NOT EVERYONE realizes that the so-called wood tick is also a dog tick and that there are eight species of these creatures, several of which carry such diseases as Rocky Mountain spotted fever and tularemia. Few dog owners have not at one time or another had to deal with the tick problem. The most effective methods are described in this article.

As the terms "dog ticks" and "wood ticks" are commonly used, they refer to eight different species of ticks so similar in appearance and habits that few persons not entomologists are able to differentiate between them. All are of importance as parasites of dogs, and many will also feed on other domestic animals and human beings. Some of them serve as carriers of diseases of animals or man, in addition to inflicting irritating bites.

All ticks have somewhat similar habits in that they must feed on blood in order to reproduce. The eggs are always deposited on the ground or elsewhere after the female has become engorged with blood and dropped from the dog or other animal upon which she has fed. Among the different kinds of ticks, however, there are minor differences in life history, the hosts attacked, and egg laying and other habits, and also in the role the ticks play in disease transmission (1, 5, 6, 9).

The American dog tick (Dermacentor variabilis), the most widely distributed and abundant species, is most numerous along the Atlantic and Gulf coasts, in the Mississippi Valley, and along the Pacific coast as far north as Oregon. Scattered infestations may be found in nearly all the other parts of the United States except the Rocky Mountain region and the Pacific Northwest. A closely related species, called the Rocky Mountain spotted fever tick (Dermacentor

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1 F. C. Bishopp is Assistant Chief and Carroll N. Smith is Assistant Entomologist, Bureau of Entomology and Plant Quarantine.  
2 Italic numbers in parentheses refer to Literature cited, p. 1187.
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occurs in the Rocky Mountain region, and a second closely
related species, the Pacific coast tick (*Dermacentor occidentalis*)
occur in California and southern Oregon. The brown dog tick
(*Rhipicephalus sanguinimus*), a species having somewhat different
habits, causes permanent outdoor infestations only in Florida and
Texas but infests houses and other heated buildings in many localities
over the entire United States. The black-legged tick (*Ixodes ricinus
scapularis*) occurs throughout the eastern part of the United States,
and a closely related species, the California black-legged tick (*Ixodes
ricinus californicus*), is found in the West. The Gulf coast tick
(*Amblyomma maculatum*) is found in the States bordering the Gulf
of Mexico and the Atlantic Ocean as far north as South Carolina.
The lone star tick (*Amblyomma americanum*) occurs in the eastern
part of the United States and as far west as Texas.

THE AMERICAN DOG TICK

In many localities the American dog tick (3, p. 422) is the most
important pest of dogs. In heavily infested areas dogs that are
allowed to run freely frequently pick up several hundred ticks each
day, and this causes severe irritation, a bad disposition, and loss of
condition. Although the authors have observed no cases of dogs hav-
ing been killed by these severe infestations, animals are known to have
been destroyed because of their weakened condition, ill temper, and
suffering, and canine paralysis has been attributed to the attacks of
these ticks. In resort areas considerable economic losses are sustained
when visitors avoid certain localities because of the injury to their
pets caused by these parasites and the fear of being bitten themselves.

A strong incentive to keep dogs free of the American dog tick is the
fact that the bite of this species transmits the dreaded human diseases,
Rocky Mountain spotted fever and rabbit fever (tularemia). These
diseases do not occur in every locality where ticks are found, and in
localities where they do occur only one in several hundred ticks is
infected, so that most persons bitten suffer no ill effects; but when
the tick happens to be infected, a bite has serious results.

The American dog tick and related species pass through four
stages—the egg; the seed tick, or larva; the nymph; and the adult.
The eggs are laid in a mass in protected places on the ground, par-
ticularly in thick clumps of grass. Each female lays only one such
mass, which contains 3,000 to 6,000 eggs. The eggs hatch into tiny
six-legged seed ticks, which attach themselves to meadow mice or other
small rodents. In 2 to 12 days they fill themselves with blood, drop
to the ground, and shed their skins, or molt. The tick that emerges
from the old skin has eight legs and is called a nymph. The nymphs
attach themselves to small rodents and become engorged with blood
in 3 to 10 days (fig. 1), after which they drop to the ground and molt,
becoming adults. The adult males and females, shown in figure 2,
also have eight legs but are distinguished from the younger stages
by the white markings on a hardened part of the back called the shield.

3 See also BISHOFF, F. C., and SMITH, CARROLL N. COMBATING THE AMERICAN DOG TICK,
CARRIER OF ROCKY MOUNTAIN SPOTTED FEVER IN THE CENTRAL AND EASTERN STATES. U. S. Bur.
Ent. and Plant Quar. Cir. E-154, 5 pp., Illus. 1938. [Processed.]
Adults of both sexes attach themselves to dogs or other large animals and feed on blood, but the females become tremendously enlarged, as shown in figure 3, while the males never increase in size. Mating occurs while the females are feeding, and when they have mated and become fully engorged, which requires from 5 to 13 days, they drop to the ground, lay their eggs (fig. 4), and die. At no time do the ticks feed on anything but the blood of mammals. The larvae and nymphs may live for a year without feeding, and the adults for over 2 years. In the Northern States the adult ticks are most active in the spring and early summer, few being encountered after August 1, but in the South their activity is less sharply restricted by seasons.

The most effective way to prevent injury to dogs by ticks is to wash or immerse the dogs twice a week in derris dip. The dip is prepared
by dissolving an ounce of mild soap in a gallon of warm water and stirring 2 ounces of fine derris or cube powder into the solution. These powders should contain at least 3 percent of rotenone, the active insecticidal principle. If a suitable dipping vat is available, a large quantity may be prepared and used repeatedly, as the mixture will retain its strength for about 3 weeks if kept in the dark. If only a small quantity is prepared, it is best to place the dog in a tub and pour the dip slowly over it, working the liquid well into the hair with the fingers. The liquid may then be dipped up from the tub and poured over the dog repeatedly until the hair and skin over the entire body are thoroughly soaked. Care should be taken to prevent the dip from getting into the dog's eyes. If possible, the dip should be allowed to dry on the dog. The dip will kill the ticks that are attached, and for 2 or 3 days after a treatment the powder remaining in the hair will reduce the number of ticks that become attached and kill most of those that do. These materials act slowly, sometimes requiring as long as 24 hours to complete the kill. Occasional treatments will benefit the animals to some extent, but for good control the treatments should be given regularly twice a week.

If a dip cannot be used conveniently, derris or cube powder may be applied as a dust, care being taken that it penetrates the hair and reaches the skin. If the dogs breathe or swallow the derris they may vomit but will not be harmed, but it should not be permitted to get into the eyes. This treatment is also highly effective in controlling fleas.

Since the dog is the principal host on which the adult tick feeds and since each female lays several thousand eggs after feeding, treating the dogs regularly will not only bring them immediate relief but will definitely limit the reproduction of ticks.

When only a few ticks are present, they may be removed by hand. For this it is best to use tweezers or forceps, since human beings handling infected ticks may become infected with Rocky Mountain spotted fever. The ticks should be killed by being dropped into turpentine or kerosene as soon as they are picked off; if they are crushed, the blood should not be allowed to touch the skin. The hands should be thoroughly washed as soon as the job is done.

Methods of eradication applicable to all the different conditions under which the American dog tick exists have not been discovered.
but several things can be done to reduce their abundance, particularly around houses, in addition to the systematic care of dogs.

The destruction of rodents, particularly meadow mice, by trapping or poisoning, reduces the number of ticks in the following year by depriving the immature ticks of the hosts they require for larval and nymphal feeding (10). Almost complete eradication of the mice is necessary, however, if the reduction in the tick population is to be appreciable. Poisoning is more effective than trapping, but owing to the danger to other animals it should be carried on only under the direction of competent authorities.

Keeping underbrush, grass, and weeds closely cut tends to drive out rodents and removes protection favorable to the ticks themselves. Burning vegetation accomplishes the same results.

![Figure 4](image-url)

**Figure 4.**—Engorged female depositing eggs. Much enlarged.

Close grazing of brushy and weedy areas by sheep will do much to reduce the tick population. If fine-wooled sheep are used, relatively few ticks become engorged on them, and many are killed by the wool grease.

Many of the ticks on an infested area may be killed by thoroughly applying a spray consisting of 1 part of nicotine sulfate (40 percent nicotine), 1 part of soap, and 288 parts of water (this is about 8 teaspoonfuls of nicotine sulfate to 3 gallons of water). As ticks often concentrate on the sides of roads and paths, such places are most in need of treatment. Sprayed vegetation remains relatively free of ticks for about 3 days. More permanent results may be obtained by adding 4 ounces of sodium fluoride to the 3 gallons of spray, but this will cause some injury to the vegetation. Additional information on control is given by Bishopp and Smith in the circular cited in footnote 3 (p. 1181).

**THE ROCKY MOUNTAIN SPOTTED FEVER TICK AND THE PACIFIC COAST TICK**

The Rocky Mountain spotted fever tick and the Pacific coast tick are so similar to the American dog tick in appearance that they can be distinguished only by microscopic examination. They cause the same injury to dogs, but the Rocky Mountain spotted fever tick is
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particularly dangerous as a vector of the fever which gives it its name, as well as of tularemia and Colorado tick fever, and also as a cause of tick paralysis in dogs and human beings.

The life history and habits of these species are much like those described for the American dog tick, except that the larvae and nymphs feed on a much greater variety of mammals. Further information on the biology of the Pacific coast tick is given elsewhere by Hooker, Bishop, and Wood (6), and the biology and control of the Rocky Mountain spotted fever tick have been discussed by several writers (4, 6, 7, 9).

The derris dip recommended for killing the American dog tick should be effective in destroying the Rocky Mountain spotted fever tick and others—except the ear tick—on dogs. Reducing the number of ticks on cattle and horses and destroying ground squirrels and other rodent hosts of the ticks have been advocated from time to time. These measures have not always been found to be practicable, but undoubtedly they do reduce the number of ticks. It is also worth while to clear away underbrush and keep dogs and livestock out of heavily infested areas.

DOG-INFESTING TICKS FOUND IN THE OPEN

Other species of ticks that are found in the open and commonly infest dogs are the black-legged tick, the California black-legged tick, the lone star tick, the Gulf coast tick, and the ear tick. Their range has already been given (p. 1181). The Gulf coast tick resembles the American dog tick in appearance but can be distinguished from the latter with a magnifying glass. The lone star tick differs from others in having the shield marked with a single white spot at the back in the female and with two white semicircles at the back in the male. Neither variety of the black-legged tick has white markings on the shield, which is dark brown or nearly black.

The life histories of these species are similar to that of the American dog tick except that the larvae and nymphs feed on a greater variety of animals, including mammals, birds, and, in the case of the black-legged tick, even reptiles. Also the larvae and nymphs as well as the adults of all but the Gulf coast tick feed readily on dogs. The Gulf coast tick in its immature stages feeds mainly on ground-inhabiting birds (2).

The treatment with derris dip recommended for the control of the American dog tick will also control the other species on dogs. Systematic treatment of the ears of livestock, especially on the inside, with commercial pine-tar oil will largely protect these animals and ultimately reduce the infestation on pastures. Clearing, burning, and grazing, as recommended, will assist in reducing the tick population.

Dogs are frequently infested by the spinose ear tick. This pest attaches itself deep in the convolutions of the ears and often causes irritation and pain, evidenced by the dog's scratching its ears, shaking its head, and holding the head to one side. Derris or cube powder (5 percent rotenone) mixed with medicinal mineral oil (1 part of the former to 10 parts of the latter by measure) and dropped into the ears
will kill these ticks. Only a few drops are required, but it is best to squeeze the base of the ear to work the material in among the ticks. A few drops of pine-tar oil (1 part) and cottonseed oil (3 parts) may also be used in the ears. Further information regarding this tick is given in Farmers' Bulletin 980. The Spinose Ear Tick (8).

THE BROWN DOG TICK

The brown dog tick is a particularly troublesome pest of dogs because of its habits. Whereas the other ticks of dogs require a vegetative cover and wild animal hosts to complete their development, the brown dog tick is adapted to life in the drier environment of kennels, houses, etc., with the dog as the only necessary host. It is also of some importance as a vector of canine piroplasmosis, although this disease is not widespread in the United States. Additional information on this pest has been published by Bishopp.4

The brown dog tick often infests houses in considerable numbers, both immature and adult ticks hiding around baseboards, window casings, and furniture, and in the folds of curtains. Dogs kept in houses are thus constantly exposed to attack and frequently become infested with hundreds of larvae, nymphs, and adults. As noted in the paragraph on distribution, this species has become established in many northern localities because of its ability to live in heated buildings.

Aside from the difference in environment and the fact that the ticks in all stages feed on dogs, the life history of the brown dog tick is like that of the American dog tick. The adults, however, do not bite human beings. This tick differs from the American dog tick in appearance in that the adult has no white markings on the shield, which is plain brown.

In combating the brown dog tick it is necessary to treat not only the infested animals but also their sleeping places.

Clipping long-haired dogs aids in keeping them free of ticks but is not really necessary. Use of the derris dip according to the procedure recommended for controlling the American dog tick will kill the brown dog tick in all stages. As the dogs are constantly exposed to reinestation, treatment should be given at 3-day intervals.

Infested dogs should be kept in one place, especially during their sleeping hours, to confine the ticks more or less and make the treatment easier. The kennels in which infested animals sleep should be thoroughly sprayed with undiluted creosote oil. This is the same material that is used for the prevention of decay in posts and timbers. Since it stains and is very caustic, it should not be used in houses or be allowed to come in contact with animals or plants. It penetrates wood and cracks and can be relied upon to destroy in a single treatment practically all the ticks in a building. If corrugated or other metal kennels or cages are being used, it is probably best not to use the creosote oil but to spray with creosote dip. The strength should be triple that usually recommended for disinfecting purposes.

The face and hands of spray operators, or persons applying creosote in any manner, should be protected, as creosote in this form is highly irritating.

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4 BISHOPP, F. C. THE BROWN DOG TICK, WITH SUGGESTIONS FOR ITS CONTROL. U. S. Bur. Ent. and Plant Quar. Cir. F-292, 3 pp., illus. 1938. (Revised.) [Processed.]
The use of a gasoline torch or "prickly pear burner" in concrete or other fireproof buildings destroys the ticks in the cracks and floors, but it is not approved. The use of a torch in a wooden building should be prohibited.

In dog and cat hospitals special attention should be given to having the cages and building constructed so as to reduce the number of hiding places for ticks to a minimum. Smooth concrete floors and walls are desirable, and cages made of metal give much less opportunity for ticks to hide than those made of wood.

When residences become infested, it is best to keep the dogs out of doors except when they are allowed to enter the house to serve as traps for free ticks. The baseboards, window casings, and other infested places should be sprayed frequently with one of the standard fly sprays, which are essentially kerosene extracts of pyrethrum. The ticks are quite resistant to sprays of this kind and must be wetted thoroughly if they are to be killed. In addition to the spray, the use of fresh pyrethrum or derris powder scattered behind baseboards and other hiding places is advised. If the dog is kept indoors it should be treated regularly as described. The treatment of the dog and the premises must be persisted in for several months to eradicate the pests completely.

Fumigation of infested houses is seldom advisable because the ticks are usually present in entryways, around porches, and in outbuildings where they cannot be reached with a fumigant, and they are also very resistant to fumigants.

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