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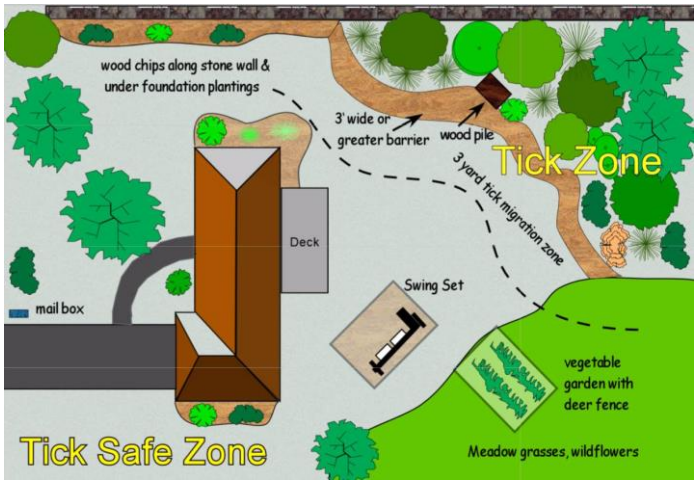
MANAGING EXPOSURE TO TICKS ON YOUR PROPERTY

In Connecticut, the two most common ticks are the blacklegged tick, *Ixodes scapularis,* which is commonly known as the deer tick, and the American dog tick, *Dermacentor variabilis*. The establishment of homes in wooded areas has increased the potential for contact with wildlife and their ticks. You can reduce the number of ticks near your home by landscaping changes, manipulating or treating tick hosts, and the selective application of least-toxic pesticides. Most people acquire Lyme disease from the nymphal stage of the "deer" tick, which is active during late spring and summer. Adult *I. scapularis* are active in the fall, warm days of winter, and spring. More detailed information is available in the Experiment Station's Tick Management Handbook or from other tick fact sheets available on the CAES website (www.ct.gov/caes).

Landscape modifications . . .

Blacklegged ticks are most abundant in the woods where hosts for the tick flourish and ticks find the high humidity levels necessary for survival. On lawns, most deer ticks (82%) have been recovered within 9 feet of the lawn edge, especially areas adjacent to woods, stonewalls, or ornamental plantings [1-3]. Fewer ticks are found in the sunny, manicured areas of the lawn. Ticks may also be found in groundcover such as *Pachysandra*.



Create a tick safe zone by altering the landscape to increase sunlight, reduce tick habitat and discourage rodent hosts. Create a clearly defined, manicured border. A dry wood chip, tree bark, mulch, or gravel barrier between woods and lawn can reduce tick migration into the lawn. The removal of leaf litter at the lawn perimeter also can help reduce the number of *I. scapularis* nymphs on the lawn. Adopting some landscaping practices such as gravel pathways, mulches, decking, stone, tile, and other hardscapes around high usage areas of the home can help create a tick safe zone. Wildflower

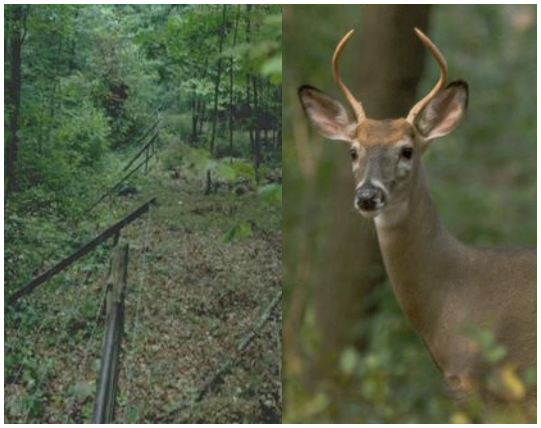
meadows, herbal gardens, etc. have very few ticks and may be an acceptable alternative to grass in some areas.

Managing Japanese barberry infestations can also reduce the abundance of blacklegged ticks and prevalence of infection in the ticks with the Lyme disease spirochete *Borrelia burgdorferi* [4, 5]. This invasive plant provides suitable habitat for the tick and rodent hosts. Reducing barberry cover in forests from 62% of cover to only 3% of cover by mechanical cutting and burning with propane resulted in fewer larval ticks on mice and reduced the density of spirochete-infected adult ticks to nearly 60% of that of unmanaged barberry infestations.

Landscape modifications include:

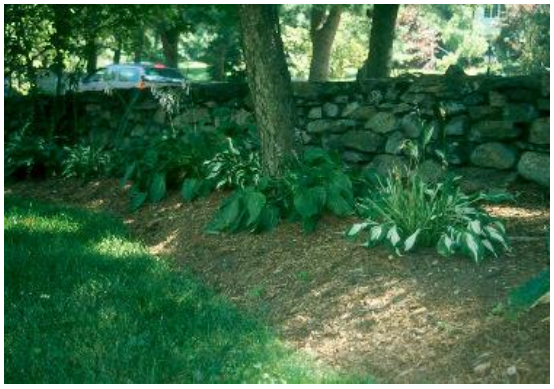
- Keep grass mowed.
- Prune trees, mow the lawn, and clear leaf litter and brush, especially along edges of the lawn, stonewalls, and driveways.
- Move play sets away from the woodland edge.
- Restrict groundcover in areas frequented by family.
- Reduce Japanese barberry cover.

Exclude key wildlife . . .



Deer are important to the reproduction of the deer tick. The exclusion of deer from large areas by fencing and reductions in the deer population has been shown to reduce tick abundance. For example, deer tick larvae, nymphs and adults were reduced by 100, 85, and 74%, respectively 300 feet within an area surrounded by an electric deer fence [6, 7]. Fencing smaller areas probably would not be as effective without the addition of other management strategies (e.g., landscape modifications, perimeter barrier application of an insecticide, bait boxes, etc.).

Don’t attract key wildlife hosts. . .



Discourage tick wildlife hosts (not all wildlife) by reducing rodent habitat and food sources. Clean up stonewalls near the home that provide shelter for mice and chipmunks. Place woodpiles away from the house.

Browsing by deer around the home can be reduced by planting landscape plants that are less palatable to deer. While no plant is completely resistant from deer damage, some plants are highly susceptible to deer browse. Plant the most deer resistant plants along the edge of the property to deter deer from including your landscape as part of their feeding territory. A list of susceptible and resistant annuals, perennials, shrubs, and trees is available in Experiment Station Bulletin No. 968 Limiting Deer Browse Damage to Landscape Plants. A deer repellent may also reduce the attractiveness of plantings to deer [8].

Chemical control . . .

Acaricides (pesticides or insecticides that kill ticks) may be applied to lawns and woodland edges to kill ticks around the home [9-11]. Many pesticide products are restricted to licensed commercial pesticide applicators. Both liquid and granular formulations have been reported effective against *I. scapularis*. A sufficient spray volume and pressure for thorough coverage and penetration of the vegetation and leaf litter is needed. Wooded areas adjacent to the home should be treated for maximum effectiveness.

TIMING AND FREQUENCY OF APPLICATION: The optimum time for an application to control the nymphal deer ticks would be mid-May to early June. A single application of most acaricides is sufficient for the summer tick season. A fall application may be used to control adult *I. scapularis* (with an early spring application if no fall application was made). Acaricides labeled for the control of ticks in the residential landscape include the chemicals listed below.

Information is intended as a guide and products are subject to change
Always read and follow U.S. Environmental Protection Agency (EPA) approved labels on a product container.
Mention of a pesticide product does not constitute an endorsement by the CT Agricultural Experiment Station

- Bifenthrin (Talstar®, Ortho® products). A pyrethroid insecticide.
- Carbaryl (Sevin®). Carbamate insecticide. Some products are for commercial use only.
- Cyfluthrin (Tempo®, other brands). A pyrethroid insecticide. Some homeowner formulations available.
- Deltramethrin (DeltaGard®, Suspend®). A restricted use pyrethoid insecticide for use by licensed applicators only; low concentrations are used in some non-restricted products.
- *lambda*-cyhalothrin (Scimitar®, Demand®). A restricted use pyrethoid insecticide for use by licensed applicators only; low concentrations are used in some non-restricted products.
- Permethrin (Permethrin, Astro®, Ortho® products, Bonide® products, others). A pyrethroid insecticide. Some are concentrates and some are ready to spray products, mainly for homeowners.
- Pyrethrins. (Pyrenone®, Kicker®, other brands) Pyrethrins are derived from the chrysanthemum flower. They are often combined with the synergist piperonyl butoxide (PBO) or insecticidal soap. Only a combination of pyrethrin and PBO with either insecticidal soap or silica dioxide (diatomaceous earth) was found highly effective against ticks in one trial. Thorough coverage appears vital for these materials to be effective as there is little residual activity. Multiple applications may be required.

Biopesticides and “Botanicals” . . .

The EPA registered bioinsecticide Met52® (Novozymes Biologicals, Inc.) containing spores of the entomopathogenic fungus *Metarhizium anisopliae* Strain F52 has been found to provide 53-74% reductions in the abundance of blacklegged ticks around the home [12]. Spores of this and other related insect fungi occur naturally in the soil at low levels. It is safe for a number of beneficial insects. Applications should be made 4- to 8 weeks apart through the tick season.

A number of botanically-based compounds, known as the FIFRA 25(b) exempt list (minimum risk pesticides - http://www.epa.gov/oppbppd1/biopesticides/regtools/25b_list.htm), do not require registration with the EPA and therefore do not have an EPA review of efficacy data or label claims. Some of the 25(b) materials included in tick control products are cedar oil, geraniol, rosemary oil, peppermint oil, garlic oil, and cinnamon oil. However, products with these or other 25(b) ingredients or essential oils do require state registraion in 10 states, including Connecticut. Tests of products with these ingredients are limited, but products with rosemary and peppermint oil (EcoExempt IC2 [13], replaced by IC3) or garlic juice (Stafford, unpublished data) have been shown to control ticks or suppress tick activity for 2-3 weeks.

Treatment of Tick Hosts . . .

Select TCS™ (Tick Control System). A rodent bait box that treats mice and chipmunks with fipronil has been shown to dramatically reduce tick abundance in a large-scale community trial [14]. The Select TCS is available commercially through certain licensed pesticide applicators. Maximum benefit is most likely if multiple residents within a neighborhood use the box. Boxes are placed every 30-60 feet around the lawn-woodland perimeter of the property and potential mouse nesting sites (see www.tickboxtcs.com).

Damminix® Tick Tubes. Permethrin-treated cotton balls target larvae and nymphs of *I. scapularis* on white-footed mice. Product effectiveness is dependent upon the collection of the cotton by the mice as nesting material from distributed tubes. The tubes are placed in mouse habitat no more than 10 yards between tubes (approximately 6 tubes per 1/8 acre of mouse habitat) (see www.ticktubes.com). The results from studies with the tubes have been mixed. No reduction in the number of infected, host-seeking nymphal blacklegged ticks in woodland and residential areas of about 4 acres or less was found in several CT and NY trials [15-17]. A reduction in nymphal tick abundance was reported in a Massachusetts study with the treatment of an 18-acre site [18] and at some sites in another NY study on Fire Island [19]. Chipmunks, another reservoir host for *Borrelia*, do not collect the cotton.

4-Poster Tickicide. Permethrin is labeled for passive application to deer in a number of states via the 4-poster deer feeding stations. White-tailed deer feed at the stations and rub against the pesticide (10% permethrin) impregnated applicator rollers, which distributes the acaricide over the head, neck, and shoulders of the animal. Use of the 4-poster device is not approved in all states and permits from state wildlife authorities may be required. Licensed by the American Lyme Disease Foundation, the 4-posters have been shown to reduce populations of the lone star tick, *Amblyomma americanum*, and the blacklegged tick, *Ixodes scapularis*. In a five state multi-year project of treated neighborhoods or areas, blacklegged ticks were reduced by roughly 60-70% over 5 years of use (~one 4-poster per 120 ac) [20, 21] and further evaluation of the study in Connecticut found a significant impact on the incidence of Lyme disease [22]. Use of the 4-poster at the 600 acre fenced Goddard Space Flight Center in Maryland resulted in a 96-97% reduction in nymphal blacklegged ticks [23]. Additional trials with the 4-poster for the control of the blacklegged tick are being conducted in Connecticut, New York, and Massachusetts.

Repellents for Human Use. . .

There are about 150 repellent products registered with the U.S. Environmental Protection Agency (EPA) for use on human skin. The primary active ingredient in most insect/tick repellents today is DEET (N,N-diethyl-3-methylbenzamide or N,N-diethyl-m-toluamide). DEET is the most effective, broad-spectrum repellent ever discovered [24-26]. The U.S. Environmental Protection Agency (EPA) estimates that over one-third of the U.S. population will use a DEET-based product. Products range in concentration from 4% to 100% DEET and are available as an aerosol can, pump spray bottle, stick, lotion, cream, or towelette for application to skin or clothing. DEET is only effective for one to several hours and must be reapplied periodically. The effectiveness of DEET on the skin is influenced by the concentration of DEET, absorption through the skin, evaporation, sweating, air temperature, wind, and abrasion of the treated surface by rubbing or washing. Higher concentrations up can provide longer protection. However, a concentration

greater than 30% doesn't provide extra protection. Several controlled-release, extended duration products with DEET have been developed which decrease skin absorption and increase protection time. All active ingredients and their concentrations are listed on the product label.

DEET and ticks: DEET will repel ticks and decrease the chances of tick bite, but depending upon the concentration, it may not provide total protection and can vary between tick species [27]. Concentrations of DEET that might prevent tick attachment may not deter a tick from walking across the skin to unexposed and untreated areas. For blacklegged ticks, DEET concentrations around 20 to 30% applied to clothes are about 86-92% effective is preventing tick bites. When applying a repellent against ticks, particular attention should be given to the shoe tops, socks, and lower portion of pants.

***Safe Use of DEET*:** The Environmental Protection Agency (EPA) completed a review of DEET and concluded that normal use of DEET does not present a health concern to the general population when following label directions. The EPA established new labeling requirements for directions, precautions, and claims. For example, child safe claims for low concentration DEET products are no longer allowed. The EPA is requiring or proposing changes to the label to ensure the safe use of DEET, particularly on children. For example, a new repellent awareness graphic could provide easily viewed information on what is repelled by the product and for how long it should be effective. The EPA has a repellent selection search tool available at http://cfpub.epa.gov/oppref/insect/ .

DEET has been used by millions of Americans for over 40 years and the incidence of adverse reactions is low. However, some allergic, toxic, and neurological reactions to DEET have been reported in medical literature. Repeated applications have occasionally produced tingling, mild irritation or contact dermatitis. Some individuals may be particularly sensitive to chemicals. Toxic reactions are rare, but have occurred with applications to the skin, particularly with children. Reported cases often involved ingestion of DEET, applications of high concentrations of DEET and over application of product contrary to label directions. Therefore, it is prudent to minimize the use of high concentrations on the skin and follow the directions and precautions given on the repellent label. The American Academy of Pediatrics recommends not more than 30% DEET be used on children and none on infants younger than 2 months of age. Apply DEET sparingly to exposed skin, and spray on clothing when possible. However, DEET will harm some synthetic fabrics (rayon and spandex), plastics (watch crystals and eyeglass frames), and car and furniture finishes. If you suspect a reaction to DEET (or any other repellent), stop using the product, wash the treated skin, and call the poison control center (CT 1-800-343-2722).

Clothing Repellents. Permethrin is the active ingredient in products for use only with clothing or other fabrics such as mosquito netting or tents. Products for consumer application to clothing contain 0.5% permethrin formulated as an aerosol spray (e.g., *Duranon® Tick Repellent, Repel® Permethrin Clothing & Gear, Permethrin Tick Repellent, Sawyer® Clothing Repellent*). A synthetic pyrethroid insecticide with some repellent properties, permethrin works primarily by killing ticks on contact with the treated clothes and can provide high levels of protection against ticks (and mosquitoes) [28, 29]. It may be purchased at lawn and garden centers or sports and camping stores. Permethrin has low mammalian toxicity, is poorly absorbed through the skin, and is rapidly neutralized by the body. Skin reactions are uncommon. Several vendors also provide various permethrin treated or impregnated clothing for protection against ticks and mosquitoes in styles and sizes for men, women and children. Major brands include *Insect Shield®*, *Orvis Bugsaway®*, *Insect Blocker™*, and *ElimiTick™* (for sportsmen).

Companion Animal Products. . .

There are over 450 products or brands available to help protect your pets, mainly dogs, from ticks and/or fleas. Use of some of these products has been shown to prevent the transmission of the agents of Lyme disease and anaplasmosis [30-32].

The majority are topically applied products that provide protection for about a month. Major products include:

Name	Type	Ingredient(s)	Company
Preventic®	collar	amitraz	Virbac
NexGard™	chewable	afoxolar	Merial
Frontline®	topical, spray	fipronil	Merial
Certifect®	topical	fipronil, amitraz	Merial
K9 Advantix®	topical	permethrin, imidocloprid	Bayer
Vectra3D®	topical	permethrin, dinotefuran	Summit
Revolution®	topical	selamectin	Zoetis
Scalibor®	collar	deltamethrin	Intervet

NexGard™ is a relatively new oral chewable that lasts about a month. Preventic® is an amitraz-based collar that lasts about 90 days. Scalibor® is a deltamethrin collar that lasts about 6 months. Revolution® is labeled only for American dog ticks (and fleas). Certifect® and the Plus versions of Frontline and other fipronil-based parasiticides also contain (S)-methoprene, an insect growth regulator. Only Frontline®, Frontline®Plus, and similar products containing fipronil such as Parastar™, Fiproguard® and PetAmor® are labeled for use for cats. Other active ingredients in some products include the organophosphate insecticides tetrachlorvinphos or propoxur, and the pyrethroid cyphenothrin. Consult your veterinarian for what may work best for your pet. Canine Lyme disease vaccines are also available from your veterinarian.

Use pesticides safely!

The pesticide label (including the label on human use insect repellents) provides information on the active chemical ingredients, formulation, pests and sites for which it can be legally used, directions for use, precautions, hazards to humans, wildlife and the environment, and first aid instructions. **Always read and follow pesticide label directions and precautions.** Not all brands of a particular pesticide will be labeled for area tick control, check the label. Medical information about the active ingredients in a pesticide is available from the **National Pesticide Information Center**, **http://npic.orst.edu**. Most of these chemicals are highly toxic to fish and other aquatic organisms and application to or near water should be avoided.

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