

Training Ambassadors in the Prevention and Surveillance of Lyme Disease in Québec



SYNTHESIS

August 2020

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Overview

The Institut national de santé publique du Québec (INSPQ) conducted a training project with the Nature Conservancy of Canada (NCC) from January to December 2019 in the regions where Lyme disease (LD) is a growing public health issue. The objective was to train Lyme disease prevention ambassadors through a cascade training approach (training trainers).

Once trained, the members of this new regional network had to lead activities to raise LD awareness among their colleagues and clients and independently carry out tick sampling activities in their respective communities. In total, 18 ambassadors were trained and 28 awareness-raising activities were organized, directly reaching at least 1,860 people in seven different public health units. During this period, 28 sampling activities were completed, and 36 ticks were collected (through active and passive surveillance). The participants' evaluation of the project was very positive. The project very clearly fulfilled a need of outdoor workers and the general population, indicating that this type of initiative—combining cascade training and community science—offers promising aspects from which public health authorities could benefit to meet LD prevention and surveillance needs in Quebec.

Introduction

Context

Lyme disease (LD) is currently the main vector-borne disease transmitted by ticks in Europe and North America and a significant emerging zoonosis in Canada [1]. Its principal vector in the northeastern United States, the blacklegged tick (*Ixodes scapularis*, *I. scapularis*), is progressively colonizing new regions in a northward direction, notably due to climate change. This has a direct impact on the number of cases of the disease reported annually, which increased from 144 reported cases in Canada in 2009 to 2,025 in 2017, and from 66 cases reported and contracted in Quebec in 2014 to 338 in 2019 (as at January 8, 2020) [2,3]. This trend is not likely to slow down; some models from 2012 estimated that 80% of the population of Eastern Canada could be living in an endemic area by 2020 [4, 5].

To address this emerging problem, public health (PH) authorities in Quebec have implemented an integrated LD surveillance program. This program is based on a compilation of the human case surveillance data (LD has been a notifiable disease since 2003) and acarological surveillance data (ticks reported through active and passive methods). It helps guide PH interventions and support healthcare professionals in a clinical context [6]. However, deploying this surveillance program requires significant resources. This is particularly true for active surveillance, which requires conducting tick sampling in different municipalities across the province. With that in mind, it is advisable to find alternative approaches to optimize this program.

Furthermore, some populations in Quebec are particularly vulnerable to LD. These populations include certain workers, especially those working in the forestry, agriculture, construction, and public works (e.g., road works, maintenance of municipal land and publicly accessible parks) sectors as well as at summer camps [10, 12]. The main risk factors that can lead to workers contracting LD relate to the following:

- The work setting (e.g., rural environment and outdoor work, especially in wooded areas in the southern part of the province, which increase the likelihood of exposure to ticks)

- The nature of the professional duties (physical jobs that involve carrying out manual tasks in contact with vegetation, e.g., technical workers responsible for maintenance or forestry work, day camp activities, challenge courses, outreach)
- Employment status and sociodemographic profile (e.g., seasonal positions causing workers to be absent from awareness training, immigrant and/or allophone workers who are not fluent in the language in which the preventative measures are communicated, etc.)
- Work organization (no individual prevention due to lack of awareness and underestimation of this occupational disease, etc.) [6]

A large amount of information on LD is available from various sources, especially on the Internet. Yet, despite the comprehensiveness and quality of the information available on Quebec and Canadian government websites on preventing this disease and PH-supported efforts toward this purpose, there are vulnerable populations in Quebec who are not reached by awareness-raising campaigns. It would be worthwhile to find solutions to improve the dissemination of relevant information to these populations (residents, workers) in a consistent and standardized way.

To address these surveillance and prevention issues, an innovative cascade training project was launched. The aim of the project was to train employees and managers of different publicly accessible nature parks so that they can be LD educators referred to as “prevention ambassadors.”

Objectives

The **main objective** of this project was to develop a bilingual training program for managers of Canadian parks using a cascade training method (i.e., training trainers). It targeted employees and managers of various publicly accessible nature parks (and any nature conservancy organization with outdoor workers) so that they could become prevention ambassadors in different regions of the province where there is a risk of contracting LD.

The specific goals of the training were to:

- 1) equip each ambassador to inform and raise the

awareness of various vulnerable populations on LD contraction (colleagues, managers, volunteers, and park visitors); and 2) teach these ambassadors to independently conduct *I. scapularis* tick sampling in the environment in a way that is safe and follows a standardized protocol.

Methodology

The project was carried out over 12 months, from January to December 2019, and divided into five main steps:

Step 1 – Developing the training program

First, the content of the training was developed to cover the two learning objectives, namely awareness-raising and independent sampling:

THEORETICAL CONTENT. The content of the training was devised by adapting information available on Quebec and Canadian government websites about ticks, the main clinical signs of disease, and prevention measures [3, 8-12]. A literature review on teaching methodologies of cascade training supplemented this content [13, 17-18].

Addressing a diverse public with varying literacy levels, the content of the training was adjusted and vulgarized to facilitate training by the future ambassadors. The selected material was validated by an interdisciplinary committee (One Health approach). Once the content was determined, an interactive workshop of around 90 minutes was created, including a turnkey training kit for each participant. Each kit contained: one copy of the ambassador training handbook (available in French and English), various samples of awareness materials (brochures and posters, bank of online resources), a sampling starter kit, pre-stamped envelopes (for mailing the collected ticks), and a USB key (containing electronic versions of most of the documents related to the project and access to a shared folder on the cloud).

The ambassadors' training handbook was designed as an independent document which ambassadors could consult after the workshop as a reference or a script, for example.

The workshops were designed to encourage group discussions and include interactive activities (icebreakers, Kahoot! quiz, Menti presentation, etc.).

They cover the project's background and the basic theory of LD prevention, present the available teaching tools, give examples of activities that can be organized, and describe the methodology for tick sampling. Finally, each workshop concludes with a practical component on a walking trail where the ambassadors conduct sampling for the first time under the instructor's supervision.

PRACTICAL CONTENT. The tick sampling procedure was adapted from the standardized protocol developed by the Faculty of Veterinary Medicine of Université de Montréal and currently used in Quebec's integrated LD surveillance program [6]. For the sake of this project, the procedure was simplified to reduce the risk of ambassadors being exposed to ticks and to facilitate its adoption (see Figure 1 appended).

In short, 2,000 m of wooded terrain was walked for each sampling while dragging a 1m² white cloth within a margin of one to five metres on both sides of a trail. As is done under the integrated surveillance program, the ticks collected from this process were kept in a vial of ethanol indicating the site and date of collection before being sent to the Laboratoire de santé publique du Québec (LSPQ), which is Quebec's public health laboratory, for taxonomic identification, then to the National Microbiology Laboratory (NML) in Winnipeg to be screened for pathogens (nymphs and adult *I. scapularis* only).

Step 2 – Identifying and recruiting ambassadors

To recruit ambassadors, a partnership was set up with the Nature Conservancy of Canada, a private non-profit organization whose mission is to promote the conservation of natural sites and wildlife through the safeguarding, management, and long-term restoration of a wide range of properties across the country. Its network spans the province, and a number of its properties are located in health regions where there is a significant risk of LD [7, 19]. Potential ambassadors were identified by the project team from among employees, managers, and NCC contributors according to their workplaces, former awareness-raising experience, personal interest, and availability. Participation required availability to take a half-day workshop and a flexible enough schedule in the summer to organize and lead awareness-raising and sampling activities.

Step 3 – Training the selected ambassadors

Three half-day workshops were given by an expert from the INSPQ in May 2019, at the start of active tick season but before peak tourism season. These workshops were organized in three different health regions, each located within or near zones where there is a significant risk of contracting the disease (Estrie, Outaouais, Chaudière-Appalaches). The theory component of the workshop was conducted indoors (in a classroom), while the practical component (supervised tick sampling) was carried out outdoors, near the place of instruction, when sampling conditions were met (see Figure 2 appended). During trail activities, all the participants were invited to apply the prevention measures they had learned, especially with regard to their attire (e.g., using a protective suit, long-sleeve shirts and long pants, and insect repellent).

Step 4 – Ambassadors' activity period (awareness-raising and tick sampling)

After taking the workshop, the newly trained and equipped ambassadors were invited to organize LD awareness and sampling activities at their respective organizations during the activity period from June to September 2019. These activities were run on a voluntary basis and the ambassadors received remote support from INSPQ experts as needed. A short form was to be completed before each activity to provide a brief description (date, location, time, participation level, two to three sentences about the event for awareness-raising activities, number of ticks collected for sampling activities). Three follow-up calls were made with each ambassador during the active period to answer questions, monitor the progress of the activities, and reinforce the transfer of knowledge learned so that it could be effectively maintained and applied.

Step 5 – Analysis and evaluation

The data from the forms were compiled at the end of the activity period, in October 2019. The ambassadors were invited to share their comments and evaluate the project on conference calls that involved the participants of each workshop and focused on their overall assessment of the project, the usefulness of the training, their feeling of independence, the strengths of the training, and its areas for improvement.

Ethical considerations

No ethics approval was required to set up this training project. Nonetheless, all participants had to sign a form recognizing and accepting all associated risks at their training sessions. In doing this, the participants acknowledged the risks associated with conducting outdoor activities in environments where *I. scapularis* ticks may be present, and that they are familiar with the LD prevention measures.

Main results

The following section presents a summary of the activities carried out by the ambassadors trained during the activity period from June to September 2019.

Description of the ambassadors and training workshops

- In total, 18 ambassadors were educated and trained at three training workshops organized in Outaouais, Montérégie, and Chaudière-Appalaches.
- These ambassadors were from 12 different associations: four directly from the NCC and the others from its partners working in wildlife or environmental conservation.
- Among the professional profiles represented were: project coordinators; wildlife and environmental technicians; volunteers; biologists; and individuals responsible for nature conservation, awareness-raising, and/or education, etc.

Description of awareness-raising activities

- Of the 18 ambassadors trained, 16 were active during the summer season. These 16 ambassadors all carried out awareness-raising activities (from one to six each).
- In total, 28 different activities were held in seven of Quebec's health regions (including those where the workshops were organized), namely: Capitale-Nationale, Chaudière-Appalaches, Montreal, Mauricie-Centre-du-Québec, Outaouais, Estrie, and Montérégie. The area of activity covered approximately 450 km from east to west and 210 km from the southern border northward (see Figure 3 appended).

- Activities were one-off events (e.g., information evenings, discussion groups, tick identification workshops), recurring (e.g., prevention at day camps, awareness-raising activities for individuals with at-risk job types and municipal workers), or ongoing (e.g., displays at work places, permanent kiosk set up).
- These activities directly raised awareness for at least 1,860 people, 10% of which participated at their workplaces (outdoor workers). The main target groups were the following: clients of affiliated organizations, coworkers and supervisors, municipal officials and managers, reforestation and forestry workers, NPOs and conservation/accessibility organizations, outdoor activity clubs, hunting associations, nature interpretation centres, patrol officers, youth and students (field trips, day camps), and all types of volunteers.
- Of the 18 ambassadors that took the training workshop, two did not carry out any activities, resulting in a total participation rate of around 89% (16/18).

Tick sampling activities

- In total, 28 samplings were done by 11 of the 16 active ambassadors, covering 56 km of wooded areas. Eleven *I. scapularis* ticks were collected from these samplings (eight nymphs, three adults, no larvae).
- Among these specimens, two nymphs were positive for the bacteria *Borrelia burgdorferi*.
- No other pathogens were detected.
- In addition to these specimens, 25 ticks were passively collected (incidental detection on the body or on equipment, not as part of sampling) by five ambassadors, bringing the total number of ticks reported by ambassadors to 36.
- Thanks to the network of NCC properties, tick dragging could be conducted on sites that are not necessarily part of the regular integrated LD surveillance program.
- No other species of tick was reported.

Evaluation

- The ambassadors greatly appreciated this initiative. Their comments from the follow-up calls and when providing their evaluative feedback at the end of the activity period were all very positive.
- The evaluation has served to identify a few potential improvements, namely in regard to communication (e.g., using a platform via social media; scheduling follow-ups, and setting clear objectives at the start of the project) and time management and scheduling (using a shorter protocol; sharing certain documents before the workshops; organizing workshops earlier in the season, etc.).
- The majority of participants and partners showed interest in maintaining this ambassador network and in future iterations of the project.

Discussion

The emergence of LD in the province warrants the implementation of initiatives to monitor its progress northward and to improve the dissemination of useful information on preventative measures to vulnerable populations.

To explore alternatives that respond to these needs, we have developed, validated, and evaluated a cascade training approach designed for employees and managers of various publicly accessible natural parks and nature conservation organizations so that they can become LD prevention ambassadors.

Following the training workshops, these ambassadors proved adept at raising LD awareness among their colleagues and clients. Under the project, 16 ambassadors carried out 28 awareness-raising activities. Through these activities, hundreds of people across southern Quebec received useful information on LD. Moreover, given the often-public nature of some activities (e.g., information kiosks at events), the number of people reached is likely underestimated.

The ambassadors also demonstrated their ability to independently carry out sampling activities in their respective communities over the summer season (28 independent samplings, 56 km of paths sampled).

It is important to note that the level of participation varied from one ambassador to the next, depending mainly on their individual availabilities and the resources at their disposal. It should be remembered that these activities are fully carried out on a volunteer basis (during or outside of work hours), which is likely one of the main constraints of the project's implementation. That said, only two of the 18 ambassadors were not active during the project period, citing a lack of time, resources, or suitable conditions (as opposed to lack of interest or understanding). The vast majority of the ambassadors and their associates said that they would be interested in continuing in the future and that they would have even wanted to do more.

Demonstrating the interest and abilities of the ambassadors recruited to carry out awareness-raising and tick sampling activities, the project has proven the usefulness of the cascade training concept for improving LD prevention and surveillance in Quebec. The ambassadors also stated that they felt better informed and, especially, better equipped to face challenges in their workplaces related to the disease at the end of the project. The fact that so many passive ticks (incidental detection) were collected is a good indicator, suggesting that the ambassadors now have a certain level of awareness of the risk and are keeping their eyes open for ticks in their daily lives, regardless of the activity (remaining alert at all times).

The cascade training approach is very promising as it offers worthwhile advantages for raising awareness and sampling:

RAISING AWARENESS

Wide coverage at a low cost

Cascade training allows for wide dissemination of information through a tailored, low-cost approach, even in more remote regions that are typically harder to access by those responsible for regular surveillance. The established ambassador network makes it possible to cover a wide geographic area, reaching a large number of people in many regions where there is a risk of tick bites. With this extended reach, the project addresses the need to train and inform vulnerable citizens and workers while limiting certain financial constraints, since the ambassadors work entirely on a volunteer basis. Cascade training has had a substantial exponential effect:



Vulnerable populations

Many of the workers educated by the project would not normally have been informed of the preventative measures to apply in their workplaces. A number of the workplaces in this project belong to companies under provincial jurisdiction covered by Quebec's Act Respecting Occupational Health and Safety, but working in business sectors where employers are not obligated to provide the preventative mechanisms set out in this Act and also do not receive occupational health services from PH teams. Without this project, these workers would likely not have been offered this type of information at this time.

Public access and potential in a nature context

As these ambassadors have ties with the clients of publicly accessible parks, raising their awareness will in turn promote the protection of the general population. Training the staff of nature parks and nature conservation organizations has strong potential to improve the general public's access to information on tick and LD prevention measures.

Involving the managers and employees of publicly accessible parks in this project has made it possible to move away from the traditional practices for communicating prevention measures and collecting field data. This new approach promises to be beneficial and cost-effective for both public health authorities and for the Quebec population.

Decentralization of efforts and citizen participation

Citizen science projects like this ambassador training are gaining popularity around the world, especially in the field of vector-borne diseases (e.g., monitoring the dispersion of the Asian tiger mosquito in Europe or the transmission of the West Nile virus (WNV) in North American bird communities). The data generated can be interpreted on a local or regional scale to support or guide nature conservation actions, management decisions, and environmental policies [14-16].

SAMPLING

Access to new sampling sites and obtaining complementary surveillance data

The approach used by this project makes it possible, through NCC partners, to access new sites in Quebec that have not been sampled in the past under the integrated surveillance program. These sites are located in zones with varying risk levels and were sampled without any additional cost to PH authorities.

Our project opens the door to receiving additional data for estimating the risk of contracting LD in Quebec and creating an overall portrait for the province. As the protocol taught to the ambassadors for carrying out independent sampling is similar to the one used for active provincial surveillance, the data obtained could enrich the disease risk map created and annually updated by the INSPQ [7].

Avoided constraints

Tick collection by the ambassadors removes certain constraints encountered in active surveillance by the PH authorities: staff already on site are available to collect ticks directly, sampling can easily be done multiple times throughout the year, the number of trained ambassadors increases sampling capacity to cover the entire province, etc. Furthermore, tick collection over a longer time period (spring to fall) by regional ambassadors not only makes it possible to monitor the spatio-temporal expansion of ticks, but also to collect specimens at different growth stages, a key criterion for categorizing the level of risk of contracting LD [7]. Thanks to the flexibility of this ambassador network, regular sampling at the start of spring and end of fall could be implemented in participating parks, making it possible to cover the complete lifecycle of *I. scapularis* ticks and ultimately identify new zones with significant risk.

Conclusion

This project explored an alternative method to meet the needs for informing vulnerable populations and for *I. scapularis* tick sampling in Quebec by working with newly trained ambassadors. They demonstrated the ability to raise awareness on LD disease prevention among their colleagues and clients while independently carrying out sampling activities in their respective communities.

By involving citizens and workers, we have highlighted the possibility of building a network of ambassadors who are able to collect ticks with fewer logistical constraints while decentralizing active sampling efforts and providing essential education on LD risk and prevention.

The efforts of the new ambassadors in rural areas can potentially generate a significant amount of information at a scale that would be difficult to achieve by a single PH authority. With wider deployment, this type of project could help the fight against the progression of LD in the province and country, while raising awareness among at-risk individuals in the general population and more effectively characterizing the geographic dispersion of ticks. This method could be applied beyond LD to address other emerging zoonoses in Quebec (e.g., other illnesses transmitted by ticks, WNV and arboviruses transmitted by mosquitoes, etc.).

The results of this project invite reflection on integrating cascade training and citizen science into the currently used methods in order to improve the surveillance and prevention of this vector-borne disease. The participants also demonstrated keen interest in maintaining the mobilization of this ambassador network for the coming years.

In light of the results obtained, it can be said that the project fulfils a real PH need in Quebec. In a global climate change context, all evidence suggests that this need will grow as ticks' range is expected to expand in Quebec over the coming years.

NOTE:

This project will soon be the subject of a scientific article in a peer-reviewed journal.

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Appendix

Figure 1 Diagram of the sampling protocol for tick sought to ambassadors (French version only)

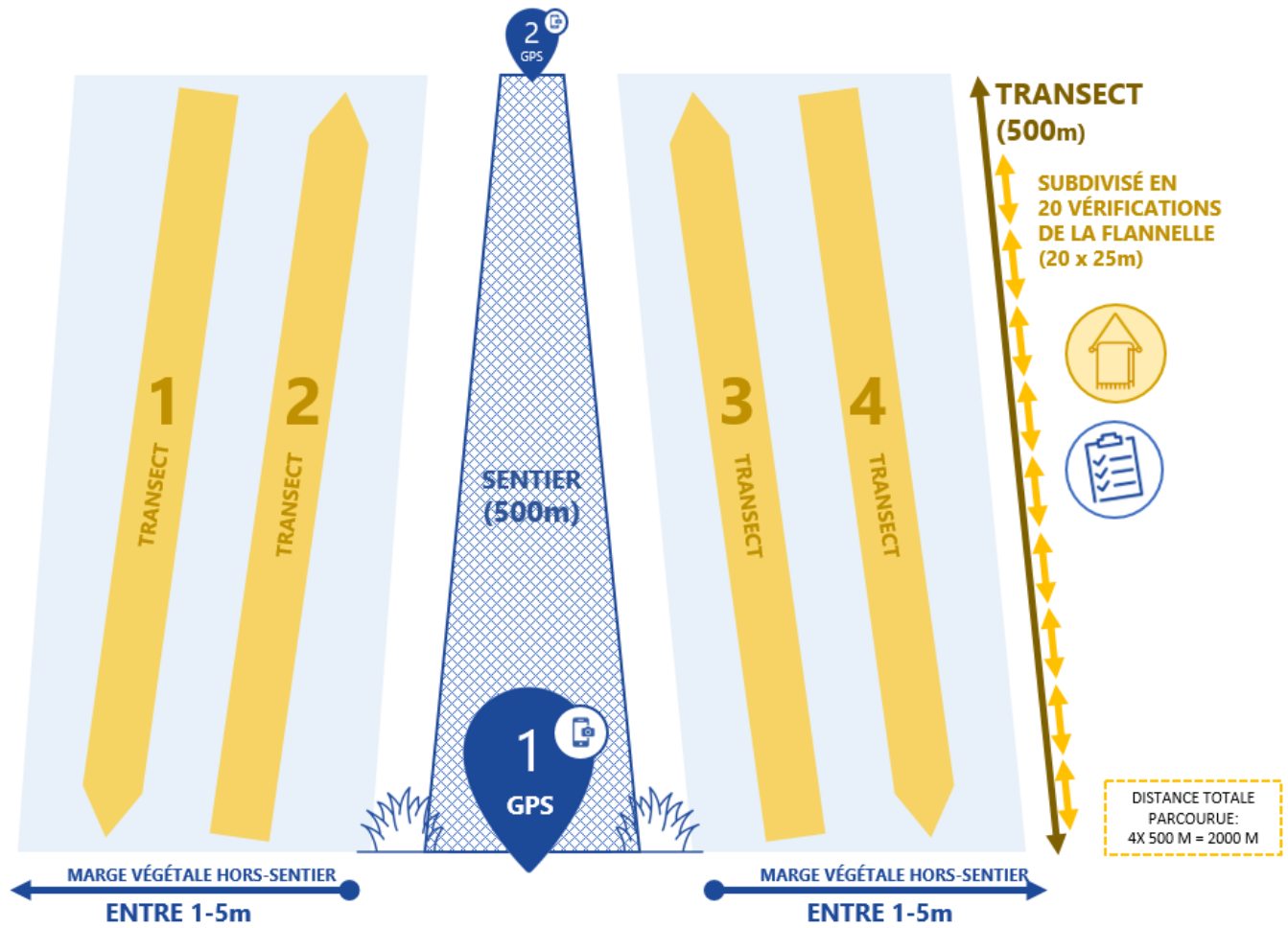
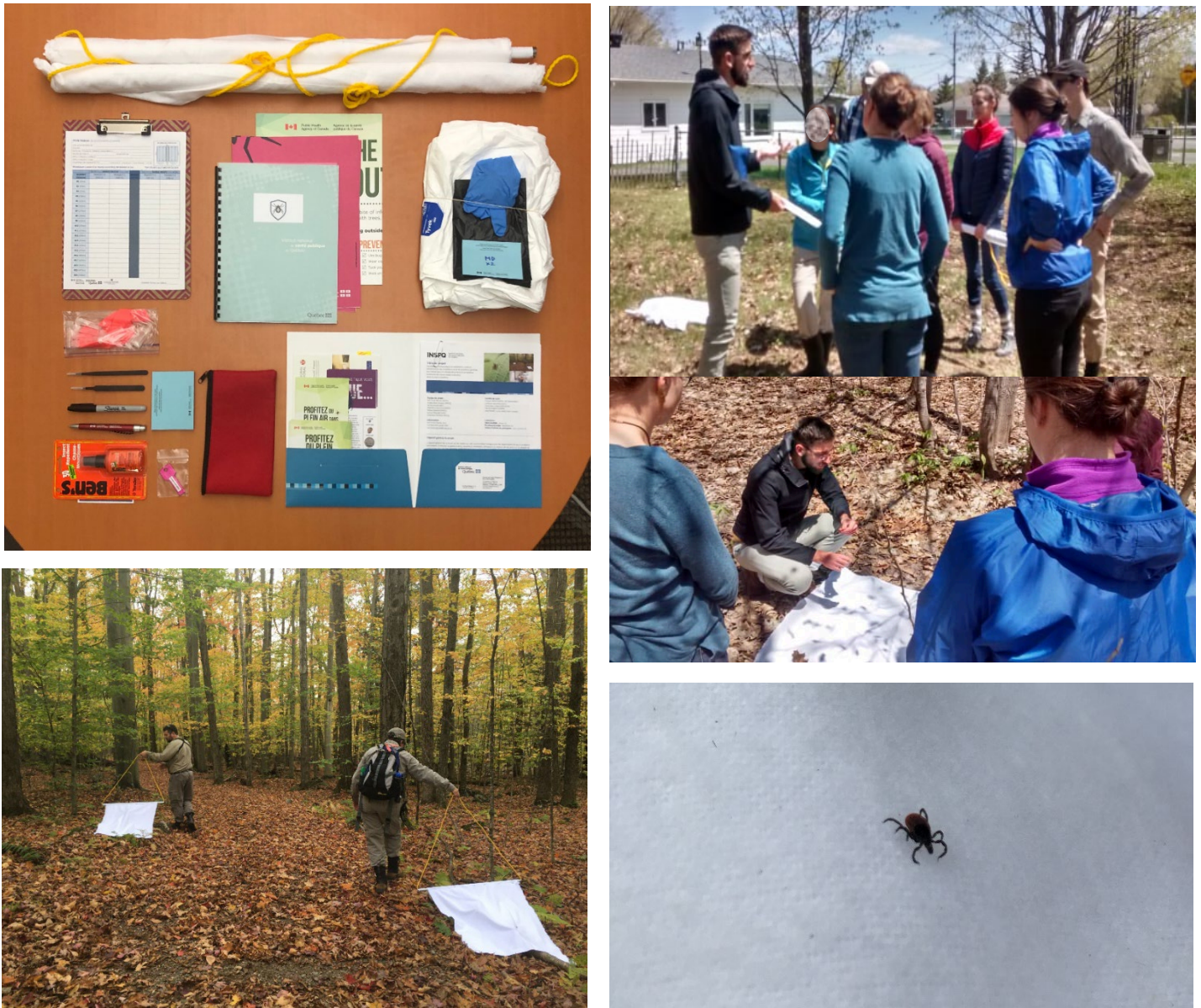


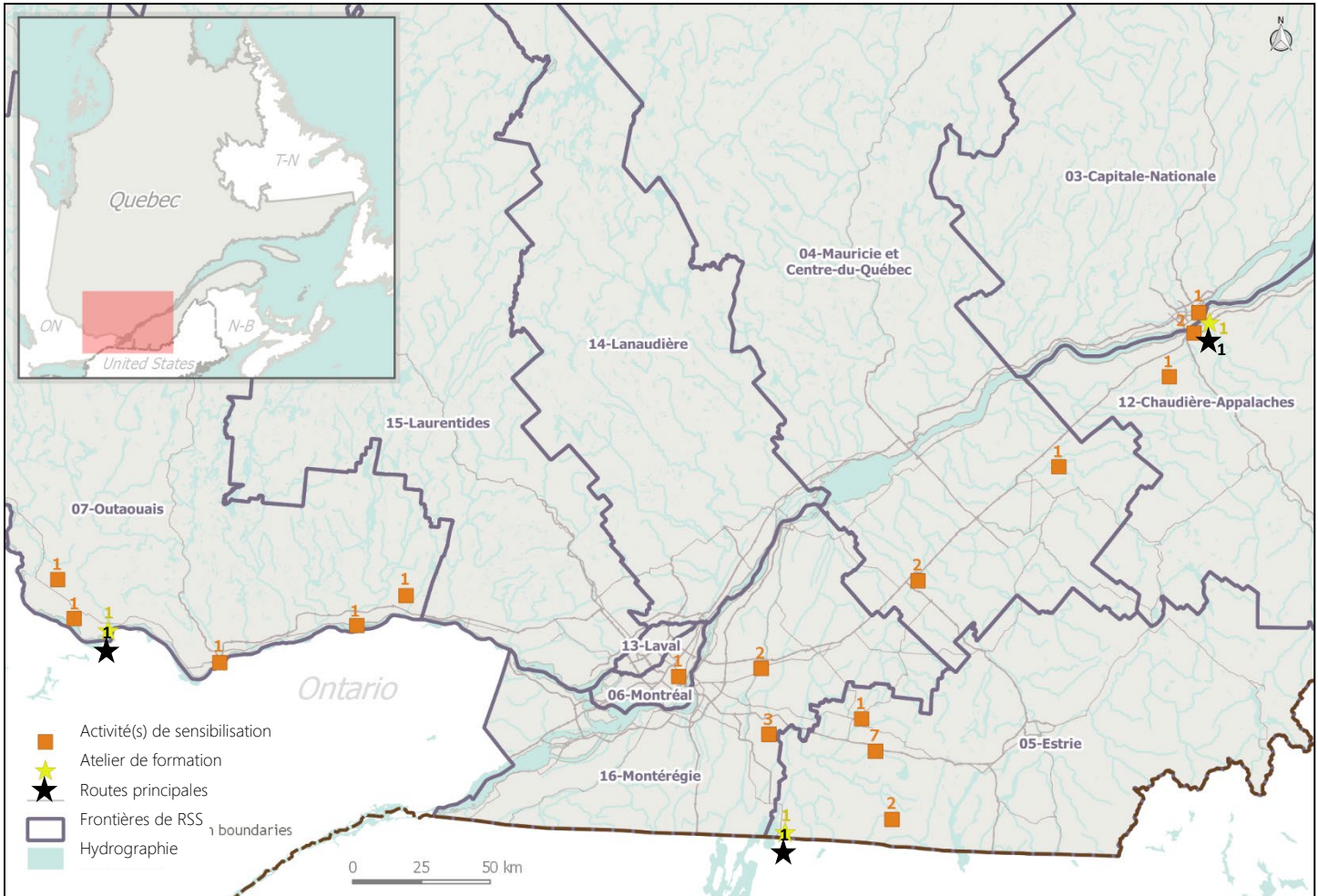
Figure 2 Practical and theoretical training workshops for ambassadors, May 2019



Legend :

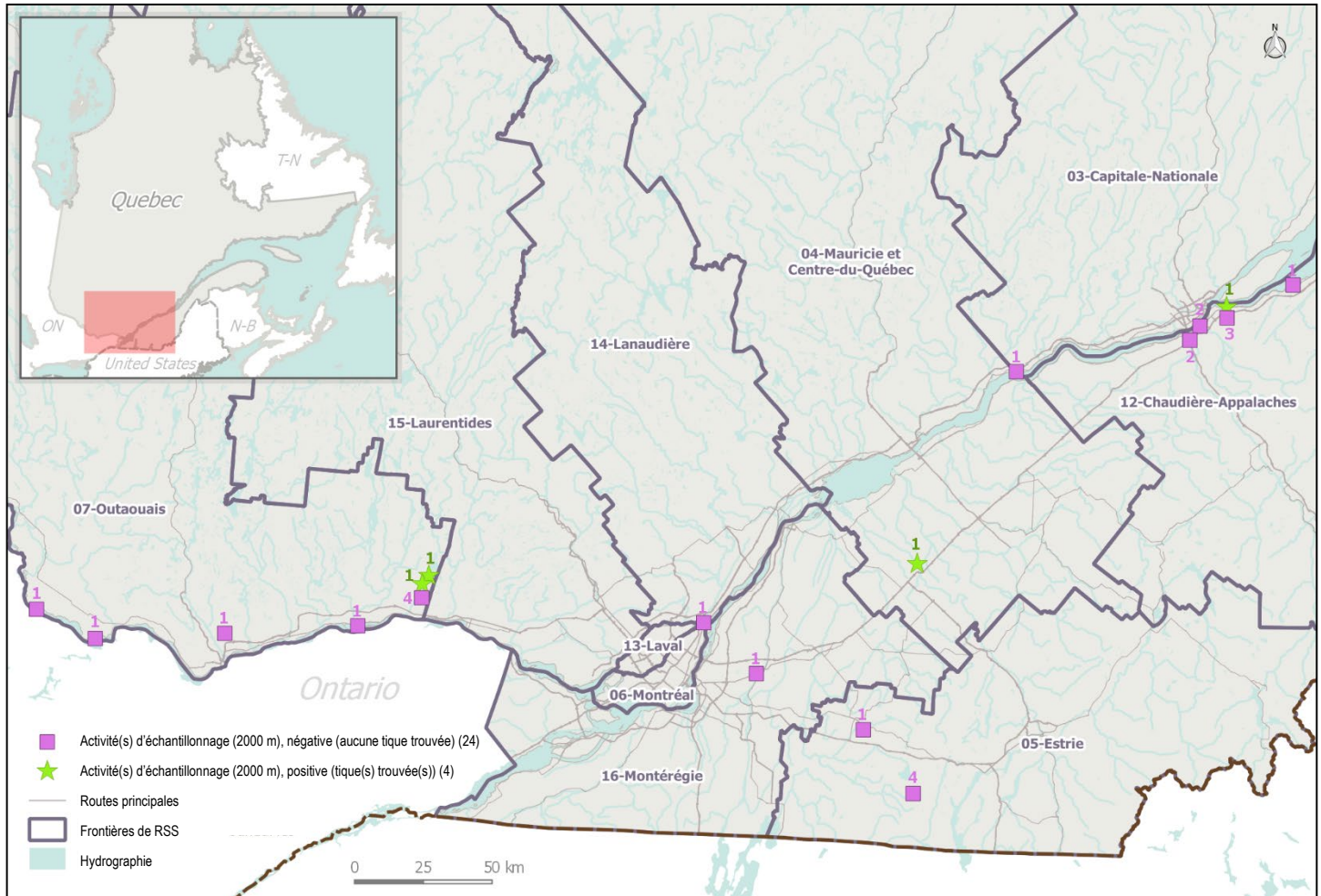
- ↖ **Upper left corner:** kit content for each ambassador at the time of training.
- ↗ **Upper right corner:** practical training, INSPQ's trainer explains the trail sampling procedure.
- ↙ **Lower left corner:** first sampling carried out by the ambassadors themselves after the training.
- ↘ **Lower right corner:** *Ixodes scapularis* female tick detected on a flannel during sampling.

Figure 3 Geographic distribution of ambassador training workshops (n=3) and awareness-raising activities carried out by them (n = 28) in Québec between May and September 2019



- Eighteen ambassadors participated in 3 training workshops.
- Twenty-eight awareness-raised activities had been organised in seven health regions of Québec (1 to 6 ambassadors).
Eg.: public information evening, discussion group, tick identification workshop, prevention activities in day camps, awareness raising among at-risk job categories and municipal stakeholders, posting in the workplace, permanent kiosk, etc.
- These twenty-eight awareness-raising activities allowed to directly sensitize at least 1,860 people with approximately 10% in the workplace.

Figure 4 Geographical distribution of tick sampling activities (n=28) carried out by ambassadors between May and September 2019



- Twenty-four autonomous samples were done, four of which detected ticks: 11 ticks in total, eg. 3 adults, 8 nymphs, 0 larvae, all belonging to the species *I. scapularis*.
- At the same time, 25 passive ticks were reported (incidental detections outside the sampling, 14 reports, of which some were multiples).

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The French version is entitled *Projet de formation d'ambassadeurs et d'ambadrices en prévention et surveillance de la maladie de Lyme* and is also available on the web site of the Institut national de santé publique du Québec at: www.inspq.qc.ca/publications/2703

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