



Ticks and Tickborne Diseases of Utah

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What You Should Know

- The primary tick attaching to humans and pets in Utah is the Rocky Mountain Wood Tick.
- The most common tick-transmitted disease in Utah is Colorado Tick Fever (virus).
- Ticks are most frequently encountered from snowmelt through mid-July in Utah.
- The only human-attaching tick that is capable of transmitting Lyme disease in Utah is the Western Black-Legged Tick.
- The likelihood of encountering Western Black-Legged Tick in Utah is very low.
- The likelihood of contracting Lyme disease from Western Black-Legged Ticks in Utah is extremely low.
- To protect yourself against tick-borne illnesses, always conduct a thorough tick check after being in tick habitat.

Ticks are arachnids and are close relatives of spiders and mites. Ticks are most known for their potential to transmit disease to humans and other animals. Both hard ticks and soft ticks may be encountered in Utah. By far, the Rocky Mountain Wood Tick (*Dermacentor andersoni*) accounts for most tick encounters with humans and pets. Less frequently encountered ticks include the Winter Fern Tick (*Dermacentor albipictus*), Rocky



Fig. 1. Top, left to right: adult female and male Rocky Mountain Wood Tick (*Dermacentor andersoni*). Bottom, left to right: adult female and male Western Black-Legged Tick (*Ixodes pacificus*). Ryan Davis, USU Extension.

Mountain Sheep Tick (*Dermacentor hunteri*) and the Western Black-Legged Tick (*Ixodes pacificus*). Brown Dog Tick (*Rhipicephalus sanguineus*) may be brought into homes on infested dogs or animals. Soft ticks in the genus *Ornithodoros* are rarely encountered. To have ticks identified in Utah, submit specimens to the Utah Plant Pest Diagnostic Lab.

Description

Adult and nymphal (2nd immature stage) ticks have eight legs; newly hatched larvae (1st immature stage) have six and are very tiny. Visually, ticks appear to have one body segment, but two distinct segments exist, the gnathosome (mouthparts: hypostome, chelicerae, palps, basis capituli) and the idosome (the oval segment that comprises the

“body” of the tick). Ticks range in size from 2-20 mm depending on the life stage and species. See page 3 for information on soft ticks.

Life Cycle

Hard ticks (Ixodidae) have four distinct life stages: egg, larva, nymph and adult. The number of hosts a tick will attach to depends on the tick species. Rocky Mountain Wood Ticks will attach to three different hosts during their life (three-host tick) while the Winter Fern Tick attaches to one host and remains on that one host throughout its life (one-host tick). Two-host ticks occur on one host as immatures and on another host in the adult stage. Ticks must take a blood meal between each life stage to molt and to successfully reproduce.

Mating occurs on-host and the female will drop to the ground to lay eggs. Egg laying can take weeks to complete and eggs can number in the thousands. Female hard ticks will die after egg laying is completed. After hatching, the larvae of two- and three-host ticks will seek rodents, lizards, and other small hosts, while one-host ticks will search for their primary host species. In Utah, humans and pets mostly come in contact with three-host ticks in the nymph or adult stage while they are seeking larger mammalian hosts.

In Utah, the most likely time to encounter ticks is from snowmelt through mid-July, but can vary by year, elevation, geographic location, and climactic conditions. In general, the moist spring season promotes tick activity, while hot temperatures and dry summer conditions inhibit tick activity. Ticks can also become active again in the fall.

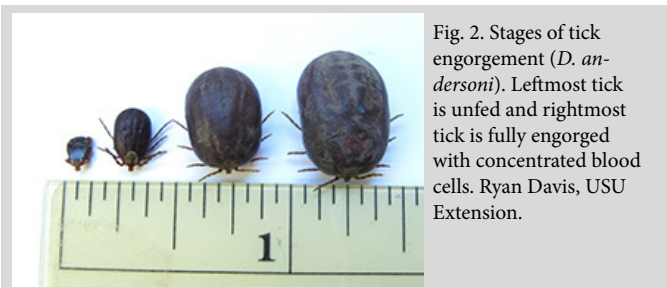


Fig. 2. Stages of tick engorgement (*D. andersoni*). Leftmost tick is unfed and rightmost tick is fully engorged with concentrated blood cells. Ryan Davis, USU Extension.



Fig. 3. Female Winter Fern Tick (*Dermacentor albipictus*) and eggs. Whitney Cranshaw, Colorado State University, Bugwood.org.

Tick Feeding

Hard ticks don't simply bite, they attach. Utah's commonly encountered ticks find hosts by questing. Questing involves climbing vegetation and waiting. The tick senses a passing host, extends its legs and grabs on as the host brushes against the vegetation. Once on the host, the tick will begin searching for a suitable, preferably protected, feeding site. Ticks will use host odors and other physical stimuli to determine host suitability before feeding.

Scissor-like mouthparts (chelicerae) are used to cut into the skin and the barbed hypostome (straw-like mouthpart) is inserted. The tick secretes a numbing agent in the saliva as the hypostome is pushed into the skin, so bites are painless. When the mouthparts are in place, hard ticks secrete a cementlike substance that will help anchor the tick to the host's skin. This process can take from 1 to 2 days. After the cement hardens, ticks become very difficult to remove.

Firmly in place, tick will secrete antihistamines, anticoagulants and other enzymes to promote blood feeding. Hard ticks' bodies don't stretch to accommodate the blood meal, they grow. Because of this, hard ticks will stay attached to the host for 2 to 3 days for the larvae and up to 2 weeks for adult females. When feeding, adult females can increase their body weight 100-120 times the

Soft Ticks: Argassidae

Soft ticks are much less frequently encountered by humans, but a few species are capable of transmitting diseases to humans in Utah. The name "soft tick" refers to this group's lack of a scutum, or the hard plate that partially (females) or completely (males) covers the back of the hard tick body.

Soft ticks have four life stages (egg, larva, nymph and adult). They differ from hard ticks in that they have multiple (typically three to five) nymph stages, whereas hard ticks only have one nymph stage. Soft ticks may live from 10-20 years, due in large part to their ability to survive long periods without feeding.

Another primary difference between soft and hard ticks is the way in which they feed. Hard ticks attach from a few days to a few weeks. Soft ticks feed more like bed bugs, actively finding prey and feeding in less than 1 hour. During feeding soft ticks will have a ten-fold increase in their body weight. Soft ticks do not grow as they feed as do hard ticks, but their body stretches to contain the bloodmeal.

Soft ticks mate off host, usually in vegetation or in hiding places in their host's nest or roost. Unlike hard ticks, soft ticks can mate multiple times and do not have to feed each time to produce viable eggs. Typically, small batches of eggs (up to 500) are laid multiple times.

In Utah, two soft tick species may transmit tick-borne disease. *Ornithodoros parkeri* may transmit tick-borne relapsing fever (*Borrelia parkeri*) to humans, though encountering this tick would be a rare event. *O. parkeri* habitat includes burrows of prairie dogs, ground squirrels, and burrowing owls in basins and valleys. *O. hermsi* may transmit *Borrelia hermsii*, and prefers coniferous forests in mountainous regions at higher elevations. This species comes into contact with people when they sleep in old, infested cabins. Ticks emerge from walls, floor boards, etc., at night, feed rapidly on sleeping hosts, and then return to their hiding spots.



Fig. 4. Soft ticks, *Ornithodoros turicata*, are similar in appearance to *O. parkeri* and *O. hermsi*.

pre-feeding weight! It is during the feeding process that diseases can be transmitted from the tick to humans or other animals.

Tick Bites & Tick Safety

Immediately contact a doctor if you have a tick attached, or recently attached to your body. Early detection of a pathogen can aid in faster treatment and recovery. In addition to tick-vectoring diseases, tick paralysis (TP) is a condition caused by the feeding of some ticks. Substances in the saliva injected into the body during feeding may cause paralysis which starts at the feet and moves up the body. In severe cases tick paralysis can cause respiratory failure and death. Mortality from TP occurs most frequently in children under 7. Tick paralysis is reversible within 24 hours after tick removal.

Always complete a thorough "tick-check" after leaving tick habitat. Ticks may take 2 hours or longer to find a suitable feeding site and even longer to fully attach. Transmission of disease usually occurs 12-24 hours after feeding has begun. For a list of tick-vectoring diseases in Utah, see Table 1 on page 4.

There are many suggested methods for tick removal, but to greatly reduce your chance of contracting a tick-borne disease, there is only one proper removal method, as outlined below by Intermountain Health Care.

For larger hard ticks:

- Use tweezers and grasp the tick as close to the skin as possible, targeting the mouthparts. If tweezers are not available, use a loop of thread around the mouthparts or a needle between the mouthparts.
- Carefully pull the tick straight upward without twisting or crushing it. Use steady pressure until it releases. Crushing or squeezing a tick can cause it to regurgitate stomach contents into the blood stream, which can contain tick-borne diseases.

Table 1: Common Tick-Transmitted Diseases in Utah

Disease	Pathogen	Type	Vector	Symptoms
Rocky Mountain Spotted Fever	<i>Rickettsia rickettsii</i>	Bacteria	¹ RMWT; ² BDT; ³ WFT	Sudden onset of chills and fever, headache, blood-shot eyes; leakage of blood from capillaries over the entire body.
Tularemia	<i>Francisella tularensis</i>	Bacteria	RMWT	Chills, fever, prostration, ulceration at bite location, and tender, swollen lymph nodes.
Colorado Tick Fever	Orbivirus	Virus	RMWT	Sudden onset, intermittent fever, headache, muscular pain, leukopenia.
Tick Paralysis	Saliva Toxin	Neurotoxin	RMWT	Paralysis spreading from feet to upper regions of the body; may cause death if tick is not removed.
Tick-Borne Relapsing Fever	<i>Borrelia hermsii</i> ; <i>Borrelia parkeri</i>	Bacteria	⁴ O _s	Episodes of fever, headache, muscle and joint pain; nausea.
*Lyme Disease	<i>Borrelia burgdorferi</i>	Bacteria	⁵ IP	Fever, chills, headache, fatigue, muscle and joint aches, swollen lymph nodes; erythema migrans rash (target-shaped rash occurring at attachment site). See the CDC page on Lyme Disease symptoms for more.

*Lyme disease, *Borrelia burgdorferi*, has not been shown to occur endemically in Utah tick populations.

¹RMWT = Rocky Mountain Wood Tick, *Dermacentor andersoni*.

²BDT = Brown Dog Tick, *Rhipicephalus sanguineus*.

³WFT = Winter Fern Tick; *Dermacentor albipictus*.

⁴O_s = *Ornithodoros* spp. (soft ticks)= *Ornithodoros hermsi* and *Ornithodoros parkeri*.

⁵IP = *Ixodes pacificus*, Western Blacklegged Tick.

For smaller hard ticks:

- Scrape the tick with a knife blade or credit card edge, being careful not to cut yourself.
- Place tick in a sealed container and have it identified.

General treatment:

- If the head accidentally breaks off and remains in your skin, clean the area around the bite and use a sterile needle to carefully lift or scrape the head from the skin.
- Wash the wound and your hands with soap and water after removal. Apply an over-the-counter antibiotic ointment to help reduce the chance of catching a tick-borne, or secondary infection. Monitor the bite and contact a doctor if symptoms develop.

Consider these tips to avoid coming in contact with ticks.

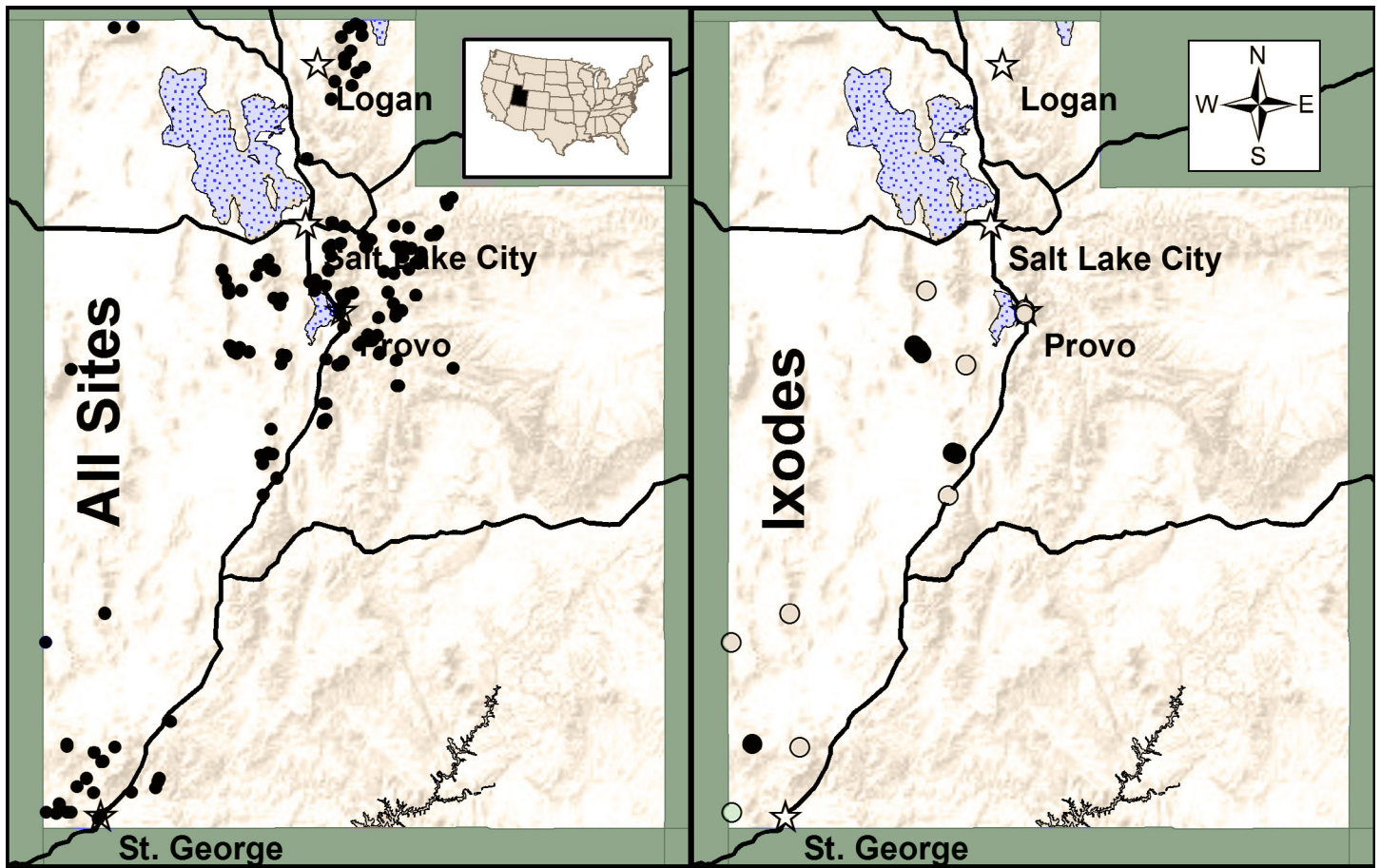
- Avoid grassy, bushy and sage-brushy areas along edges of woodlands and fields, from March to mid-July.
- Wear long pants and long-sleeved



Fig. 5. Typical habitat of *Ixodes pacificus* in the Sheprock Mountains, UT. In Utah, *Ixodes pacificus* ticks are generally found between 5,500 ft and 7,300 ft elevation. Habitats where WBLTs were collected commonly included scrub oak (*Quercus gambelii*), juniper (*Juniperis* spp.), big sage brush (*Artemisia tridentata*), grasses and black sage brush (*Artemisia nova*). **Areas containing a mix of black sage brush and gambel oak were particularly favored by WBLT during our collections.**

shirts. Tuck shirts into pants and pants into socks. Apply tick repellent to clothing before entering tick habitat.

- Wear light-colored clothes to make it easier to detect and remove ticks.
- Conduct tick checks everywhere on your body, including armpits, waistline, belly button, scalp and crotch areas.



Figs. 6 & 7. (Left) Locations of all 160 sites surveyed between 2011-2013. (Right) Location of all sites (current and published historical records) where Western Black-Legged Ticks (*Ixodes pacificus*) were collected. Gray dots represent historical *I. pacificus* collections and black dots represent collections from 2011-2013 (modified from Davis et al., 2015).

The Status of Lyme Disease in Utah

It is important to understand that not all ticks are capable of transmitting Lyme disease. In Utah, the Western Black-Legged Tick (WBLT) (*Ixodes pacificus*) is capable of transmitting Lyme disease (*Borrelia burgdorferi*) to humans. The most commonly encountered tick in Utah, the Rocky Mountain Wood Tick, does not transmit Lyme. Additionally, not all WBLTs carry Lyme. In California and Arizona, where Lyme has been confirmed, only 4.9% - 14.6% of larvae and 1% - 5.7% of adult WBLTs carry Lyme (Eisen et al. 2004, Holden et al. 2003, Lane et al. 2009, Wright et al. 2011, Eisen et al. 2010, Lane et al. 2007, Olson et al. 1992).

In Utah, Davis et al. (2015) surveyed 160 sites in northern and southern Utah over a 3-year period by flag/drag sampling. During that period, only 119 WBLTs were collected. Ninety-five percent (114 ticks) of the collected ticks were taken from a few isolated sites in the Sheeprock Mountains

(Tooele Co.), demonstrating the rarity of encountering WBLTs in Utah.

All 119 adult WBLTs were tested for the presence of *B. burgdorferi* (Lyme) using DNA tests. All 119 WBLT DNA extracts tested negative for *B. burgdorferi*. While more research is needed to determine the status of Lyme in Utah, this research suggests that encountering a WBLT in Utah is rare (Figs. 6 & 7), and that it would be exceedingly rare for that tick to be a carrier of Lyme disease. *Dermacentor* ticks were commonly collected throughout the general survey area.

Regardless of the risk, always practice sound tick safety procedures and conduct thorough tick checks to avoid contracting tick-borne diseases. Remember, different ticks carry different diseases, so be sure to collect any tick that has bitten you, and have it identified by the Utah Plant Pest Diagnostic Lab (UPPDL). The UPPDL only provides identification services, not disease testing.

To submit a tick to the UPPDL, please place the tick in a small container/vial with ethanol, rubbing alcohol or water and ship to:

Utah Plant Pest Diagnostic Lab
5305 Old Main Hill
Logan, UT 84322

For an analysis of tick-borne diseases, a few labs around the country specialize in disease testing. Visit these sites for more information on tick

testing:

[Bay Area Lyme](http://www.bayarealy.me.org/lyme-disease-prevention/tick-testing/)

<http://www.bayarealy.me.org/lyme-disease-prevention/tick-testing/>

[Mainley Ticks](http://www.mainelyticks.com/submission-services.html)

<http://www.mainelyticks.com/submission-services.html>

References

Bowman, A.S., and Nuttall, P.A. 2008. *Ticks: Biology, Disease and Control*. Cambridge University Press.

Cranshaw, W.S., and Peairs, F.B. Updated 2010. *Colorado Ticks and Tick-Borne Diseases*. <http://www.ext.colostate.edu/pubs/insect/05593.html> .

Davis, R.D., Ramirez, R.A., Anderson, J.L., and Bernhardt, S.A. 2015. *Distribution and Habitat of Ixodes pacificus (Acari: Ixodidae) and Prevalence of Borrelia burgdorferi in Utah*. *Journal of Medical Entomology*. November; 52(6): 1361-1367.

Larisa, V. 1997. *Ticks Commonly Encountered in California*. Department of Entomology, University of California, Davis. <http://entomology.ucdavis.edu/faculty/rbkimsey/caticks.html> .

Schmitt, B.D., and Thompson, D.A. 1994-2010. *Tick Bite – Children: Self-Care Decisions* LLC. <http://intermountainhealthcare.org/HEALTH/SYMPTOM/Pages/TickBite-Children.aspx>

Yunker, C.E., Keirans, J.E., Clifford, C.M., and Easton, E.R. 1986. *Demacentor ticks (Acari: Ixodoidea: Ixodidae) of the New World: A Scanning Electron Microscope Atlas*. *Proceedings of the Entomological Society of Washington*. 88(4), pp. 609-627.

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