Utah Department of Health and Human Services

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Utah Department of Health & Human Services

Tick surveillance annual report 2022

Introduction

The Utah Department of Health and Human Services (DHHS) and the Utah Public Health Lab (UPHL) conduct tick surveillance to better understand the distribution of tick species across the state, seasonal tick trends, and potential tickborne pathogens which can be acquired in Utah. All of these data help identify areas of risk for certain tickborne diseases across the state.

The tick surveillance project began in the summer 2020, and tick identification at UPHL began in summer 2022. Along with DHHS and UPHL, these surveillance efforts have been conducted with help from several other partners including the local health departments (LHDs) throughout the state of Utah, Division of Wildlife Resources (DWR), the Rickettsial Zoonoses Branch at the Centers for Disease Control and Prevention (CDC), Heber Valley Camp, and citizens of Utah who submit tick specimens to UPHL.

This annual report summarizes the tick surveillance efforts during the 2022 season, including locations where tick drag events occurred, which tick specimens were found, and tick surveillance expansion and improvement efforts.

Dermacentor andersoni female under the microscope at UPHL.

Tickborne disease incidence in Utah is low. The most common disease carried by ticks in Utah is Colorado tick fever (CTF), followed by Rocky Mountain spotted fever (RMSF). On average, 1–2 CTF cases are reported annually and an average of 1 RMSF case is reported every 5 years in the state. Both diseases can be transmitted by the Rocky Mountain wood tick (*Dermacentor andersoni)*, which is the most common tick found in Utah.

The most common cause of tickborne illness in Utah residents is Lyme disease. However, most human cases reported in Utah report travel to Lyme-endemic areas in the mid-west and along the east coast. While the vector for Lyme disease, the western black-legged Tick (*Ixodes pacificus),* is endemic to Utah, there is no evidence of tickborne Lyme disease transmission in the state. DHHS began tick surveillance efforts in order to help answer the question, "Can you get Lyme disease in Utah?" This question came up after a review of a Utah State University (USU) paper from Davis, *et al*. (2015). Researchers from USU conducted tick drags in areas where human cases of Lyme disease were suspected to have been acquired in Utah. The investigators found the western black-legged tick (the only vector for Lyme disease in Utah) in Tooele, Millard, and Washington counties, but none tested positive for the Lyme disease spirochetes.

Along with better understanding Lyme disease risk in Utah, the CDC has expressed interest in understanding the distribution of various types of ticks and any pathogens they carry on a county level across the country. Therefore, DHHS tick surveillance efforts are also conducted with the goal to identify which tick species are present in Utah on a county level, what pathogens they carry, and the seasonality of these tick species.

Utah's tick surveillance efforts have expanded to include tick drags performed by LHDs, animal surveillance conducted by representatives at DWR, and passive surveillance by volunteer partners such as the Heber Valley Camp as well as public submissions.

Surveillance protocols

DHHS tick drags

The spring tick drag schedule is determined by the temperature and snow melt, and start dates change on a yearly basis. Once temperatures are above freezing for a few consecutive days and there is no snow on the ground at a specific site of interest, the spring tick drags can begin. During the spring season, DHHS schedules tick drags every 1–2 weeks. Sites are based on previously dragged areas from the Davis *et al*. study, historical tick data, and reported tick exposures through the state electronic disease surveillance system (EpiTrax). Two to 4 DHHS employees go to a drag site and, using a white cloth, walk

for 30-minute increments to try to collect any ticks in the drag area. Drags are checked every 25 steps to ensure any captured ticks do not fall off of the drag. Ticks are collected from the drag and placed in labeled tubes for further analysis at UPHL.

As temperatures climb in the summer months, tick activity usually decreases since ticks prefer cooler temperatures. Because of this, summer tick drag schedules are assessed and changed if temperatures get too high for consecutive weeks. Tick drag events tend to decrease in frequency to about twice a month during the summer. Toward the end of September through October, tick drag events increase again as these fall months show another spike in tick activity, and the fall tick drag season ends once temperatures drop below freezing for a few consecutive days and an area gets snow.

LHD tick drags

During the fall 2022 tick drag season, DHHS began training LHDs on tick surveillance and tick drag protocols and provided tick drag supplies. For LHDs whose staff are trained and interested in tick drags, DHHS requests partners participate in a few tick drags during the spring season, if time permits. Pre-visited sites or areas where ticks have been sighted are preferred. In addition, when LHDs interview tickborne disease cases in their jurisdiction, if the case reports no out-of-state travel history, DHHS requests the LHD to perform a tick drag in the area of suspected or confirmed tick exposure which was identified during the case interview process. LHD tick drags should follow the same protocol as DHHS tick drags.

Passive surveillance

Passive surveillance includes tick submissions from partners and the public. In both cases, ticks found (on a person or pet, or in the environment) are collected and sent to UPHL for analysis. If an organization is interested in becoming a tick surveillance partner with DHHS, vector-borne epidemiologists at DHHS provide training and tick collection supplies including vials with ethanol, vial labels, and a Google spreadsheet to document tick specimens collected. Tick specimens may be transported to UPHL by DHHS staff or the UPHL courier system.

Animal surveillance

Animal surveillance allows for opportunities to collect higher numbers of ticks at one site while still answering the question, “What ticks are found in Utah at the county level?” Many tick species are host-specific and will likely not be found during tick drag events, so animal surveillance is a more efficient way to capture tick count data for various tick species. To reduce added work for those who participate in animal surveillance, tick collection should take place during trapping events, game checkpoint events, and other pathogen testing or

animal encounter events which are already scheduled. DHHS provides pre-filled vials with ethanol and vial labels for tick collection along with a Google sheet to document tick specimens. Tick specimens will either be picked up by DHHS or the UPHL courier system will be utilized to transport samples to UPHL for further analysis.

Tick drag locations summary

In 2022, DHHS conducted **15 tick drag events totaling 44 drag sites (28 unique sites)**. The first tick drag of the year occurred on April 8, 2022 in Salt Lake County, and the last tick drag of the year occurred on October 19, 2022 in Tooele County. One tick drag occurred in Uintah County where DHHS epidemiologists educated colleagues at the TriCounty Health Department and DWR about tick surveillance efforts in Utah. Furthermore, a few individuals from the TriCounty Health Department participated in 2 tick drags during the visit. Additionally, DHHS epidemiologists trained partners from the Tooele County Health Department and Tooele area DWR staff on tick surveillance. Tooele County Health Department staff also helped with a tick drag in the Vernon area. Table 1 summarizes the tick drags completed during 2022 by county.

Table 1. Tick drag events by county, 2022

County	Number of tick drags
Millard	2
Salt Lake	14
Summit	9
Tooele	7
Uintah	2
Utah	7
Wasatch	3
Grand total	44

Tick specimen summary

In 2022, **80 adults, 1 nymph, and 215 larval ticks were collected** (Table 2). Ticks collected this year came from DHHS tick drags and passive collection from public submissions and partners at Heber Valley Camp. Figure 1 shows the locations where tick adults, nymphs, and larvae were collected by DHHS and partners throughout Utah.

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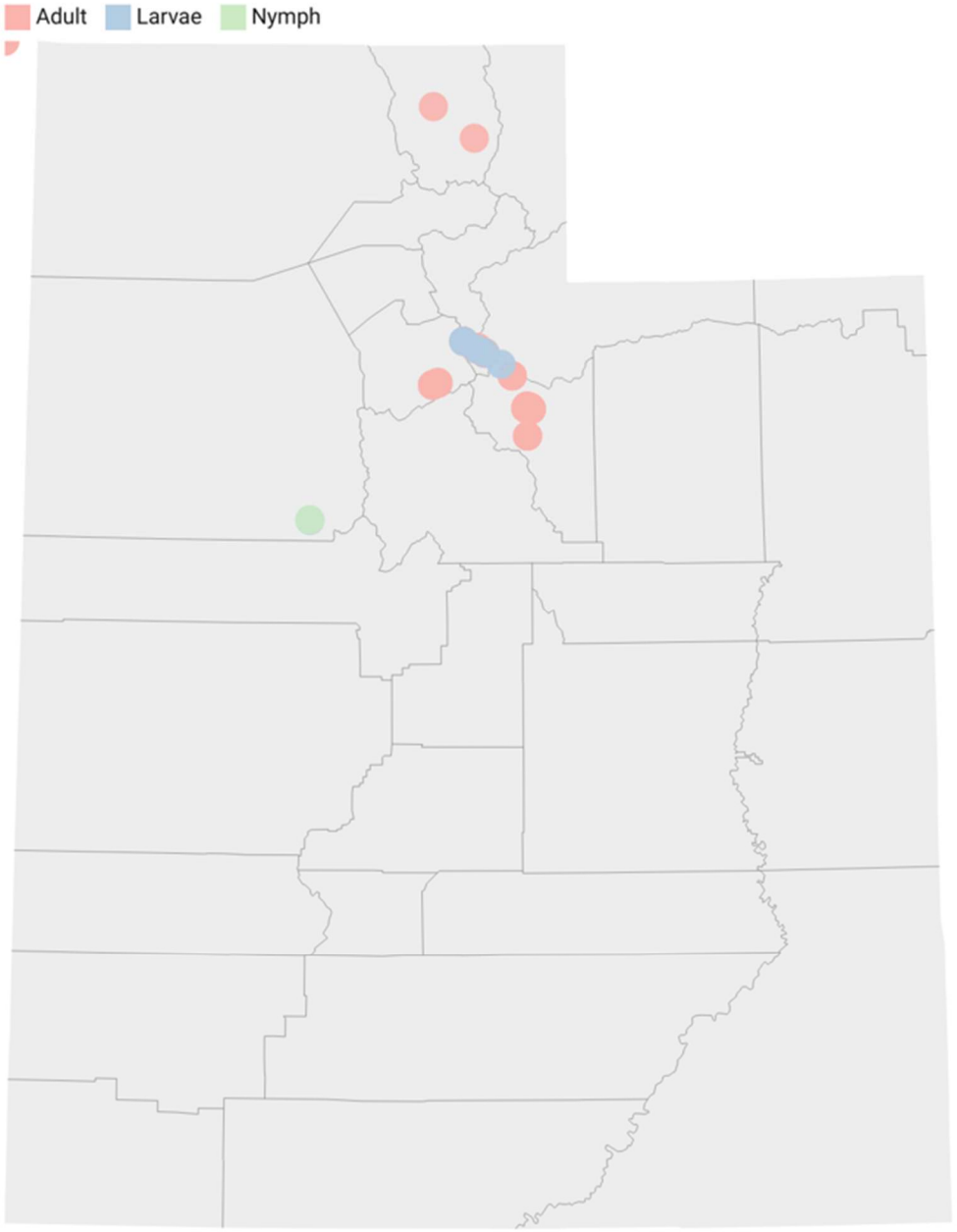
Figure 1. Map of collected ticks in Utah, 2022



Note: Dots may represent a cluster of ticks found in a single area with similar GPS coordinates. Dot coordinates are not exact, but rather an estimate location in the general area where a tick was found.

All adult ticks (n=80) were identified as *Dermacentor andersoni* (Rocky Mountain wood tick). Of these 80 adult ticks collected, 64% (n=51) were female (Table 2). Larval ticks collected in April from Salt Lake County (n=7) were identified by the CDC as *Dermacentor albipictus* (the winter tick). All larvae and a single nymph found in October in Salt Lake County (same site as in April), Summit County, and Tooele County were also identified as *Dermacentor albipictus* through sequencing. Table 3 describes count data for tick species and life stage found in 2022.

Table 2. Collected adult ticks by sex, 2022

Sex	Tick count
Male	29
Female	51
Total	80

Note: Sex was not determined for larval and nymph ticks.

Table 3. Tick species counts by life stage, 2022

	Life Stage			
Species	**Adult**	**Nymph**	**Larvae**	**Total**
D. albipictus		1	215	216
D. andersoni	80			80
Total	80	1	215	296

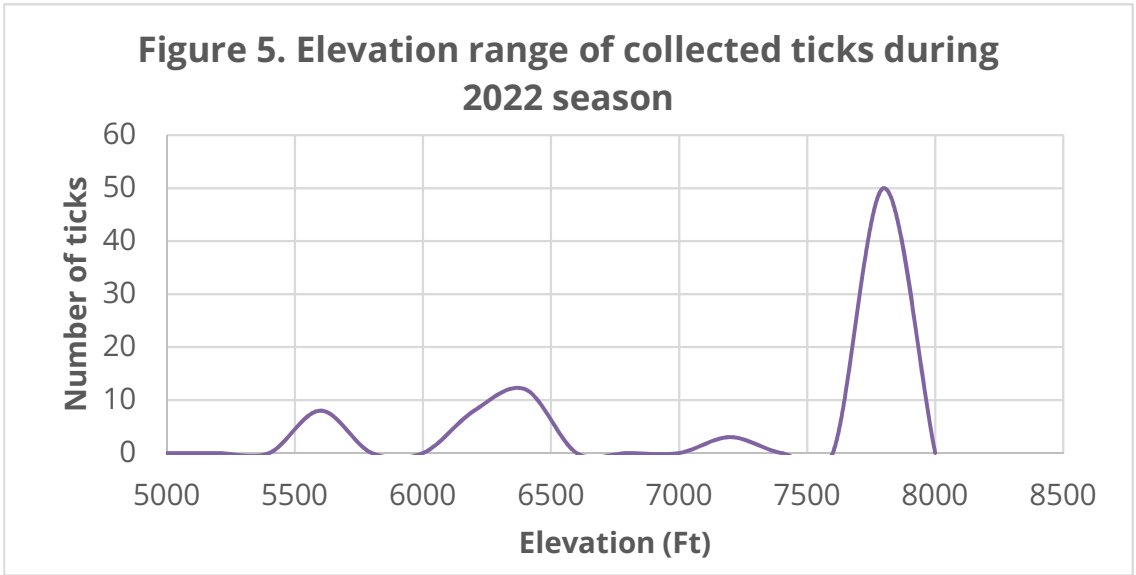
Tick habitat

Dermacentor andersoni adult ticks were found in areas with sage brush and mixed grasses (Figure 2). All larval ticks were found in tall dry grasses (Figure 3). Many of these tall grasses were flattened, most likely by a large mammal (Figure 4). Ticks collected in 2022 were found at elevations ranging between 5,600 feet and 7,800 feet. Figure 5 shows the elevation distribution of the ticks collected during the 2022 season.

Figure 2. *Sage brush and mixed green grass habitat where D. andersoni adults were found in the spring months*

Figure 3. *Tall dry grasses where larval ticks were collected in October in Tooele County*

Figure 4. *Area where grass was flattened, most likely by a large mammal lying is a common habitat for larval ticks*



Note: this graph shows the elevation range of the sites where DHHS tick drags were done, as well as where the passive surveillance partners collected ticks. This figure does not necessarily show the preferred elevation of ticks. Additional collections are needed to better understand elevation preferences of different tick species.

Seasonality of ticks

Ticks are most active in the spring months after the snow melts and in the fall months once the weather cools down, before the first snow. The 2022 tick drag season aligned with this seasonality trend. The first ticks collected by DHHS tick drags were found in April at the first tick drags of the season in Salt Lake County and Wasatch County. Tick numbers from drag events peaked in May. Submitted ticks from Heber Valley Camp and other public submissions also peaked in May but remained high into June. No ticks were found in August or September, but 1 nymph and 208 larval ticks were found in October in Salt Lake, Summit, and Tooele counties. Seven larval ticks were also found earlier in the year in April while dragging in Salt Lake County. Table 4 summarizes the location of the adult ticks found in 2022 by month for each collection method (drag and submission) and Table 5 summarizes the location of the larval ticks found in 2022 by month for each county. Figure 6 outlines the number of adult and nymph ticks found by all methods on a biweekly basis and Figure 7 outlines the number of tick larvae found on a biweekly basis.

Table 4. Count of adult ticks collected by month per county

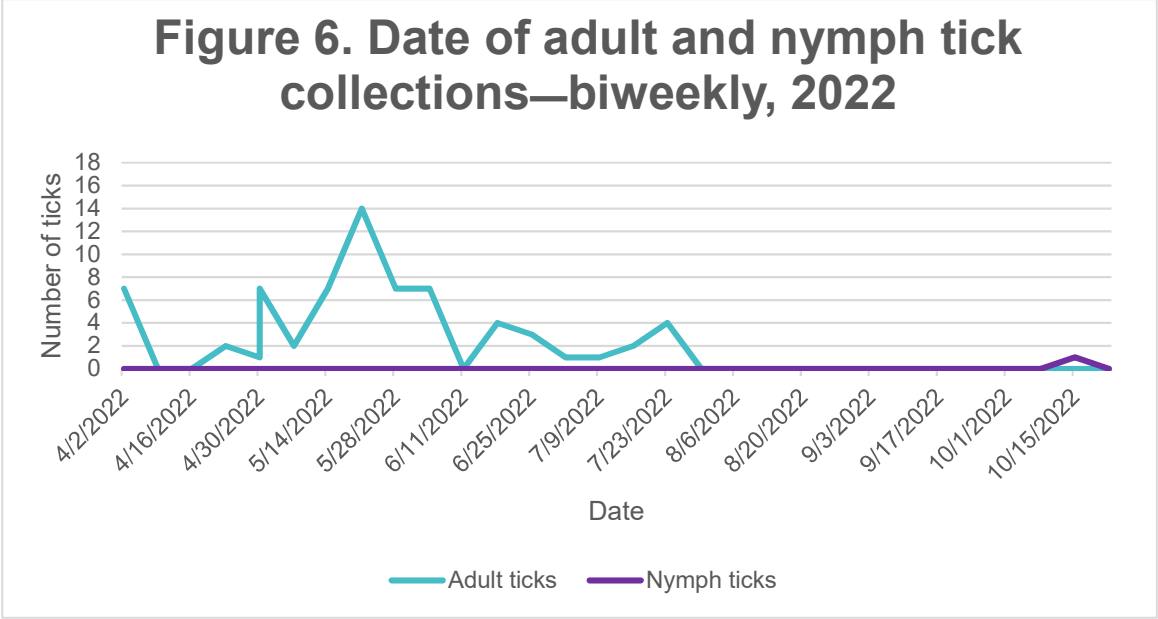
	Month					
County	**April**	**May**	**June**	**July**	**Unknown**	**Grand total**
Cache			**2**			**2**
Drag			1			1
submission			1			1
Salt Lake	**8**					**8**
Drag	8					8
submission						0
Summit		**10**	**1**	**4**		**15**
Drag		10		4		14
submission			1			1
Wasatch	**1**	**18**	**16**	**4**	**15**	**54**
Drag		3				3
submission	1	15	16	4	15	51
Unknown county			**1**			**1**
Drag						0
submission			1			1
Grand total	**9**	**28**	**19**	**8**	**15**	**80**

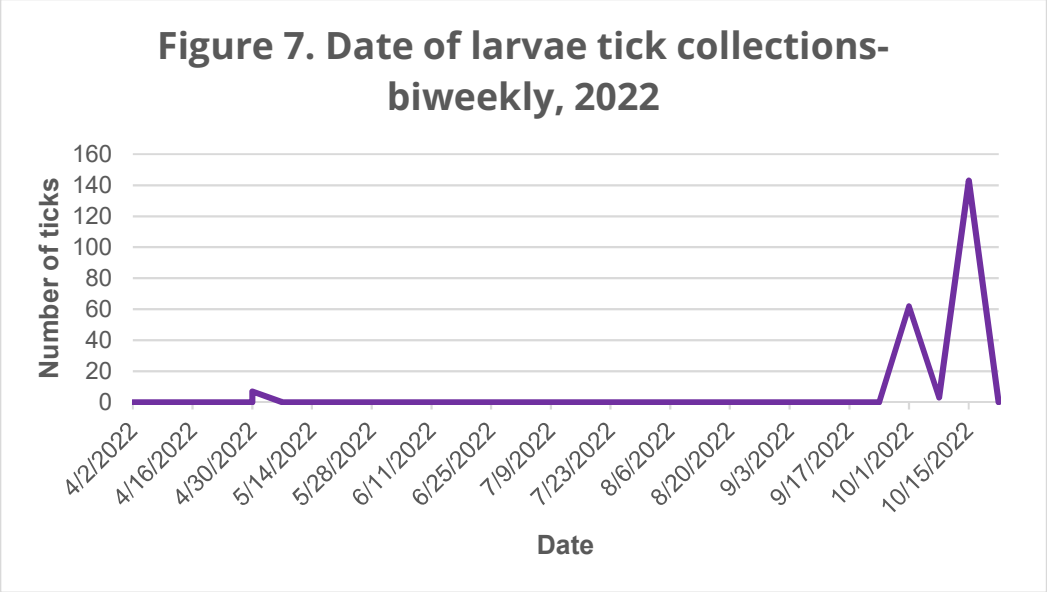
Note: "Drag" = tick drags performed by DHHS; "Submission" = ticks found and submitted by partners, such as Heber Valley Camp in Wasatch County or by citizens, to UPHL.

Table 5. Count of larval ticks collected by month per county

County	Month							
	April	May	June	July	August	September	October	Grand total
Salt Lake	**7**	0	0	0	0	0	**62**	**69**
Summit		0	0	0	0	0	**3**	**3**
Tooele		0	0	0	0	0	**143**	**143**
Grand total	**7**	0	0	0	0	0	**208**	**215**

Note: one nymph tick was found with the 143 larval ticks at the Tooele County site in October as well, but was left out of this table.





Pathogen testing

Forty-eight ticks (41 adults and 7 larvae) were submitted to the CDC in Atlanta, GA for pathogen testing. The CDC tested all adult ticks for the presence of *Rickettsia rickettsii* (bacterium that causes Rocky Mountain spotted fever), *Coxiella burnetii* (bacterium that causes Q fever), *Anaplasmataceae* species (bacteria that cause anaplasmosis), and other *Rickettsia* species. Larval ticks were solely tested for the presence of *Rickettsia* species. Ticks were not tested for *Borrelia burgdorferi* (bacteria that causes Lyme disease) because no *Ixodes* ticks were collected. All larval ticks were negative for *Rickettsia* species, and all adult ticks were negative for *R. rickettsii, C.burnetii,* and *Anaplasmataceae* species. Twenty-six of the adult ticks tested were infected with *Rickettsia peacockii*, and 1 adult was infected with *Rickettsia rhipicephali* (Both are rickettsial non-pathogenic endosymbionts of *D. andersoni*).

Updates and next steps

UPHL is working to validate pathogen testing assays to allow for local testing of ticks for certain pathogens. DHHS will continue to work with DWR to conduct animal surveillance during the hunting and trapping season through December. Additionally, DHHS plans to continue protocol development for submission of ticks to UPHL from Utah residents across the state.

Resources

Utah pest fact sheet: Ticks and tickborne diseases of Utah (Utah State University)

Lyme disease DHHS disease plan (2022)

Colorado Tick Fever DHHS disease plan (2018)

Spotted Fever Rickettsiosis DHHS disease plan (2019)

CDC tick surveillance and tick drag protocol (2020)

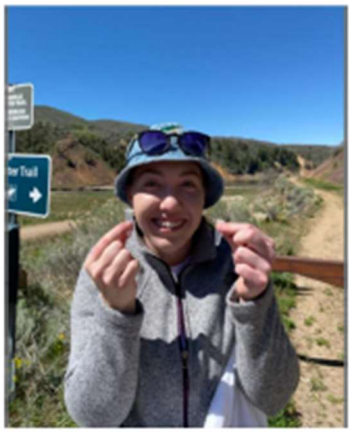
CDC Tick Website

CDC tick-borne disease reference manual for providers (Sixth Edition, 2022)

Utah Department of Health & Human Services

Tick surveillance 2022 photo album

DHHS staff in Little Cottonwood Canyon for the first tick drag of the 2022 season



Dermacentor andersoni adults found at Jordanelle Reservoir

Checking for ticks on the tick drag cloth

Removing larvae from the tick drag cloth

UPHL staff learning DNA extraction techniques

DHHS staff identifying tick species under the microscope

Two *Dermacentor andersoni* adults collected from a trailhead in Summit County

Proper personal protective equipment: tucking pants into long socks helps prevent ticks from crawling under clothes

Teaching TriCounty HD how to do a tick drag near Vernal, UT

Tick drag with Tooele HD outside of Vernon, UT

DHHS staff talking to the media about tick surveillance efforts and tickborne diseases in Utah

CO2 trap used to attract ticks in the nearby area