Tick Surveillance Report

2024 Summary

Saskatchewan

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Summary

Tick surveillance can be passive (examining ticks or photographs of ticks that are voluntarily submitted by the public) or active (targeted collection of ticks in their natural habitat). Both methods are useful for monitoring changes to the risk from Lyme disease and other tick-borne diseases.

Both active and passive tick surveillance are carried out in Saskatchewan and provide useful information on tick activity in the province. Surveillance began in 1995 and active surveillance for *Ixodes scapularis* (the blacklegged tick) has been ongoing in Saskatchewan since 2008[1]. The blacklegged tick is the primary carrier for the agents that cause Lyme disease and several other tick-borne diseases in Canada and the United States of America. The active surveillance program has the objectives of assessing the risk of Lyme disease in the province by checking for blacklegged ticks and determining if they have become established in any areas of the province and determining what fraction of them carry the bacteria responsible for Lyme disease or other tick-borne diseases such as anaplasmosis and babesiosis. Confirmed human cases of Lyme disease or other tick-borne diseases are also recorded. The risk of acquiring Lyme disease from infected ticks increases substantially in areas where the blacklegged tick has become established.

Blacklegged ticks submitted through the surveillance program are tested for *Borrelia burgdorferi* (the agent that causes Lyme disease), *Anaplasma phagocytophilum* (the agent that causes anaplasmosis) and as of 2013, *Babesia microti* and occasionally *Babesia odocoile*i (agents that causes babesiosis), *Borrelia miyamotoi* (the agent that causes relapsing fever) and *Borrelia mayonii*, a newly described organism that can cause Lyme disease.

The sampling locations for active tick surveillance are determined by a number of factors including computer modelling to map habitats likely to sustain tick populations, information from passive surveillance (such as where blacklegged ticks have been collected), and any known human or animal Lyme disease cases that can be tracked to a definitive location. Other factors that are considered in sample site selection include sampling in suitable habitat areas such as parks and recreational areas where there is a high level of interaction among people, pets, wildlife, and proximity to known risk areas in neighbouring jurisdictions.

A small number of blacklegged ticks have been found over past years of surveillance, but no reproducing populations of ticks have been detected in any areas of the province despite several years of active sampling. This means that, at present, there are no known Lyme disease risk areas in the province. However, the possibility of blacklegged ticks being dropped by migrating birds exists across the province, and approximately 12 percent of the ticks submitted for pathogen testing are infected with the bacteria that causes Lyme disease. Thus, there is still a low and sporadic risk to humans of contracting Lyme disease from an infected tick in Saskatchewan, even in the absence of known risk areas. Furthermore, since adult blacklegged ticks are active in the spring and fall months, and nymphs are found in the late spring and summer, the risk of being bitten by an infected tick can exist for the entire spring, summer, and fall period.

[1] Corrected from previous reports which stated active tick surveillance started in 2009.

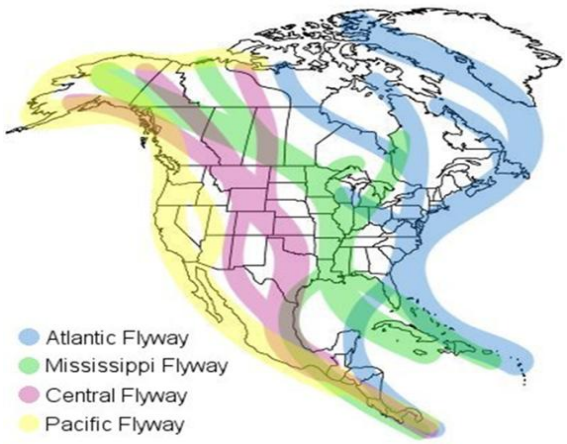
2024 Tick Surveillance Summary

- In Saskatchewan, both passive surveillance (via voluntary submissions) and active surveillance (via tick surveys) are conducted to monitor tick activity in the province.
- Most ticks (about 95%) obtained through the surveillance programs are the American dog tick (*Dermacentor variabilis*), winter or moose tick (*Dermacentor albipictus*) or the Rocky Mountain wood tick (*Dermacentor andersoni)*. These species are not known to be competent vectors of Lyme disease but may transmit other diseases such as Rocky Mountain Spotted Fever, tularemia and tick paralysis, although only rarely in western Canada.
- In 2024, 1,613 ticks were identified through voluntary submissions and 51 were blacklegged ticks (*Ixodes scapularis*). Thirty-six blacklegged ticks were submitted for pathogen testing; four tested positive for the bacteria that causes Lyme disease and four ticks tested positive for the bacteria that causes anaplasmosis.
- Compared to 2023, more blacklegged ticks tested positive for the bacteria that causes Lyme disease in 2024 (4 vs 1); however, this corresponded with an increase in ticks submitted for testing, and the proportion positive remained similar (9.1% in 2023 vs 10.8% in 2024).
- Since 2008, 38,871 ticks have been identified through voluntary submissions and 201 (0.5%) were blacklegged ticks. Of the 201 blacklegged ticks, 149 were submitted for testing, and 18 (12%) tested positive for the bacteria that causes Lyme disease. Twelve of the tested ticks (8%) were positive for the bacteria that causes anaplasmosis. Three ticks (2%) were co-infected with both agents.
- Active tick surveys have increased in recent years. In 2024, 59 surveys at 49 sites were completed during the spring, summer and fall periods.
- Through active surveys in 2024, 1,358 ticks were collected. One blacklegged tick was collected through active surveys, which tested negative for pathogens that cause Lyme disease, anaplasmosis, babesiosis, and relapsing fever. In addition, 777 American dog ticks (*D. variabilis*) and 580 ticks identified as *Dermacentor* spp. were collected.
- The single blacklegged tick collected through active surveys in 2024, together with three collected in 2023, represent the first blacklegged ticks detected through active surveys since surveys began in 2008.
- No reproducing population of blacklegged ticks have been detected in any areas of the province despite years of active sampling.

Introduction

Lyme disease is caused by a bacterial infection transmitted to humans through the bite of certain types of ticks, most notably some species within the genus *Ixodes*. The range of the primary vector of Lyme disease in Canada, *Ixodes scapularis,* the blacklegged tick, has been rapidly expanding in Canada in recent years. This tick is now considered to be endemic to some localized areas of southern Ontario, Quebec, New Brunswick, Nova Scotia, and Manitoba. The risk of acquiring Lyme disease increases in areas where populations of infected blacklegged ticks are established. Another vector of Lyme disease, *Ixodes pacificus* or Western blacklegged tick, is established in areas of southern British Columbia[2]. Populations of blacklegged ticks are not known to be established in Saskatchewan at this time; however, small numbers of infected blacklegged ticks are transported into the province by birds migrating north. Several major flyways converge over Saskatchewan and can have birds that have picked up infected ticks from the midwestern and central states of the U.S. (Figure 1 and Figure 2).

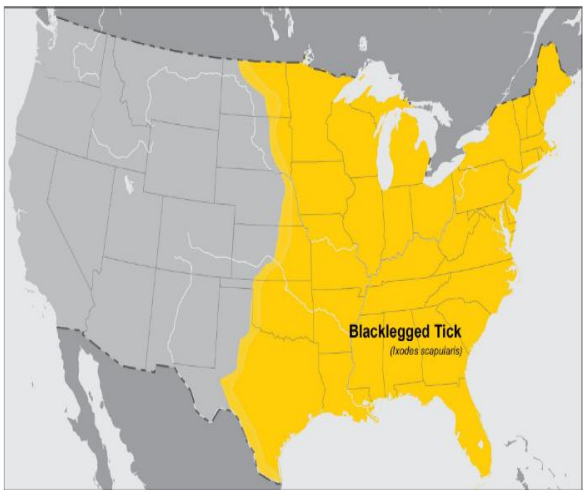
Figure 1: North American bird flyways



https://www.michiganaudubon.org/bfc/safe-passage-great-lakes/

[2] Henry B, Morshed M. Lyme disease in British Columbia: Are we really missing an epidemic? BC Med J. 2011; 53(5): 224-229

Figure 2: Estimated distribution of *Ixodes scapularis* – United States, 2018



https://www.cdc.gov/ticks/geographic_distribution.html)

Most ticks found in Saskatchewan are the American dog tick *(Dermacentor variabilis*). Other common species include the Rocky Mountain wood tick (*Dermacentor andersoni*) and the winter or moose tick (*Dermacentor albipictus*). *Dermacentor* species are not competent vectors of Lyme disease but may transmit other diseases such as Rocky Mountain Spotted Fever, tularemia and tick paralysis, although only rarely in western Canada[3]. A few ticks (0.5%) detected through voluntary submissions are the blacklegged ticks; these are occasionally found in the southern and central part of the province. Since 2008, 201 blacklegged ticks have been detected through passive surveillance (voluntary submissions) in the province, and of the 149 ticks submitted for testing, 18 (12%) tested positive for *B. burgdorferi,* the bacteria that causes Lyme disease (Table 1).

Blacklegged ticks may carry other organisms that cause human disease, including anaplasmosis and babesiosis. These diseases have not been documented in humans in Saskatchewan although, 12 (8%) blacklegged ticks have tested positive for the bacteria that causes anaplasmosis. Of the 1,358 ticks collected during active field surveys in 2024, one (<1%) was identified as a blacklegged tick. A reproducing population of blacklegged ticks has not yet been detected in Saskatchewan.

Determining Lyme Disease Risk

Monitoring for blacklegged ticks and the prevalence of infection with *Borrelia* spp. or other pathogens allows public health officials to assess the risk of human exposure to infected ticks in a given area. A Lyme disease risk area is defined as a location in which there is:

- evidence of established (reproducing) populations of blacklegged ticks. This is indicated by the presence of all three life-cycle stages (larva, nymph, adult) in an area, found over more than one year; and
- likely transmission of *B. burgdorferi*. This is demonstrated by laboratory testing (molecular detection or culture) of *B. burgdorferi* in ticks and/or rodent samples.

[3] Dermacentor variabilis: American dog tick - Learn About Parasites - Western College of Veterinary Medicine [Internet]. 2021. Available from: https://wcvm.usask.ca/learnaboutparasites/parasites/dermacentor-variabilis-american-dog-tick.

The following methods are used to determine risk areas in Saskatchewan:
1. drag sampling for ticks[4]; and,
2. field-validated signals from passive tick surveillance[5].

The risk can increase substantially in areas where infected tick populations become established. Tick abundance and infection rates for the bacteria that cause Lyme disease can be much higher and more localized in established areas than in non-established areas[6].

Lyme disease risk areas identified in Canada are summarized at: https://www.canada.ca/en/public-health/services/diseases/lyme-disease/prevention-lyme-disease.html. Relevant provincial and territorial websites can be found at the following link: https://www.canada.ca/en/public-health/services/diseases/lyme-disease.html#a5

In order to maximize the probability of finding any risk areas (i.e., sites with established blacklegged tick populations) in Saskatchewan, the active surveillance program prioritizes the locations with the highest likelihood of supporting an established tick population. If such populations were found, these would be the first Lyme disease risk areas known in Saskatchewan.

Several sources of information are used in determining priority locations for active tick surveillance. These information sources include computer models, information from the passive surveillance program, any known human or animal cases of Lyme disease, and information from other nearby jurisdictions with known tick populations.

Tick Surveillance in Saskatchewan

Since 1995, the Ministry of Health (Population Health Branch) has collaborated with the Roy Romanow Provincial Laboratory (RRPL), the Public Health Agency of Canada - National Microbiology Laboratory (NML), and, since 2009, the University of Saskatchewan (U of S) to monitor ticks in the province. From 2016 to 2021, the Saskatchewan Health Authority (Regina environmental public health), assisted with the spring and fall surveys of ticks in southeastern Saskatchewan.

The goal of tick surveillance is to assess the risk of acquiring Lyme disease and other tick-borne diseases by determining whether the vector is present and/or established in Saskatchewan. Tick surveillance can determine the distribution and level of establishment of tick populations, specifically blacklegged tick populations within an area, monitor the infection prevalence, and assess the possible risk of infection to humans. The status of blacklegged tick populations in an area is classified as one of:

- established – field surveillance confirms that reproducing populations occur;
- adventitious – ticks are found only sporadically, both in time and space, and usually only a single stage of tick (e.g., adult females) is present; or
- not present – ticks have not been found in an area after surveys have been conducted to assess the level of establishment.

[4] Ogden NH, Koffi JK, Pelcat Y, Lindsay LR. Environmental risk from Lyme disease in central and eastern Canada: a summary of recent surveillance information. Can Comm Dis Rep 2014; 40: 74-82
[5] Koffi JK, Leighton PA, Pelcat Y et al. Passive surveillance for *Ixodes scapularis* ticks: enhanced analysis for early detection of emerging Lyme disease risk. J Med Entomol 2012; 49: 400-409
[6] Lindsay LR (National Microbiology Laboratory) (Personal communication)

Tick surveillance can be passive (examining ticks or photographs of ticks voluntarily submitted by the public) or active (targeted collection of ticks in their natural habitat). Both methods are useful for monitoring changes to the risk from Lyme disease or other tick-borne diseases.

Passive Surveillance

The objectives of passive tick surveillance are to assess potential risk of Lyme disease across the province and to provide input to the active surveillance program regarding when and where to sample for ticks. Passive surveillance is recommended for jurisdictions, such as Saskatchewan, where established blacklegged tick populations do not exist. It is found to be less useful in areas where there are known established tick populations[7] because it provides minimal new information.

Methods

From 2009-2019, ticks were voluntarily submitted by veterinarians, health care workers, the general public, and other interested parties to the RRPL or the U of S for sorting and identification. In 2020, eTick was implemented, and has since become the primary platform for passive tick surveillance in the province. More information on eTick can be found at www.eTick.ca.

Through eTick, individuals submit photographs of ticks they encounter. Researchers at the U of S identify ticks and request all blacklegged ticks and other non-native tick species by mail for validation and testing purposes. Mailed-in blacklegged ticks are tested for *B. burgdorferi, B. miyamotoi*, *B. mayonii* (occasionally), *A. phagocytophilum*, *Ba. microti* and *Ba. odocoilei* (occasionally) at the NML or U of S.

Active Surveillance

The objective of active surveillance is to detect the location of any established blacklegged tick populations and to identify Lyme disease risk areas (if any) in the province. Active surveillance uses targeted surveys to look for blacklegged ticks in locations where other information (passive surveillance, human cases, and suitable habitat) suggests the possibility of tick populations occurring. In order to establish baseline information on tick populations, an important goal of active surveillance is to repeatedly sample many of the same sites every year and conduct seasonal sampling (i.e., spring or fall) at other sites.

Site Selection

Potential risk areas for the establishment of blacklegged ticks have been identified through development of a risk model for the Prairie Provinces[8]. This model integrates temperature, habitat as a combined geo-layer of forest cover and agricultural land use, and rainfall to produce a risk map for Saskatchewan, Manitoba and Alberta. The map identifies low to high potential (risk index 0-5) for *I. scapularis* (blacklegged ticks) and has helped to further guide active tick surveillance in Saskatchewan (**Appendix A – Figure 7**). Of the 64.6 million hectares of habitat classified in Saskatchewan, 1,463,322 ha have been classified as having some risk for establishment of the blacklegged tick, with 181,984 ha classified as having a high-risk potential (risk category 4-5) for establishment of blacklegged ticks[9].

[7] Koffi JK, Leighton PA, Pelcat Y et al. Passive surveillance for *Ixodes scapularis* ticks: enhanced analysis for early detection of emerging Lyme disease risk. J Med Entomol 2012; 49: 400-409

[8] Gabriele-Rivet V, Koffi J, Pelcat Y et al. A risk model for the Lyme disease vector *Ixodes scapularis* (Acari: Ixodidae) in the Prairie Provinces of Canada. 2017. J. Med. Entomol. 54: 862-868

[9] Saskatchewan Ministry of Health, unpublished data

Sites with high-risk potential have been identified in aspen parkland and boreal transition habitat throughout southeastern and central Saskatchewan. Most targeted surveys are conducted at these sites (Table 2).

Sites for active sampling include provincial parks, provincial recreation/historic sites and ecological reserves, national historic sites, regional parks, urban parkways, sites where blacklegged ticks have been collected by passive surveillance, as well as sites of most likely exposure for human or domestic animal Lyme disease cases.

Sites also include those tested annually or several times per year as "sentinel" sites along the Upper Assiniboine, Qu'Appelle and Souris River watersheds, which are tributaries to the larger Assiniboine River watershed in southern Manitoba where established populations of blacklegged ticks have been found. In addition, a number of sites have been identified in the North and South Saskatchewan River watersheds in central Saskatchewan and in urban parks and naturalized areas where blacklegged ticks have been submitted through passive surveillance.

Included in the active survey sites for 2024 (n=49) were 12 Canadian Lyme Sentinel Network (CaLSeN) sites in Saskatchewan (Table 2). Of the 59 active surveys completed in 2024, 12 surveys were in CaLSeN sites. Located near the cities of Saskatoon, Regina, Yorkton, and Prince Albert, CaLSeN surveillance sites provide detailed and standardized collection of data on tick distribution and abundance in Saskatchewan and will provide baseline information on current and future Lyme disease risk as the vector and disease becomes established in the province. In previous reports, these sites were referred to as Canadian Lyme Disease Research Network sites.

A more detailed summary of the site selection criteria is included in **Appendix A**.

Methods

Adult blacklegged ticks are active in the spring and fall months, while nymphs are found in the spring and summer months. To detect these ticks during the season, active tick surveillance by drag sampling is completed by the Ministry of Health and the Western College of Veterinary Medicine (WCVM) at the U of S. Training in tick surveillance techniques and tick identification is provided by qualified professionals with expertise in tick morphology.

Surveyors use a dragging technique which consists of pulling a white flannel cloth over and around vegetation where ticks may be present. The drag resembles a moving host, and the ticks will grab onto the cloth as it moves by. The cloth is $1m^2$ and is attached to a 1.2m wooden dowel, with a cord or rope used to pull the drag cloth (Figure 3 and Figure 4).

Figure 3: Tick surveillance using a drag

(*Photo courtesy of Phil Curry)*

Figure 4: Winter or moose tick (*Dermacentor albipictus*) larvae collected using a drag

(*Photo courtesy of Phil Curry)*

At non-CaLSeN sites, each survey consists of collecting and recording ticks every 25m, for a total distance of 2km. Because the drag cloth is $1m^2$, the total area sampled per site is $2000m^2$ or 0.2 hectare. For the fall surveys, the distance travelled is often more than 2km. A minimum of two hours of sampling effort by the surveyors is completed at most sites with the exception of some smaller sites where a blacklegged tick had been submitted through passive surveillance and a full survey could not be completed.

CaLSeN surveys are conducted by drag sampling along two 1000m transects (total $2000m^2$ or 2km) in suitable tick habitat. Tick samples are collected every 25m and an in-depth analysis is conducted of the ecological factors that support the establishment of a tick population. Measurements include weather during collection, latitude and longitude coordinates at each sample point, temperature, forest and understory vegetation types, litter depth, soil humidity and percent canopy cover. There are usually four people involved in a CaLSeN survey, two surveyors and two observers recording the data. CaLSeN sites are sampled in the spring each year to determine if blacklegged ticks are present and to measure yearly fluctuations in tick activity.

During the surveys, “flagging” is done at a few of the individual survey points where the shrubs and trees are too thick to allow for dragging. Dragging is done by dragging the white cloth over relatively open ground, whereas flagging (i.e., moving the cloth in a waving motion over and through vegetation) is usually done in densely brushy ground. With flagging, the end of the drag cloth can be gripped at one end so that the cloth hangs vertically downwards, and the device used to flag vegetation. Ticks that are questing for passing hosts cling to the cloth and can be removed for identification and counting. Any blacklegged ticks that were collected would be tested for a range of pathogens.

Ticks are removed from the drag cloth and the numbers and species are recorded. All male and female adult ticks and nymphs of any species from CaLSeN sites are placed into collection vials for identification. For all other sites, ticks are identified and counted, and a subsample may be collected for further studies. Blacklegged ticks and nymphs, or species that require further identification, are placed in vials for identification and testing.

Drag or flag sampling is usually done in the late morning or early afternoon and is not effective when it is raining, when the vegetation is wet (from rain or dew), or when temperatures are less than 4°C or greater than 25°C.

Surveillance Results

Passive surveillance

In 2024, 1,613 ticks were identified through passive tick surveillance and 51 (3%) were blacklegged ticks collected from Saskatchewan (Table 1). Five blacklegged ticks were collected from humans, one from clothing/tick drag, six from cats, and 39 from dogs. Of the 51 blacklegged ticks, 36 were submitted via mail for pathogen testing. Four ticks tested positive for the Lyme disease agent, *B. burgdorferi*; two ticks were collected from moist mixed grassland, one tick was collected from aspen parkland, and the other tick was collected from the boreal transition ecoregion (Figure 5). Four ticks tested positive for *A. phagocytophilum*; three from boreal transition ecoregion and one from moist mixed grassland. All ticks tested negative for *Ba. microti,* and *B. miyamotoi*. Ticks were not tested for *B. mayonii* in 2024.

In addition, two blacklegged ticks, likely collected outside Saskatchewan were submitted to the surveillance program, one from Ontario and one from an individual with recent travel history to Germany. Both ticks tested negative for pathogens that cause Lyme disease, anaplasmosis, babesiosis and relapsing fever; this data is not included in Table 1.

In addition to the blacklegged ticks, other notable *Ixodes* ticks detected in 2024 include five *Ixodes kingi* (rotund ticks), four collected from prairie dogs and one collected from a dog. Four ticks were submitted for testing and all tested negative for the pathogens that cause Lyme disease, anaplasmosis, babesiosis, and relapsing fever. *I. kingi* is distributed across western North America, including Saskatchewan[10]. This tick species has been found to carry pathogens that cause Q fever

[10] NatureServe Explorer 2.0 [Internet]. Available from: https://explorer.natureserve.org

and tularemia[11]; however, it is not considered a vector of significant public health concern[12]. Besides the *Ixodes* ticks, a single *Amblyomma maculatum* (Gulf Coast tick) was collected from a dog and two *Haemaphysalis leporispalustris* (rabbit ticks) were collected from rabbits. *A. maculatum* is not established in Saskatchewan; its known geographic range includes eastern coastal United States, Mexico, and Central and South America[12]. *H. leporispalustris* is commonly found on rabbits and hares in the Prairies and is rarely detected on humans or domestic animals[13].

There was no significant change in blacklegged ticks collected or positive test results from 2008-2016 (Av. 1 positive tick/yr.; range 0-2). In 2017, however, the numbers collected and numbers that tested positive increased to 15 and four, respectively (Table 1). In 2018 and 2019, fewer blacklegged ticks were collected; however, in 2018 two of six tested positive while in 2019 zero ticks tested positive. Compared to 2018 and 2019, blacklegged tick submissions increased each year from 2020-2024. Compared to 2023, blacklegged tick submissions increased by 89% in 2024. It is unclear whether this reflects a true increase in tick populations or heightened public awareness and submission. Of the ticks submitted in 2024, 22% tested positive for pathogens.

Over the last 17 years (2008-2024), 38,871 ticks were identified through passive surveillance and of these 201 (<1%) were blacklegged ticks. Of the 149 blacklegged ticks mailed in for pathogen testing, 18 (12%) were infected with *B. burgdorferi*. Blacklegged ticks positive for *B. burgdorferi* were collected from moist mixed grassland, aspen parkland, boreal transition, and mid-boreal lowland ecoregions. Twelve blacklegged ticks (8%) collected from moist mixed grassland, aspen parkland, and boreal transition were infected with *A. phagocytophilum*. Three ticks (2%) were co-infected with both agents (Table 1).

[11] Anstead CA, Chilton NB. Detection of a novel Rickettsia (Alphaproteobacteria: Rickettsiales) in rotund ticks (Ixodes kingi) from Saskatchewan, Canada. Ticks and Tick-borne Diseases [Internet]. 2013 Feb 16;4(3):202–6. Available from: https://doi.org/10.1016/j.ttbdis.2012.11.013

[12] Ontario Agency for Health Protection and Promotion (Public Health Ontario). The ticks of Ontario. 2nd ed. Toronto, ON: King's Printer for Ontario; 2026

[13] Galloway TD. Getting to know your ticks. Blue Jay [Internet]. 2002 Jun 1;60(2). Available from: https://doi.org/10.29173/bluejay5685

Table 1: Number of ticks detected through passive and active surveillance, blacklegged ticks and ticks positive for *Borrelia burgdorferi* and *Anaplasma phagocytophilum* (2008-2024)

Year	Passive surveillance		Active surveillance		Results of Pathogen Testing			
	Total ticks (all species)	Blacklegged ticks	Total ticks (all species)	Blacklegged ticks	Blacklegged ticks positive for *Borrelia burgdorferi* [1]	Blacklegged ticks positive for *Anaplasma phagocytophilum* [2]	Blacklegged ticks co-infected with both *Borrelia* and *Anaplasma*	Total Blacklegged ticks positive
2008	-	5	-	0	0	1	0	1
2009	1,478	5	-	0	1	1	1	1
2010	1,139	3	-	0	0	0	0	0
2011	736	3	-	0	1	0	0	1
2012	2,896	1	-	0	0	0	0	0
2013	1,726	10	-	0	1	2	1	2
2014	3,176	5	945	0	0	0	0	0
2015	5,103	9	1,516	0	1	1	1	1
2016	5,300	9	1,823	0	0	0	0	0
2017	5,112	15	511	0	4	0	0	4
2018	2,233	7	263	0	2	0	0	2
2019	2,393	7[3]	674	0	0	0	0	0
2020	2,678	12[4]	1,746	0	3	1	0	4
2021	969	15[5]	556	0	0	2	0	2
2022	1,308	17[6]	595	0	0	0	0	0
2023	1,011	27[7]	2,029	3[8]	1	0	0	1
2024	1,613	51[9]	1,358	1[10]	4	4	0	8
Total	**38,871**	**201**	**12,016**	**4**	**18**	**12**	**3**	**27**

Notes:
[1]*Borrelia burgdorferi* is the bacteria that causes Lyme disease.
[2]*Anaplasma phagocytophilum* is the bacteria that causes anaplasmosis, an illness with symptoms that can range from fever, muscle pain, headache to severe symptoms such as difficulty breathing, hemorrhage, renal failure or neurological problems that can be fatal.
[3]One blacklegged tick tested positive for *Borrelia miyamotoi*.
[4]Of the 12, only seven blacklegged ticks were mailed in for pathogen testing. All seven ticks tested negative for *Borrelia miyamotoi*, *Borrelia mayonii,* and *Babesia microti*.
[5]Nine out of 15 blacklegged ticks were mailed in for pathogen testing. Blacklegged ticks were not tested for *Borrelia miyamotoi, Borrelia mayonii,* and *Babesia microti* in 2021.
[6]Seven blacklegged ticks were mailed in for pathogen testing. One tick tested positive for *Borrelia miyamotoi*. Ticks were not tested for *Borrelia mayonii* in 2022.
[7]Eleven blacklegged ticks were submitted for testing in 2023.
[8]Blacklegged ticks collected through active surveillance were not tested for pathogens.
[9]Thirty-six blacklegged ticks were submitted for testing in 2024.
[10] The single blacklegged tick collected through active surveillance in 2024 tested negative for the pathogens tested (*B. burgdorferi*, *B. miyamotoi*, *A. phagocytophilum*, and *Ba. microti*).

Blacklegged ticks have been detected throughout the province but predominantly in the moister and more wooded moist mixed grassland, aspen parkland, boreal transition, and mid-boreal upland areas (Figure 5 and Figure 6). Six percent of blacklegged ticks have been found in the mixed grassland and mid-boreal lowland ecoregions (Figure 6).

Figure 5: Blacklegged tick locations in Saskatchewan through passive and active surveillance, 2008-2024 (N=199)*

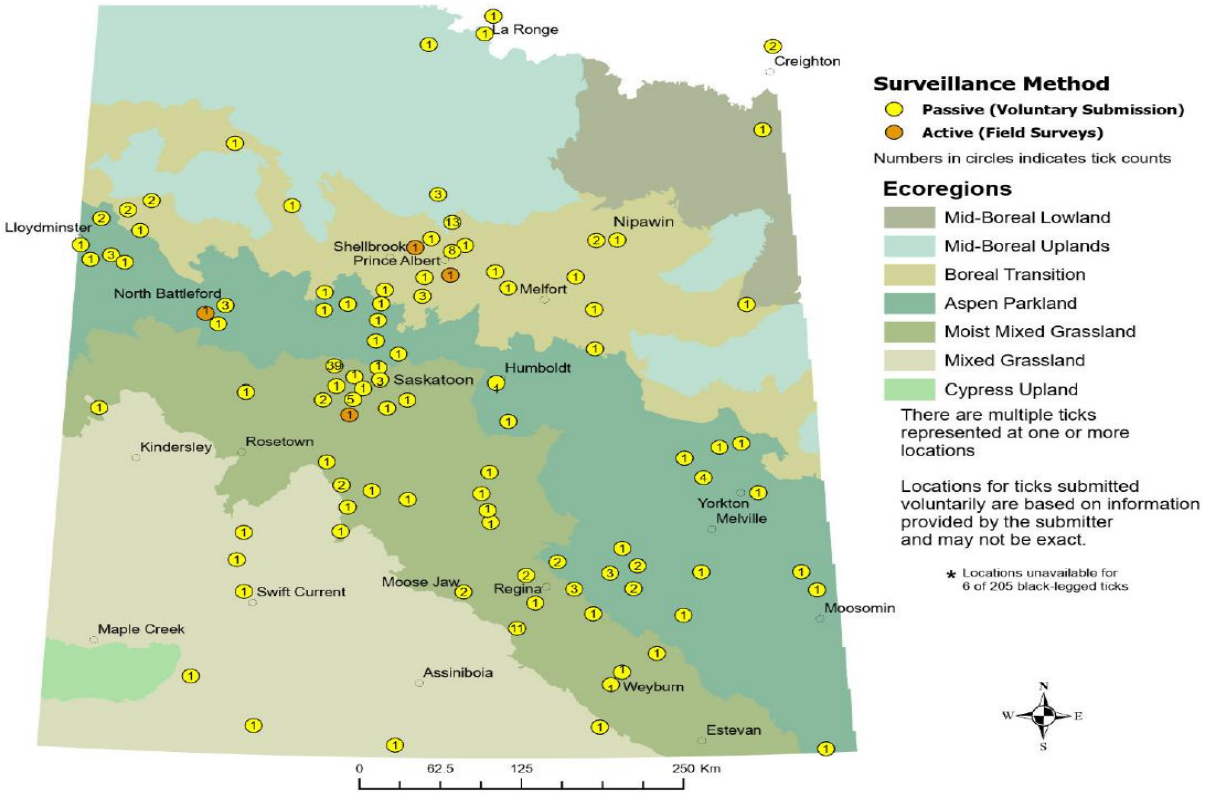
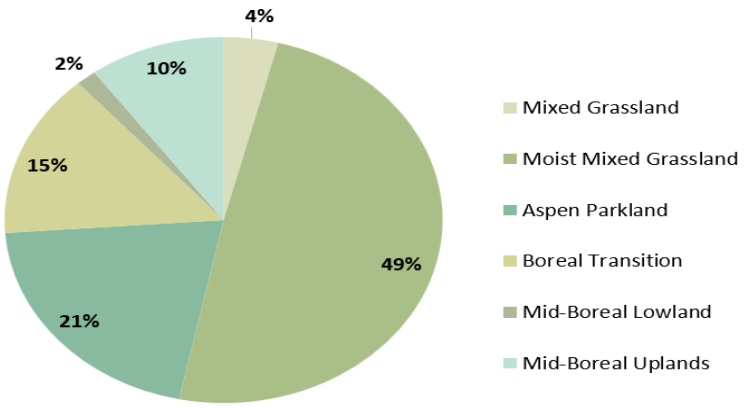


Figure 6: Percent blacklegged ticks by ecoregion in Saskatchewan, passive and active surveillance, 2008-2024 (N=199)*



* Locations were not available for 6 of 205 blacklegged ticks

Active surveillance

Fifty-nine surveys at 49 sites were completed during the spring, summer and fall periods in 2024. Twenty-eight surveys were completed during the spring and early summer period, and 31 surveys were completed during the fall period (Table 2).

The survey sites included ten Provincial Parks (two individual sites were located at Pike Lake and Buffalo Pound), six Regional Parks, six provincial ecological reserves/historic sites, three National Historic Sites, one National Wildlife Area, 15 urban parks, ecological reserves and recreation areas (two individual sites were surveyed at Connor Park), and six private properties. There were eight sites where two surveys were conducted in the spring and fall at the same location (i.e., Echo Valley, Crooked Lake, Moose Mountain and Pike Lake Provincial Parks, Chief Whitecap Park South, Mair Park, Miller's Hill Park and Fort Esperance National Historic Park). An additional survey was completed in the spring at Connor Park (Wakamow Valley Authority) to determine the effects of a fire from August 2023 on tick numbers.

There were numerous surveys conducted in urban parks, ecological reserves and recreation areas close to larger urban areas in response to submissions of blacklegged ticks by the public. These included sites near Saskatoon, Regina, Prince Albert, Moose Jaw, Yorkton, and the Battlefords.

Spring surveys – Surveyors completed 28 surveys during the spring and early summer period, all in suitable tick habitat (Table 2). Twelve CaLSeN sites were surveyed in the spring in cooperation with staff and students from the WCVM. Surveys started earlier and ended later than previous years, to capture tick activity over the entire spring and summer tick season. Surveys began on April 14, 2024, and ended on July 10, 2024. Conditions were dry and sunny at most sites, except for two sites where rain showers delayed or stopped the survey.

Most surveys were a minimum of 2 km in length except for Fort Esperance, where a rain shower stopped the survey and the Connor Park burn survey, where the survey was 800 m in length. There were 70.2 hours of sampling effort with an average of 2.5 (range 1.5 - 4.2) hours of survey effort completed at the sites.

Sampling was done during the late morning-early afternoon period when conditions were more favourable for tick activity (i.e., dry, sunny or partly overcast, low winds). Temperatures during the spring sampling period were generally warm and ranged from 8 – 28°C (mean 17.1°C).

There were 1,357 ticks collected during the spring surveys. This included 777 American dog ticks (*D. variabilis*) (2 nymphs, 374 males, 401 females), and 580 ticks identified as *Dermacentor* spp. The latter represents ticks collected at the CaLSeN sites where surveyors identified ticks to the genus level. There were no Rocky Mountain wood ticks (*D. andersoni*) or other species identified in the samples, but this may change pending identification of the CaLSeN samples. There were no blacklegged ticks (*I. scapularis*) collected during the spring surveys.

Fall surveys –Thirty-one surveys were completed during the fall period in southern and central Saskatchewan, all in suitable habitat (Table 2). The fall survey program began on September 23, 2024, and the last survey was completed on November 9, 2024.

Conditions during the surveys were dry and mainly sunny at most sites. Temperatures in September, October and early November were above average and generally dry throughout the fall survey period (average 14.8°C; range 7 - 24°C). The last survey for the season was completed on November 9, 2024, when cold, wet weather occurred throughout southern Saskatchewan.

Most surveys were 2 km in length except for several smaller sites where the amount of wooded habitat was limited to small islands of habitat on farmsteads, urban parks, or open grassland areas (Ravine Ecological Area – Yorkton, R.M. of Blaine Lake, R.M. of Old Post, Last Mountain Lake National Wildlife Area), or sites where access was limited due to thick wooded areas (R.M. Lakeland). A total of 52.5 hours of sampling effort were completed during the fall period, with an average of 1.7 hours of survey effort at each site.

A single female blacklegged tick (*I. scapularis*) was collected at one site (Battleford – Finlayson Island Ecological Reserve) during the fall surveys. This tick tested negative for the pathogens that cause Lyme disease, anaplasmosis, babesiosis, and relapsing fever. Detailed habitat evaluations (including measurements of temperature, forest and vegetation type, weather during collection, litter depth, soil humidity and percent canopy cover) will be conducted in the spring of 2025. This site will be surveyed again in the spring and fall of 2025. A second female blacklegged tick was incidentally collected on a tick drag on October 21, 2024. The exact location of where this tick was picked up is unknown. However, it is suspected to have come from a survey site near Christopher Lake (R.M. of Lakeland). The tick tested negative for all pathogens and has been included in the passive surveillance dataset (Table 1).

Aside from the single blacklegged tick collected at Finlayson Island Ecological Reserve, no other ticks were collected through active fall surveys, including at sites where blacklegged ticks were collected in 2023 (Prince Albert – Mair and Miller's Hill Parks and Pike Lake Provincial Park). These sites were surveyed in the spring and fall in 2024.

Table 2: Active surveys completed in Saskatchewan (2024)[1]

Tick Sampling Locations and Sites 2024	Date	*Dermacentor variabilis*				*Dermacentor* spp.				*Ixodes scapularis*			
		Nymph	Male	Female	Total	Nymph	Male	Female	Total	Nymph	Male	Female	Total
Provincial Parks Buffalo Pound – Nicolle Flats	2024-06-30		68	50	118								
Buffalo Pound	2024-09-29												
Crooked Lake (S)	2024-05-10		94	128	222								
Crooked Lake (F)	2024-10-08												
Echo Valley (S) - CaLSeN	2024-05-09								90				
Echo Valley (F)	2024-09-24												
Duck Mountain	2024-10-15												
Greenwater Lake	2024-09-23												
Good Spirit – CaLSeN	2024-06-06								90				
Moose Mountain (S)	2024-05-29	1	37	48	86								
Moose Mountain (F)	2024-10-01												
Pike Lake (East) (S) - CaLSeN	2024-05-09								70				
Pike Lake (West) (S)	2024-06-01		22	27	49								
Pike Lake (West) (F)	2024-10-24												
Blackstrap	2024-06-14		5	7	12								
Recreation/Historic Sites and Ecological Reserves Wascana Trails – CaLSeN	2024-05-28								121				
White Butte Trails – CaLSeN	2024-05-28								40				
Condie	2024-06-07		44	49	93								
Wood Mountain	2024-05-22		16	14	30								
Fairy Hill	2024-09-25												
Upper Qu'Appelle Natural Area	2024-11-09												
Regional Parks Saltcoats – Leflay Trail - CaLSeN	2024-07-10								11				
Outlook and District	2024-05-15		7	10	17								
Lady Lake	2024-10-02												
Whitesand	2024-10-01												
Carlton Trail	2024-10-21												
Esterhazy	2024-10-21												
Urban Parks Beaver Creek Cons. Area – CaLSeN	2024-05-05								48				
Chief Whitecap Park - CaLSeN	2024-05-05								7				
Chief Whitecap Park – South (S)	2024-05-23		1	2	3								
Chief Whitecap Park – South (F)	2024-10-11												
Sutherland Dog Park (Saskatoon) - CaLSeN	2024-04-30								25				
Cosmopolitan Park (Saskatoon - MVA)	2024-10-16												
Wanuskewin Heritage Park (Saskatoon)	2024-10-09												
SW Dog Park (Saskatoon)	2024-10-16												
Kingsway Ecol. Zone (Moose Jaw –WVA)	2024-04-14		9	3	12								
Kingsway Ecol. Zone (Moose Jaw –WVA)	2024-05-23	1	29	29	59								
Kingsway Ecol. Zone (Moose Jaw –WVA)	2024-07-07		3	2	5								
Connor Park (Moose Jaw – WVA)	2024-04-29		7	9	16								
Logan Green (Yorkton) - CaLSeN	2024-07-10								27				
Ravine Ecological Reserve (Yorkton)	2024-10-02												
Finlayson Island (Battleford)	2024-10-10											1	1
Battleford	2024-10-10												
Mair Park (Prince Albert) - CaLSeN (S)	2024-05-16												
Mair Park (Prince Albert) (F)	2024-10-09								4				
Miller's Hill (Prince Albert) (S)	2024-06-13												
Miller's Hill (Prince Albert) (F)	2024-10-09												
National Historic Sites Fort Esperance (S)	2024-04-29		31	20	51								
Fort Esperance (F)	2024-10-29												
Fort Livingstone	2024-10-01												
Batoche	2024-10-09												
Other: Strawberry Hills - CaLSeN	2024-04-29								47				
Connor Park – Burn survey	2024-05-29		1	3	4								
Stushnoff West	2024-09-26												
R.M. Prince Albert	2024-10-09												
R.M. Old Post	2024-10-02												
R.M. Blaine Lake	2024-10-10												
Last Mountain Lake Wildlife Refuge	2024-10-08												
R.M. Lakeland (Christopher Lake)	2024-10-17												

[1]"S or F" – indicates spring or fall sampling at the same site, Canadian Lyme Sentinel Network (CaLSeN) sites are indicated.

Weather during the spring and fall sampling period – A warm, dry winter with little snow gave way to a more moderate April, May and June with average to slightly above average temperatures and above average precipitation. Precipitation levels were well above average in the aspen parkland areas of central Saskatchewan. Ticks emerged in mid-April and were active throughout May and June, where the combination of slightly cooler, showery weather produced ideal conditions for ticks in the grass, brush, and forest understory. Tick activity slowed by early July with the onset of drier, hot weather with fewer ticks collected by mid-July.

The warm, dry conditions continued in August. Precipitation was less than 40 percent of average across most areas during the 30-day period ending August 14, 2024. Much of western Saskatchewan saw above-average to well-above-average precipitation in September, while eastern areas received below-average to average precipitation. Temperatures throughout July and August were generally average to slightly above average. In September, many areas saw above-average temperatures, with highs in the mid-20°C range. Warm conditions continued into October and early November, before colder, snowy weather developed across southern Saskatchewan in mid-November. December temperatures were above average, and winter precipitation was also above average in December. However, drought conditions persisted along the southern Saskatchewan border and mid-boreal forest regions of northern Saskatchewan. A summary of the mean monthly temperatures for southern and central Saskatchewan during the tick season is provided in Table 3.

Table 3: Mean monthly temperatures - difference from normal – Southern Saskatchewan, 2024

Month	Difference from normal
April	0°C to +2°C
May	0°C to +2°C
June	-2°C to 0°C
July	0°C to +3°C
August	0°C to +2°C
September	+3°C to +4°C
October	0°C to +3°C
November 11	+2°C to +4°C
November 30	-2°C to 0°C
December	+2°C to +3°C

(Source: Canadian Drought Monitor. Agriculture Canada)

Habitat quality – Most survey sites were in areas with moderate to high potential risk for blacklegged tick establishment – classes 3-5 (**Appendix A – Figure 7**). Habitat quality was rated as excellent at most sites and ranged from brushy sites with high grass along walking or game trails to sites in more densely wooded areas comprised of aspen and balsam poplar, Manitoba maple, and elm. Special attention for sampling was focused on hiking and biking trails in or near urban areas. Other areas of focus included game trails, deer concentration areas, and wood piles which provide good habitat for small rodents. All of these areas tend to have a wide variety of hosts available in the immediate vicinity for all stages of ticks.

Habitat quality and suitability also varied depending on location in the watershed, temperature and how much precipitation had been received. Blacklegged ticks favour wooded areas with high levels of humidity (>85%) as they are prone to drying out quickly under more arid conditions. Also, tick activity drops off if the temperatures exceed 25°C. Wooded areas influence surface temperatures by providing cool, shady conditions during summer and providing added warmth in winter. This effect is particularly pronounced in urban areas[14]. In drier years and in lighter soils, soil moisture levels can drop, resulting in low relative humidity levels on the ground and in the surrounding vegetation. These conditions, combined with hot weather affect tick activity at all active stages (larvae, nymph and adult) and their ability to seek hosts for a blood meal. In addition, dry conditions can lead to excessive egg desiccation and mortality, which can set back the next couple of generations.

The habitat at the three sites where blacklegged ticks were collected in 2023 were all high-quality woodland sites located in the moist mixed grassland and boreal forest transition ecoregions. All three sites had a variety of trees and an ample understory of shrubs, forbs, and grasses. The 2024 site, Finlayson Island Ecological Reserve, is an island located in the North Saskatchewan River between Battleford and North Battleford, Saskatchewan. Located in the Aspen Parkland ecoregion, it has a mixture of alluvial dark gray, black silty clay to sandy soils typical of river valley complexes (Figure 8) and coarser, sandy fluvial deposits common to river channels (Figure 9). The varying soil types and relatively flat terrains support a wide variety of vegetation types, ranging from moist poplar forest to dryer sandy sites with dryland grasses, juniper and sage. The dominant tree species at this site are balsam poplar, river birch, chokecherry and willow species. Dominant shrubs include red osier dogwood, buffaloberry, low juniper and sage. Forbs include coneflower, gaillardia and field mint and a variety of other species. The ground cover includes bearberry, silverweed, and a variety of grasses including smooth brome grass, bluegrasses and various dryland species.

Other Activities

Connor Park burn survey

A survey to measure the effects of fire on ticks was conducted at Connor Park (Wakamow Valley Conservation Authority) near Moose Jaw. A fire in August 2023 burned three ha of woodland and grassland habitat within the park. The 2024 survey consisted of four transects of 200 m each in the burned and unburned areas and recorded the number of ticks found in each area. Four ticks were collected in the unburned area and no ticks in the burned area. Fire has the effect of not only killing any ticks that are present but also removing the available leaf litter and other understory vegetation.

[14] Analysis of satellite data from 293 European cities found that tree cover can reduce local surface temperatures of a city by up to 12°C.

This kills any eggs and decreases the chances of immature and adult ticks surviving cold temperatures in the winter. These results indicate that controlled burning may be an effective management tool for controlling tick populations.

Next steps

In 2025, passive surveillance will continue with submissions primarily received through eTick. In terms of active surveillance, the goal is to conduct a minimum of 58 surveys at 50 sites, with a continued focus on deciduous woodlands in several watersheds in southeastern, central, and northwest areas of the province. These include the Upper Assiniboine and Qu'Appelle River watersheds in southeast and east central Saskatchewan near Yorkton and Regina, and the North and South Saskatchewan River watersheds near Saskatoon, Prince Albert, and North Battleford. The eight "sentinel" sites that were sampled in previous years will be resampled in the spring and fall of 2025. These sites include Echo Valley, Moose Mountain, Crooked Lake and Pike Lake Provincial Parks, Fort Esperance National Historic Site, Finlayson Island Ecological Reserve and Mair and Miller's Hill Park in Prince Albert. Spring surveys at CaLSeN sites will continue at sites near Saskatoon, Regina, Yorkton, and Prince Albert.

Conclusion

Saskatchewan has maintained a robust tick surveillance program, that includes both passive and active surveillance to detect sites with established blacklegged tick populations in the province. The most common tick detected through surveillance continues to be the American dog tick (*D. variabilis*), which is not considered a competent vector of Lyme disease.

Through passive surveillance, 201 blacklegged ticks have been detected in the province and a small number of these have been infected with the agents that cause Lyme disease and other disease-causing pathogens. These ticks were likely brought into the province on migrating birds and animals or by travelling people and their pets.

The active surveillance component prioritizes locations most likely to support established tick populations. In 2023, three male blacklegged ticks were detected through field surveys for the first time since active surveillance began in the province, followed by the detection of one female blacklegged tick in 2024, marking the second consecutive year of detection through active surveys. Despite this finding, a reproducing population of blacklegged ticks has not yet been detected in Saskatchewan.

While there are signals of a possible increase in blacklegged ticks from both active and passive surveillance, it is difficult to determine if this is from natural variability and survivability of adventitious ticks in the environment, increased surveillance effort or represents the beginnings of an established population. Confirmation of an established population of blacklegged ticks, and increasing Lyme disease risk, would come from a combination of sources including submissions of blacklegged ticks from passive and active surveillance, and several other sources.

Risk generally increases with the numbers of ticks submitted from a particular location with suitable habitat, increased numbers and stages of ticks detected through active surveillance[15] over several years, an increase in the numbers of blacklegged ticks found on humans[16,17,18]or locally acquired human cases. Currently, the risk of contracting Lyme disease or other tick-borne diseases remains low in the province, however, precautions should be taken to prevent tick bites.

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Appendix A - Site selection for active surveillance

In Saskatchewan, active tick surveillance efforts are prioritized based on several criteria including:

- sites where blacklegged ticks have been detected through passive or active surveillance;
- sites of most likely exposure for human or domestic animal cases;
- sites in suitable habitat areas where climate models predicted the establishment of blacklegged ticks [19] [20] [21]. These models suggest that areas in southern and central Saskatchewan are suitable for the potential establishment of this tick. Areas include wooded riparian and lake edges in river valleys, aspen poplar bluffs, forested uplands (i.e., Moose Mountain Provincial Park, Duck Mountain Provincial Park) and boreal transition areas because of their potentially more hospitable habitat and abundance of host species (i.e., small rodents, rabbits, birds, deer). In addition, the southeast region of the province is in close proximity to areas of southern Manitoba where established populations of the blacklegged tick have been detected[22]; and,
- suitable habitat sites where there is a high degree of interaction among people, domestic animals, and wildlife. These include provincial parks, ecological reserves, recreation and historic sites, national historic sites, urban parks, regional parks, private campgrounds and resort developments.

Active surveys are also conducted at CaLSeN sites. A project pillar of Canada's National Lyme Disease Strategy, CaLSeN's goal is to establish a national network of sentinel regions allowing a standardized approach to observe the changing Lyme disease risk across Canada. This will serve as a platform to integrate environmental and epidemiological risk data for each region and across Canada.

Key outcomes of the Canadian Lyme Sentinel Network include:

1) the first standardized, national, real-time portrait of Lyme disease risk across Canada;
2) new capacity to detect/monitor Lyme disease risk factors; and
3) a novel integrated structure to assess how risk and risk factors are changing along the continuum of disease emergence across the country.

Active surveillance for the blacklegged tick has been conducted in the province since 2008 and the number of surveys increased in 2014. Surveillance has continued at several sites that were systematically surveyed as part of a province-wide surveillance project over a 5-year period (2013-2017)[23] and at additional sites identified from 2016 to 2024.

Active surveillance is important as established or reproducing blacklegged tick populations have not yet been detected in Saskatchewan. To establish baseline information on tick populations, an important goal of active surveillance is to repeatedly sample many of the same sites every year, and seasonally sample (i.e., spring or fall) at other sites.

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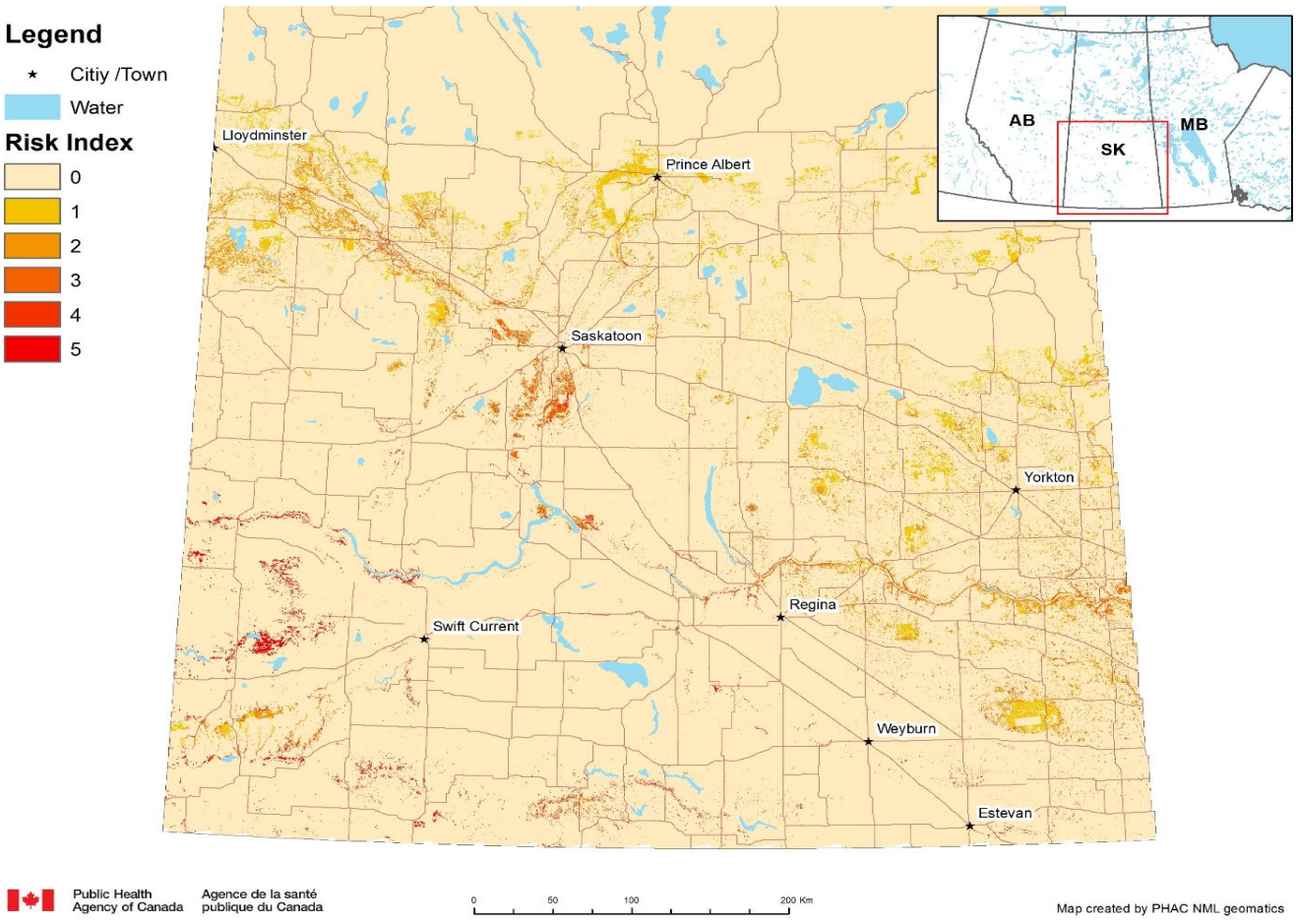
Figure 7: Habitat suitability for blacklegged tick establishment in Saskatchewan - low to high potential risk (Risk Index 0 – 5)



Appendix B - Habitat quality

Figure 8: Finlayson Island Ecological Reserve – Battleford

(Photos courtesy of Phil Curry)

Figure 9: Finlayson Island Ecological Reserve with sandy soils and juniper understory

(Photo courtesy of Phil Curry)