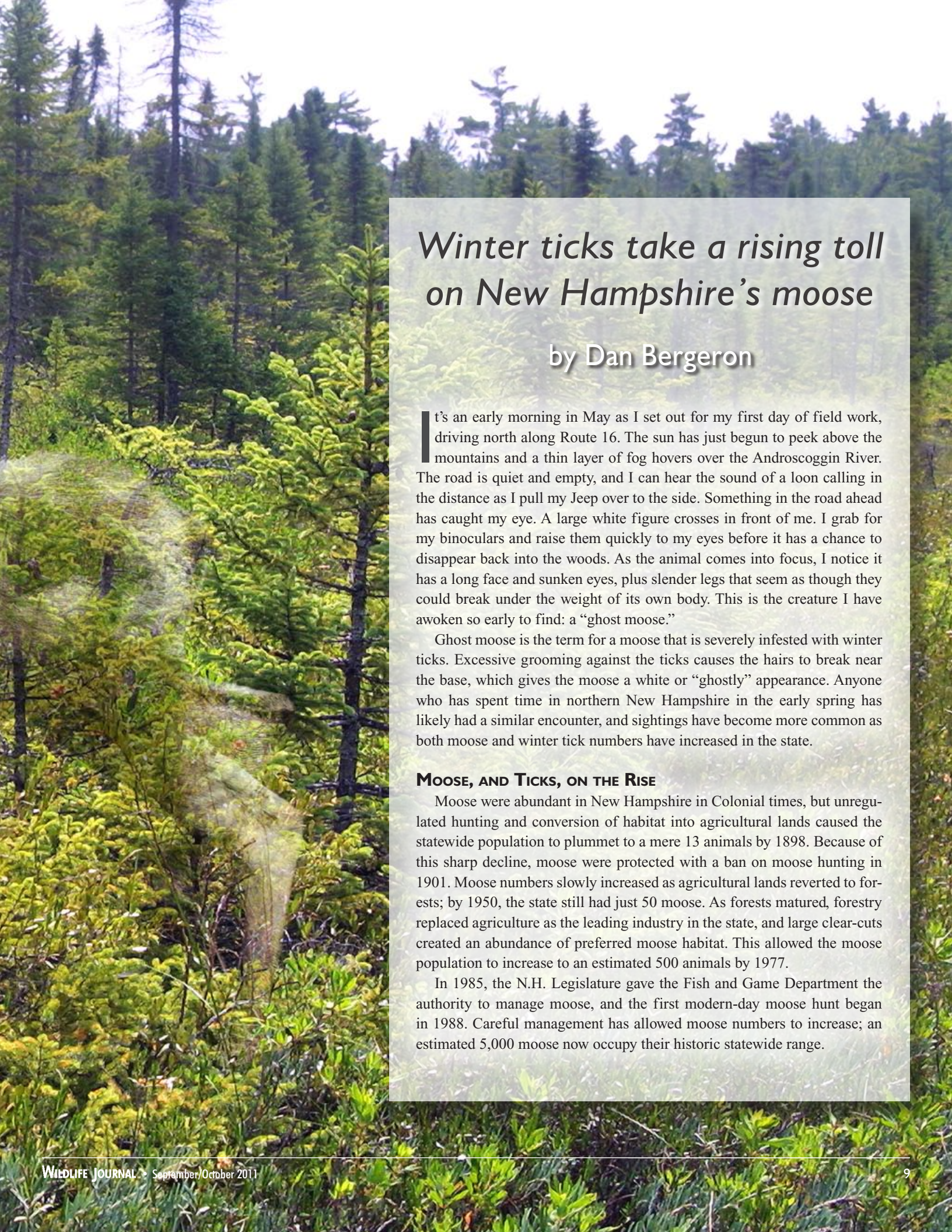


GHOST

in the woods





Winter ticks take a rising toll on New Hampshire's moose

by Dan Bergeron

It's an early morning in May as I set out for my first day of field work, driving north along Route 16. The sun has just begun to peek above the mountains and a thin layer of fog hovers over the Androscoggin River. The road is quiet and empty, and I can hear the sound of a loon calling in the distance as I pull my Jeep over to the side. Something in the road ahead has caught my eye. A large white figure crosses in front of me. I grab for my binoculars and raise them quickly to my eyes before it has a chance to disappear back into the woods. As the animal comes into focus, I notice it has a long face and sunken eyes, plus slender legs that seem as though they could break under the weight of its own body. This is the creature I have awoken so early to find: a "ghost moose."

Ghost moose is the term for a moose that is severely infested with winter ticks. Excessive grooming against the ticks causes the hairs to break near the base, which gives the moose a white or "ghostly" appearance. Anyone who has spent time in northern New Hampshire in the early spring has likely had a similar encounter, and sightings have become more common as both moose and winter tick numbers have increased in the state.

MOOSE, AND TICKS, ON THE RISE

Moose were abundant in New Hampshire in Colonial times, but unregulated hunting and conversion of habitat into agricultural lands caused the statewide population to plummet to a mere 13 animals by 1898. Because of this sharp decline, moose were protected with a ban on moose hunting in 1901. Moose numbers slowly increased as agricultural lands reverted to forests; by 1950, the state still had just 50 moose. As forests matured, forestry replaced agriculture as the leading industry in the state, and large clear-cuts created an abundance of preferred moose habitat. This allowed the moose population to increase to an estimated 500 animals by 1977.

In 1985, the N.H. Legislature gave the Fish and Game Department the authority to manage moose, and the first modern-day moose hunt began in 1988. Careful management has allowed moose numbers to increase; an estimated 5,000 moose now occupy their historic statewide range.



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An adult winter tick is 1/8" - 1/4" long, and grows to the size of a grape once it has fed; Winter tick larvae are so tiny, it's hard to believe how much damage they can do to moose.

As moose rebounded, another species has also been on the rise: the winter tick. This is not the dog tick or deer tick we're all familiar with, but a different species that's been associated with moose die-offs throughout the U.S. and Canada. How the Granite State moose herd will fare in the face of increasing winter ticks is a central question in moose management today, and new research is shedding light on this threat.

QUESTING TICKS

What do we know about winter ticks? They are a one-host parasite, meaning they spend their entire life on a single host, and moose are their host of choice. Eggs hatch in late summer, and larvae remain dormant in the leaf litter until fall, when larvae begin to climb vegetation to "quest," or search, for a host. Thousands of tiny winter tick larvae, each no bigger than a grain of sand, form clumps at the ends of branches and wait for a host – a moose or any other animal (including humans) – to brush against them so they can hitch a ride.

Once a larva attaches to a host, it remains on that animal throughout the winter, taking blood meals and changing into different life stages. In late winter/early spring, adult female ticks take one last meal, mate, drop from the moose, lay eggs, and die. Each female can lay nearly 3,000 eggs.

Many hunters and hikers have encountered winter tick larvae in the fall – they are easily brushed off by people. (While conducting field work I have found clumps of hundreds of winter ticks on myself, but never found one embedded in my skin.) Though winter ticks are not known to carry any diseases, they are extremely problematic to moose for several reasons. First, they tend to "quest" on vegetation at roughly chest to shoulder height of a moose. Second, winter ticks are most actively questing during the peak of moose breeding in the fall, when moose are very mobile in their search for mates and more likely

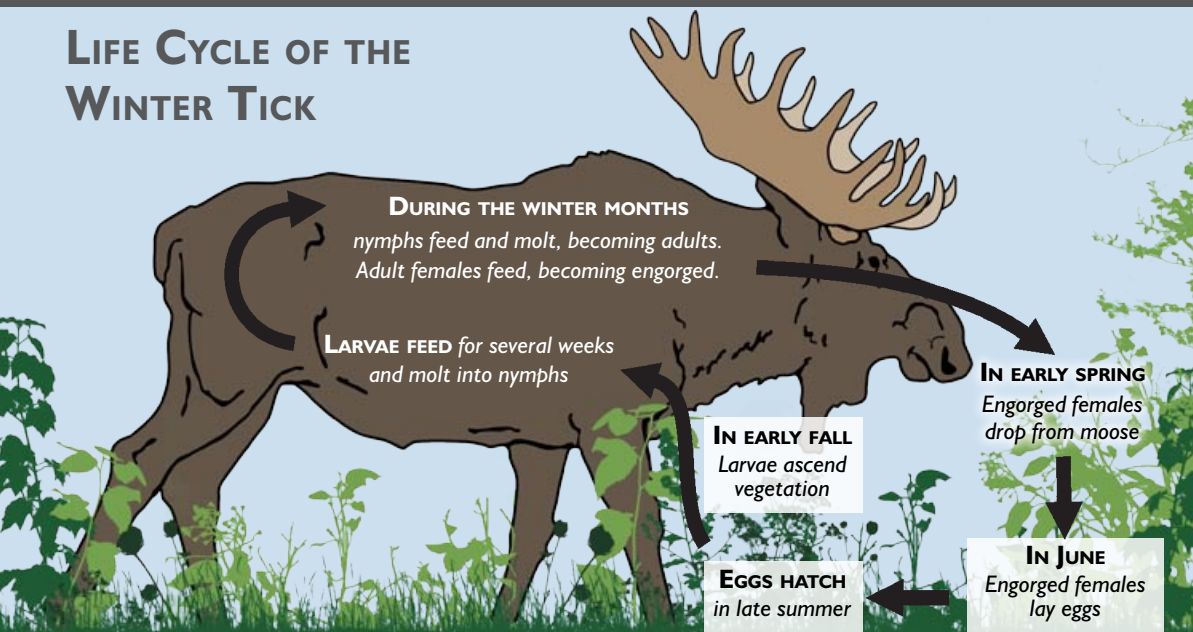
to encounter clumps of questing tick larvae. Lastly, moose don't groom against winter ticks until spring – at which point they are already covered in biting adult ticks. Deer, by contrast, groom in the fall, removing tick larvae before they have a chance to attach in large numbers. Moose may be poor groomers because of their short evolutionary relationship with winter ticks, whereas deer, which are thought to be the original host of winter ticks, have become quite effective at removing them.

HOW TICKS IMPACT MOOSE

You may wonder how something as small as a tick could harm an animal as large as a moose. The answer is sheer numbers. The average number of winter ticks on a single animal in Alberta, Canada, is around 32,000, with a maximum of nearly 150,000! These large infestations can cause problems for moose, including loss of winter coat, anemia (blood loss), reduced growth in young and even death. Research conducted by N.H. Fish and Game and the University of New Hampshire suggested winter ticks were responsible for a large number of moose mortalities in the state in 2002. This surge in tick-related deaths prompted the Fish and Game Department to enter into cooperative research with UNH, and my project was launched.

Winter tick numbers are dictated primarily by weather and the number of moose on the landscape. If fall and spring weather is mild with little or no snow, winter ticks will survive to attach to moose, mate and lay eggs. When moose density in an area is high, there are more hosts for the ticks to attach to – again, allowing more ticks to mate and lay eggs in the spring. Once large numbers of ticks are present on the landscape, there is little that can be done to control them. Pesticides are either too costly or dangerous to apply at such a large scale. Historically, our weather

LIFE CYCLE OF THE WINTER TICK



Winter tick eggs hatch in the leaf litter in summer. In fall, the larvae climb vegetation, and wait for a host to brush past. They make their way to the moose's skin, attach, and feed, molting twice over several months. The engorged females drop to the ground in spring and lay eggs – beginning the cycle once again.

patterns and low moose density have done a good job in controlling tick numbers.

The only practical way for moose managers to reduce tick numbers is to reduce moose density. Fewer moose translates to fewer ticks, a balancing act that can favor one or the other depending on weather conditions. If wildlife managers had an accurate way to help predict or identify years of tick outbreaks, it would allow them to adjust harvest levels the following year to compensate for those moose that are lost to winter ticks. If the weather becomes consistently too warm, however, tick numbers are likely to remain high and the Fish and Game Department will be forced to reduce the moose population in order to reduce tick numbers, or to deal with higher annual moose mortality stemming from ticks. Either way, ticks will play a larger role in our moose management program than in the past.

HAIR LOSS AND COMB-OVERS

Recently, we've seen both good and bad years for ticks. My research looked at three different methods to track winter tick numbers from year to year. Anyone hunting north of the White Mountains may have seen people acting strangely, dragging white sheets through clear-cuts. This was part of our research. Moose prefer to use regenerating habitat in the spring, when ticks are dropping off to lay eggs. That makes this an ideal place to find winter ticks in the fall, after the eggs hatch. Tick larvae were collected by dragging white sheets over the vegetation in clear-cuts, after which we could compare average numbers of ticks collected between years to look for levels that might indicate tick outbreaks.

If you have visited a moose check station, you may have seen people combing a moose's hair. This, too, was a method to track tick numbers, and a source of several hair stylist jokes. We used combs to part the moose's hair and count ticks on different areas of the



From top: By fall, moose have molted. Their new dark, thick coats no longer show signs of previous winter tick infestation, though they may be afflicted again in the months to come; Researchers drag white sheets through the brush to collect questing ticks; A hunter-killed moose gets a tick check; Winter tick nymphs feed on moose.



Moose research in New Hampshire is funded in large part by Federal Aid in Wildlife Restoration, supported by your purchases of firearms, ammunition and archery equipment.



hide; average numbers of ticks counted helped us gauge the degree of infestation.

The last method we used to track ticks was moose hair-loss surveys. Anyone who has spotted a moose in the spring has likely noticed their scraggly appearance; their hair loss is caused by grooming against winter ticks and is what created the “ghost moose” I observed on my first day of field work. The hair loss follows a distinctive pattern, starting at the moose’s neck and working its way back, sometimes until all the hair has been removed. The amount of hair loss is related to the number of biting adult ticks. By observing moose and categorizing their hair loss, we can compare the severity and identify years of tick outbreaks.

RESILIENT MOOSE

All three methods identified yearly differences in New Hampshire’s winter tick numbers – and they all matched, indicating a reduction in winter tick numbers from 2008 to 2009, and a spike in 2010. The high number of winter ticks in 2010 was most likely caused by the warm, snowless spring, which allowed more adult female ticks to drop from moose and survive to lay eggs.

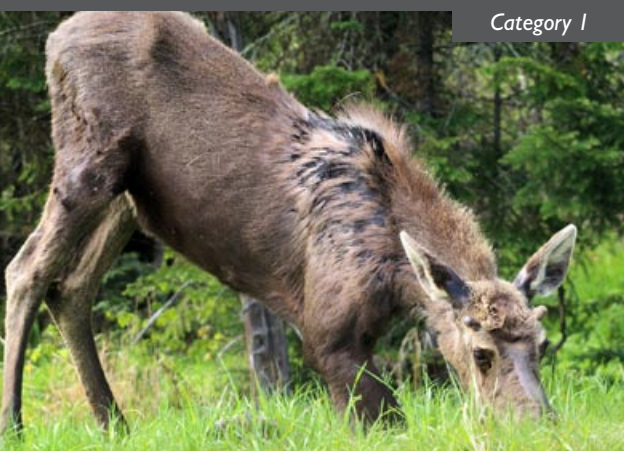
Moose are resilient creatures, though; it will take more than one severe tick year to put our moose in any real danger. Kristine Rines, the state’s moose biologist, has run computer models that simulate tick impacts to the state’s moose population. Her work suggests it would take several consecutive years

of extremely high mortality to severely impact the moose herd. Fortunately, tick outbreaks resulting in moose die-offs don’t usually happen back-to-back. Warm weather is the biggest driver of winter tick numbers, though, and moose are northern creatures – so the predicted effects of climate change for New Hampshire could create a paradise for ticks and perfect conditions for severe annual tick infestations.

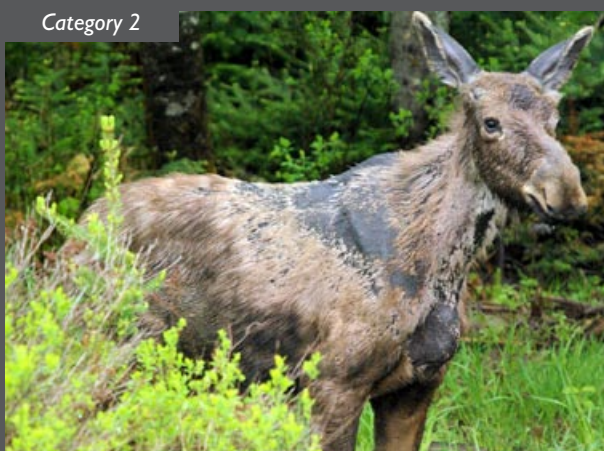
As I sit on the side of the road watching the ghost moose struggling for every bite of a twig and sip of cold water spiked with road salt, trying to replenish the nutrients that have been drained by thousands of biting parasites, I stop and remind myself that I am here to conduct research, and I begin to record my observations. As I do, I wonder what the future will hold. Effective wildlife management requires thorough research, and continued monitoring of winter ticks will be critical to maintaining a healthy moose herd in New Hampshire as long as we have variability in our weather patterns. Will our weather continue to change, giving ticks the advantage of shorter winters and warmer springs? If ticks do gain the upper hand, New Hampshire will likely see fewer moose. Only time will tell.



Dan Bergeron has worked with Fish and Game and UNH on a number of research projects related to wild turkeys, black bears and moose. He received his Master of Science in Wildlife Ecology at the University of New Hampshire in 2011.



Category 1



Category 2



Category 3



Category 4

MONITORING HAIR LOSS

Researchers categorize tick-afflicted moose in 4 stages.

1. Some hair loss on shoulders;
2. Substantial hair rubbed off shoulders, chest and back;
3. Most protective hairs gone from moose’s front;
4. Ghost moose - 80% or more of hair gone from its body. Starkest illustration of what thousands of parasitic winter ticks can do.

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