Lyme Disease: Myths & Facts for Tree Care Professionals

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Lyme disease was first discovered in coastal New England in the 1970s and has now spread throughout the northeastern, mid-Atlantic, and upper midwestern regions of the United States. It also occurs in southern Canada, Europe, and Asia. It is caused by a spirochete bacterium called *Borrelia burgdorferi*, which is spread by the bite of a tick—the North American culprit is the blacklegged tick, *Ixodes scapularis*. Lyme disease is unusually complex both in its ecological and medical aspects, and misunderstandings of the disease have led to the proliferation of many myths and legends. Clearing up some of these misunderstandings can help green industry professionals and ordinary residents of Lyme-endemic zones to avoid exposure.

Acorn production predicts future Lyme disease risk.

Myth #1

Lawns are a risky place for Lyme disease. Several researchers have estimated tick abundance on lawns, old fields, shrubby thickets, and deciduous forests of the Northeast. They are unanimous in finding that lawns and grassy fields support the lowest abundances of ticks, with forests having by far the highest. The difference between the tick population in a lawn and adjacent forest can be 100-fold. Blacklegged ticks are unable to live out their life cycle in a lawn. Ticks can be transported from woods to lawns by mammals and birds, but they don't persist for very long, because the ticks are sensitive to desiccation and over-heating.

Myth #2

Edges are risky for Lyme disease. Much less research has addressed this assertion, but the few studies that have, reject it. In southeastern New York State, studies show that tick abundance is much higher in the forest interior than it is on forest-field edges. Some studies have suggested that people are more likely to get Lyme disease if they live in landscapes with a lot of forest-field edge. But this appears to be caused by human behavior and not the "tickiness" of edges. Lots of edge means many opportunities to cross into forests.

Myth #3

Deer abundance determines tick abundance. When Lyme disease was first discovered, scientists thought they had found a new species of tick never before known to science. They named it the "deer tick" because they found the adult, reproductive stage to be abundant on deer. (The immature stages called larvae and nymphs were more widespread, being found on mice, chipmunks, deer, and many other hosts.) More than a decade later, careful study of the "new" tick revealed that it was not new at all. The scientists had simply found a New England population of a tick that had been described and named back in 1821, namely the blacklegged tick. Biologists have rules for naming species, and these rules reject the name "deer tick." Unfortunately, the name persists in many circles and helps perpetuate myth #3.

Blacklegged Tick *Ixodes scapularis*—Scott Bauer, USDA Agricultural Research Service, Bugwood.org

Two studies on islands off the New England coast were highly influential in establishing the notion that deer abundance determines tick abundance. In both cases, deer herds were nearly eliminated (Great Island, MA) or completely eliminated (Monhegan Island, ME) by hunters, and tick populations crashed to very low levels. Unfortunately, several studies on the mainland of New England, New York, and New Jersey have found little or no effect of deer reduction on tick numbers. It turns out that the adult ticks also feed on things like raccoons, foxes, opossums, and skunks, but these animals were scarce (Great Island) or completely absent (Monhegan Island) on some islands, so when the deer were eliminated, there was no other game in town for the ticks. On mainland sites, when deer are culled, ticks are able to crowd onto the remaining deer or onto other hosts, so the total number feeding does not decline. In addition, although deer are an important host for adult ticks,

they virtually never infect ticks with the Lyme disease spirochete. So, other hosts, like mice and chipmunks, are essential for the perpetuation of Lyme disease risk.

Myth #4

A benign climate is required for tick survival. Ticks are very easy to kill in the laboratory by either freezing or drying them to death. In fact, ticks will die within hours if they're held at less than about 85% relative humidity. This observation combined with the coastal, maritime climate where Lyme disease first emerged led to the notion that ticks need mild climates to survive. It turns out that ticks in the wild are extremely good at avoiding cold or dry conditions. During droughts they stay under leaf litter or in soil pores where humidity is high, and during winter they go underground to avoid freezing. Lyme disease is now more prevalent in upper Wisconsin and Minnesota—areas with anything but a benign climate—than in many coastal parts of New England, and the disease is rapidly expanding northwards into Ontario and Quebec, Canada.

These myths are slowly being replaced by a more complicated but still understandable science. Numbers of tick nymphs, the stage responsible for most cases of Lyme disease, are better predicted by abundance of white-footed mice than by numbers of deer. Mice are responsible for infecting the ticks with Lyme spirochetes. Mouse populations explode after years of heavy acorn production ("mast" years), because the acorns provide excellent food over winter and boost mice the next summer. Thus, acorn production predicts future Lyme disease risk. Landscapes with many small forest patches embedded within suburban development are the riskiest places for Lyme disease. This is mostly because fragmented forests lose much of their native mammal and bird diversity, which increases Lyme disease risk for at least two reasons. First, many of the species we lose when we destroy or fragment forest—such as foxes, weasels, owls, and hawks—prey on mice, and so mice thrive under fragmentation. And second, these same species, when present, act as hosts for ticks, but either fail to infect them or actually kill them when they groom (mice are poor at grooming). When we lose these non-mouse animals, more ticks feed on mice, more survive, and more get infected.

Landscapes with many small forest patches embedded within suburban development are the riskiest places for Lyme disease.

The complexity of the Lyme disease system is a challenge. But, continued research is busting myths, unlocking mysteries, and suggesting ways of managing our landscapes to reduce risk.

Richard S. Ostfeld, Ph.D. is a Senior Scientist at the Cary Institute of Ecosystem Studies and is the author of a new book entitled Lyme Disease: The Ecology of a Complex System. Dr. Ostfeld will be speaking at New England Grows on Thursday, February 2, 2012. His seminar topic is: "The Fight Against Ticks & Lyme Disease Continues."

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4. Slide the ball to the diameter of your tree (from 1 inch and up).
5. Enter your tree condition (vigorous and healthy, healthy with minor problems, unhealthy with minor problems, major

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