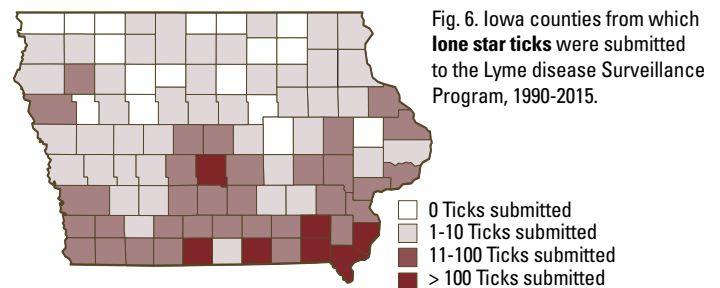
American dog ticks are carriers of the bacteria (*Rickettsia rickettsii*) that cause Rocky Mountain spotted fever. This disease is rarely seen in Iowa – only 106 cases were reported from 1990 to 2014. These ticks also can transmit the bacteria (*Francisella tularensis*) that cause rabbit fever. In addition, they may cause tick paralysis, an uncommon but potentially fatal malady in which a female tick that has been attached for days paralyzes its host, though the paralysis disappears within a few hours of the tick's removal.



The lone star tick

Amblyomma americanum

Lone star ticks can be found from Texas to Florida in the south, north into the Midwest as far as eastern Nebraska and Iowa, and up the East Coast into Maine. These ticks are now found throughout Iowa, although they are most common in the southern counties (Figure 6) and their range is expanding northward. They are most active from April through September, and they have a two-year life cycle in Iowa.



Although slightly smaller than American dog ticks, adult females are still fairly large and possess a distinctive white or cream-colored spot, or "lone star," on the back, whereas males are smaller and lack this mark. These ticks are usually caramel brown in color (Figure 7). All active stages will feed readily on humans, other mammals, and even birds.



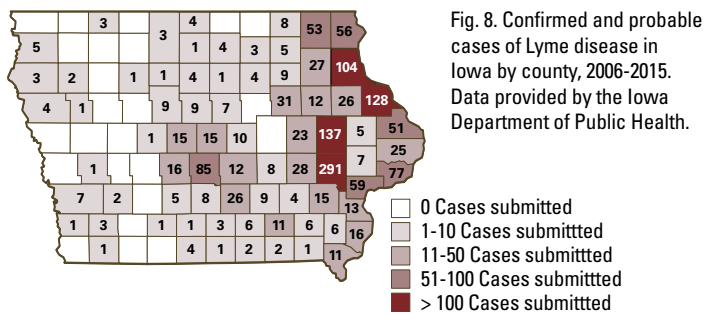
Fig. 7. Nymph and adult forms of the lone star tick. Clockwise, from bottom left: unfed nymph, engorged nymph, male, unfed female, and engorged female. For size reference, ticks are placed near a period (12 point, Times New Roman font) that is approximately 0.8 mm in diameter. Photo by Jeffery Alfred, USDA/APHIS/VS/NVSL.

Lone star ticks can transmit the bacteria that cause rabbit fever (*F. tularensis*), canine and human granulocytic ehrlichiosis (*Ehrlichia ewingii*), and human monocytic ehrlichiosis (*E. chaffeensis*). Although this tick is often encountered because of its range across Iowa, a low percentage of ticks are usually infected.

Lyme Disease

The Iowa Lyme Disease Surveillance Program (LDSP) was established in 1990 at Iowa State University to respond to growing concern about the disease. Through this program, private citizens, health care providers, and government agencies were encouraged to submit ticks for identification and, in some cases, testing for bacteria transmitted by ticks.

Information collected from the LDSP provided information on what ticks are in the state, at what time of year they are active, and where they are most common. The program also tested blacklegged ticks to determine if they were infected with the bacteria (*Borrelia burgdorferi*) that cause Lyme disease.



Blacklegged ticks also can transmit microbial agents that cause human granulocytic anaplasmosis (HGA, *Anaplasma phagocytophilum*) and human babesiosis (*Babesia microti*). Blacklegged ticks can also transmit viruses such as the one that causes Powassan encephalitis.

Background

Lyme disease is named after Old Lyme, Connecticut, where some of the first cases in the United States were documented in children exhibiting signs of unusual juvenile arthritis. Most cases occur in the Northeast, Mid-Atlantic, and upper Midwest, with fewer cases reported from the Pacific Coast. In Iowa, the numbers of Lyme disease cases have steadily increased. Since 2006 there have been over 1,500 human cases reported in people living across Iowa (Figure 8). Although cases are reported from counties across the state, more cases of disease tend to be reported from those counties (particularly in northeast Iowa) from which the LDSP received the most submissions of blacklegged ticks during its operation.

Signs and symptoms of Lyme disease

Most often, signs and symptoms of Lyme disease in humans become evident 3 to 30 days after being bitten by an infected tick. Lyme disease causes a wide range of symptoms, but the unique sign of infection is a bull's-eye-shaped skin rash, called erythema migrans. It is roughly circular, white in the center, and expands outward

over time. About 70 percent of those who are infected develop this rash, which may be missed if it is out of sight or not intensely colored.

Other less immediate signs and symptoms of Lyme disease include arthritis (especially in the knees), facial paralysis, neurological and cardiac problems, general malaise, and fatigue. Successful treatment for Lyme disease requires antibiotic therapy, and patients treated early in the disease process have a high chance of recovering.

Lyme disease in animals

Lyme disease has been reported in dogs, cats, horses, cattle, and sheep. The most common sign of disease in non-human patients is lameness. Approximately 10 to 20 percent of dogs may develop Lyme disease after being infected and will exhibit signs of fever, joint swelling and lameness (from arthritis), fatigue, kidney damage, heart disorders, and neurological problems. Currently, vaccines are available to protect dogs from infection, but they will not cure an existing infection. Cats may develop Lyme disease as well, with many of the same signs of infection as seen in dogs.

Under everyday conditions, Lyme disease cannot be passed directly from an infected pet to a person. However, companion animals can bring infected ticks into the home, so frequent tick checks on pets, especially during spring and summer months, are highly recommended.

Livestock can fall ill with Lyme disease. Infected horses may show signs of lameness and stiff joints, refusal to feed, depression, laminitis, blindness, spontaneous abortion, encephalitis, and other neurological signs. Cattle also may show signs of lameness, including painful and swollen joints, weight loss, fever, laminitis, and a rash on the udder. In contrast to domestic animals, wildlife, especially the deer and rodents that most frequently serve as tick hosts, seem to be largely unaffected by infection.

Prevention

Prevention is the best method of combating tick-borne disease. Knowing where in the state one might come in contact with infected ticks and avoiding tick bites will help prevent exposure to Lyme disease.

- Wear long-sleeved shirts and long pants, tuck pants into socks.
- Wear light-colored clothing for easier visualization of ticks.
- Use a tick-specific, EPA-approved repellent (e.g., one containing DEET) making sure to follow the manufacturer's instructions. Permethrin-containing repellents also are effective but should be used only on clothing, as directed on the label.

- During tick season, perform regular tick checks at least once a day on yourself and others, including children, especially around the head and neck areas, and on companion animals that have been outside. Knowing the size of the tick is particularly critical, as detection of immature ticks requires extra vigilance.

Removing Attached Ticks

The common folk remedies used to remove ticks can be dangerous and even increase the chances of contracting a tick-transmitted disease. The tick removal method described here is proven to be effective, and is the method recommended by the Federal Centers for Disease Control and Prevention.

- Carefully remove the tick by using tweezers to grasp the tick's mouthparts where they enter the skin. Pull steadily directly away from your skin. Because removing the tick is the main goal, do not be overly concerned if its mouthparts break off in the process. Clean the wound and disinfect the site of the bite.
- It usually takes at least 36 hours for an infected tick to transmit Lyme disease bacteria. If the tick is swollen and is a "gun-metal grey" color, it may have been attached for the minimum length of time needed for transmission.
- Tell your doctor if you experience any possible signs or symptoms of Lyme disease after a tick bite, such as fever, joint pain, rash, or inflammation at the bite site. Symptoms typically develop 3 to 30 days after the bite.
- If you're exposed to a tick in Iowa and are curious to know what species the tick is, place it in a plastic bag with a blade of grass, and send it to:

Plant and Insect Diagnostic Clinic
Iowa State University
327 Bessey Hall
Ames, IA 50011

Submittal forms can be found online at www.ipm.iastate.edu/ipm/info/submit/insect. Please include the following information: if the tick was found on an animal or human, if it was attached, and the date found.

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References and Resources

Centers for Disease Control and Prevention.

<http://www.cdc.gov/lyme/>

Tick Management Handbook. The Connecticut Agricultural Experiment Station, New Haven. This publication is available online at:

<http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1010.pdf>

Guidelines for Removal of Ticks.

http://www.cdc.gov/ticks/removing_a_tick.html

Merck Veterinary Manual.

<http://www.merckvetmanual.com>

American Lyme Disease Foundation.

<http://www.aldf.com>

Iowa Lyme Disease Surveillance Program.

<http://www.ent.iastate.edu/medent>

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