

Winter Warming and Summertime Biters: Climate Change, Lyme Disease and West Nile Virus

If you were hiking in the woods this past autumn, you probably noticed a surge in the deer population. Did you know that every October through December marks the white-tailed deer mating season, commonly referred to in North America as the ["rut"](#)?

The deer are out in full force.

You may also have noted that the “summertime” vectors (ticks, mosquitoes, and fleas) were happily thriving and biting in North America’s unseasonably warm, humid, late autumn temperatures.

Were you still extracting ticks from your dog, cat (and maybe yourself) up until Thanksgiving? Hearing mosquitoes buzz and seeing fleas circulate?

So why were these warm-weather biters still out and about?

Global public health experts believe that [climate change is partly responsible](#) for these vectors' survival - and their expansion into new habitats.

So how does this increased vector activity affect you? Because these “summertime biters” that are surviving longer and moving into new geographic areas may elevate your risk of exposure to vector-borne diseases.

Two of the [most common vector-borne diseases](#) are Lyme disease (ticks) and West Nile virus (mosquitoes). And when ticks and mosquitoes bite you, they can potentially transmit these (and other) vector-borne diseases. (Fleas can also transmit serious diseases, but we’ll focus on ticks and mosquitoes here).

Lyme Disease: A Trilogy of Ticks, Deer, and Mice

Lyme disease is transmitted to humans through the bite of an infected nymphal (immature) deer tick. If you are bitten, the speed with which you extract it from your skin can help determine your risk of contracting Lyme disease.

The [black-legged tick](#) or “deer tick” (*Ixodes scapularis*, Northeast/Mid-Atlantic, or *Ixodes pacificus*, Pacific Coast), is the vector that transmits the [Lyme disease bacteria](#) (*Borrelia burgdorferi*) to humans, dogs, and other animals.

Here's how it works. Rodents, especially [white-footed mice](#), are commonly infected with the bacteria *Borrelia burgdorferi*. When deer feed on these infected white-footed mice, the infected ticks hop onto the deer.

As deer move around their habitat, they serve as “landing pads” for the ticks. They are a [passive source of blood](#) upon which the ticks feed, survive, and hitch a free ride. ([Deer do not acquire the Lyme disease bacteria](#), nor do they show signs or symptoms of the disease).

If you are nearby, the infected deer tick can then bite you – but you may not even feel or see this tiny tick. That's why it's so important to do daily tick checks when you are outside in the warm weather.

[Lyme disease](#) in humans can range from a mild, limited clinical illness to a significant, long-term disease. Initial signs and symptoms may include a distinctive skin rash (“bulls-eye rash”), joint pain or arthritis, fatigue, and fever. Long-term health complications may follow.

West Nile Virus: Mosquitoes, Crows, and Bird Migration

West Nile virus is transmitted to humans by the bite of an infected mosquito. But if you are bitten, your risk of getting West Nile virus depends on your age, general health, and the type of exposure. Slap that mosquito away as fast as you can!

The [Culex](#) mosquito is the vector that transmits the West Nile virus (part of the [Flavivirus group of viruses](#)) to humans, birds, and horses.

The [cycle of West Nile virus infection](#) typically starts when a mosquito feeds on an infected bird and then transfers the infection to an uninfected bird during its next feeding. The infected mosquito may then bite you, potentially transmitting the virus.

[Individuals with West Nile virus infection](#) typically experience no illness, or they may show mild, nonspecific clinical signs and symptoms, such as fever, rash, headache, and body aches.

You may be at [higher risk](#) for severe West Nile virus infection if you are elderly or have a weakened immune system. Some individuals can develop neurological effects from the virus, such as meningitis or encephalitis.

Culex mosquitoes are typically [attracted to larger birds](#), particularly corvids (crows, blue jays, and ravens) and raptors (eagles, hawks, and owls). Corvids, raptors, and other smaller bird species can contract West Nile virus and act as the primary host or carrier of the disease.

And it turns out that [crows are particularly susceptible](#) to West Nile virus infection and may be more likely than other large bird breeds to become ill and die.

If you've ever seen crows tilting their heads or struggling to keep their balance on the ground, they could be infected with West Nile virus. Loss of coordination, lethargy, and tremors are common [neurological signs](#) of this infection in birds.

A cluster of crows already [dead on the ground](#) was one of the early public signs of the 1999 New York City West Nile virus outbreak, signaling the introduction of the virus in North America.

Lyme Disease and West Nile Virus Have Long Histories and International Origins

Lyme disease and West Nile virus infection are international diseases and have been reported worldwide for many years.

Lyme Disease

Lyme disease is consistently reported every year throughout Europe, the Northern Mediterranean, the Middle East, and the United Kingdom.

The clinical illness that was initially termed "Lyme arthritis", now known as Lyme disease, was [first described](#) in Lyme, CT, in 1977. However, according to a [2017 study](#) published in *Nature* by Yale University School of Public Health researchers, the bacteria associated with Lyme disease (*Borrelia burgdorferi*) had reportedly been circulating in North America for thousands of years.

Ecological, environmental, and climate changes over the years may have supported the survival and spread of *B. burgdorferi*.

Lyme disease is the [most common tick-borne disease](#) reported in the United States. It is [more frequently reported](#) in the Northeast, mid-Atlantic, and upper Midwest areas.

In 2022, fifteen states (and the District of Columbia) reported [over 63,000 cases](#), accounting for 95 percent of the total U.S. cases.

West Nile Virus

The [first human case of West Nile virus](#) was identified in 1937 in the West Nile region of Uganda. Over the next 85 years, clusters and outbreaks of varying degrees have been reported in the Middle East, Israel, Egypt, Romania, South Africa, and Russia.

West Nile virus was [first imported into New York City in 1999](#). Public health experts believe the outbreak originated in the [Middle East, possibly in Israel](#). The method of overseas travel was unclear, but researchers think an infected mosquito may have been transported via an airplane, ship, or a migrating infected bird.

West Nile virus is the [most common mosquito-borne disease](#) reported in the United States. The Midwest, Southwest, California, Texas, and Colorado reported the [highest number of cases](#) in 2024.

In 2024, forty-nine states reported [1,466 cases](#) of West Nile virus infection, including 1,063 (73%) cases with neurological involvement.

Vector-Borne Diseases Are Just A Plane Ride Away

Ticks, mosquitoes, and fleas can easily travel on airplanes, ships, boats, vehicles, birds, animals, luggage, and people.

They can survive international travel, and [travelers continue to import](#) malaria, dengue, and chikungunya (other notable mosquito-borne diseases) into Florida and other states.

What Is the Impact of Climate Change on Vector-Borne Diseases?

[Climate change](#), which partly includes a dynamic mix of global warming, extreme weather events, and shifting precipitation patterns, can alter the profile of vector-borne diseases in several ways.

Let's look at how this profile is evolving - and how these changes may impact you.

Long, Hot Summers and Warm, Mild Winters Extend the Active Vector Season

According to the National Aeronautics and Space Administration (NASA), [2024 was the hottest year on record](#), having already beaten the 2023 heat record. The past ten years (2014-2024) have been the warmest recorded since [record-keeping began around 1880](#).

In fact, Mt. Fuji, Japan's [highest peak](#), was so warm in 2024 that snow was not recorded on the mountain until [November 6](#), marking the latest-ever arrival of the first snowfall.

As the active vector season begins earlier and lasts longer, the number of infected ticks and mosquitoes is projected to increase, raising your risk of exposure to Lyme disease, West Nile virus, and other vector-borne diseases.

Winter Survival of Vectors Alters Their Life and Reproductive Cycles

Climate change has the potential to directly impact ticks and mosquitoes by altering their life cycles and reproductive capabilities.

[Ticks and mosquitoes are susceptible](#) to a warm, humid environment. Ticks especially prefer [temperatures above 45 degrees Fahrenheit and humidity levels above 85%](#), which explains why

they actively bite during the typically hot, sticky summer weather. Mosquitoes also require access to [stagnant bodies of water for their breeding sites](#). Ticks and mosquitoes that previously died naturally during the cold, dry winter season may now be able to survive, reproduce, and even travel during the increasingly warm, humid winters.

As the vectors' life cycles are disrupted by climate change, ticks and mosquitoes may emerge earlier in the spring and linger later in the summer.

Vector Territory Is Expanding To A Warmer Northern Habitat

Climate change can also indirectly affect the activity of ticks and mosquitoes by expanding the geographical regions where they can thrive and reproduce.

Climate scientists note that vectors are already [heading into more northern habitats](#) of North America, including Canada, as these areas become warmer and more hospitable for their survival.

Bird Migration Patterns Are Disrupted

Migratory birds infected with the West Nile virus have been called the virus's primary ["long-distance transport agents"](#). These birds fly regularly to their destinations, and infected mosquitoes continue to support the chain of transmission.

Climate change can [disrupt bird migration and breeding patterns](#). Birds react to even minor ecological changes in temperature and humidity. They also respond to extreme precipitation patterns, such as hurricanes, torrential rainstorms, or tornadoes.

Higher Risk for Human Exposure to Vectors

The population of ticks and mosquitoes appears to be increasing as they thrive in a longer, warmer breeding season across an expanding footprint. This expansion of vector activity likely elevates the [risk of more vector-human interaction and direct exposure](#).

How Can You Lower Your Risk of Getting Lyme Disease and West Nile Virus?

- The best prevention is to discourage ticks and mosquitoes from landing on your body and to stop them from biting you if they do.
- Try to schedule inside activities during dawn, dusk, and early evening.

- Shower or bathe within 2 hours after outdoor exposure and check for ticks and mosquito bites.
- Avoid mosquito habitats: birdbaths, ponds, lakes, rivers, and any standing or stagnant body of water.
- Avoid tick habitats: tall grass, meadows, leaf litter, wooded and brushy areas. Walk in the center of the trails and avoid brushing against plants.

Check For Ticks Every Night and Remove Them Immediately

- Not every tick bite results in direct transmission of the *Borrelia burgdorferi* bacteria.
- But if a tick bites you, you must act quickly to prevent the transmission of the bacteria: [extract the tick immediately using tweezers](#) or a tick removal tool.
- Ticks can be very tiny and hard to see! Check these areas carefully: armpits, inside the belly button, groin, scalp, behind the knees, back, and inside and around the ears. Depending on the species, ticks can bite at any time of day.
- If the entire tick is not removed, it may engorge, or feed. Ticks that are completely removed within 36-48 hours of attachment and are not engorged are generally [less likely to transmit](#) *Borrelia burgdorferi*.

Anticipate and Kill Mosquitoes Before They Bite

- Mosquitoes are obviously a different type of vector. Unlike ticks, they don't burrow into your body and feed. Instead, they bite and immediately fly away. Mosquitoes usually bite at dawn, dusk, and early evening.
- To lower your risk of contracting the West Nile virus, you must move quickly to slap them away before they bite. Mosquitoes are fast and hard to catch!

Use Clothing, Permethrin, and Insect Repellent To Keep Ticks and Mosquitoes Away

- Wear long-sleeve, lightweight synthetic shirts, long pants (tuck pants inside hiking socks), jackets, and a hat (which keeps insects out of hair), especially when outside at night.
- Wear sneakers or hiking boots, not open-toe sandals or slides.

- Spray [Permethrin](#) (buy it in camping/outdoor stores) on clothing and gear (jackets, pants, shirts, hats, socks, and shoes) before heading outside. Spray heavily until clothes are very damp, then let them dry. Follow the application instructions carefully, and keep pets (especially cats) away.
- Consider Permethrin-treated mosquito nets and “knock-down” insect repellent spray (also in camping/outdoor stores) when camping outside.
- Permethrin is for clothing and gear application only!
- Apply an insect-repellent lotion or spray containing either 20% [Picaridin](#) or 25% [DEET](#) before heading outside. (The sustained-release, long-acting (12-hour) products may be less toxic).
- DEET is a very effective, strong chemical product; Picaridin is also very effective, safe, and a more environmentally friendly, natural product.
- DEET or Picaridin is for direct skin application only!
- Apply sunscreen first, then apply insect repellent as the top layer.

Key Take-Home Points for You

- Climate change has dramatically altered the face of vector-borne diseases, and this trend will continue.
- Lyme disease (ticks) and West Nile virus (mosquitoes) are the most common vector-borne diseases in the U.S.
- Warmer winters, earlier springs, hotter temperatures, and extreme weather patterns translate into more opportunities for human exposure to ticks and mosquitoes.
- Take steps to protect yourself against ticks and mosquitoes every time you are outside, even if you are only in your backyard.
- Because these “summertime biters” might just be staying home too this summer.