Canadian Food Inspection Agency | Agence canadienne d'inspection des aliments

Plant Protection Survey Report

2015–2016

Canada

PREFACE

Plant protection surveys are required to maintain a claim of "pest-free" status for an area, to detect new populations of quarantine pests, and to delimit populations of quarantine pests with limited distributions in Canada. Pest surveys are also an integral part of control and eradication programs. Surveys provide information in support of all regulatory programs: import, export, and domestic. In all cases, reliable and accurate pest distribution data provides the basis for sound regulatory decisions.

The Plant Health Surveillance Unit is responsible for planning, coordinating, and administering the national survey program. The Survey Unit also plays a lead role in the design of new surveys and is responsible for the refinement of ongoing survey techniques and tools as new methodologies develop. Other areas of work include the development of information systems to collect, organize, and store survey data and mapping of regulated pest distributions.

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ACKNOWLEDGEMENTS

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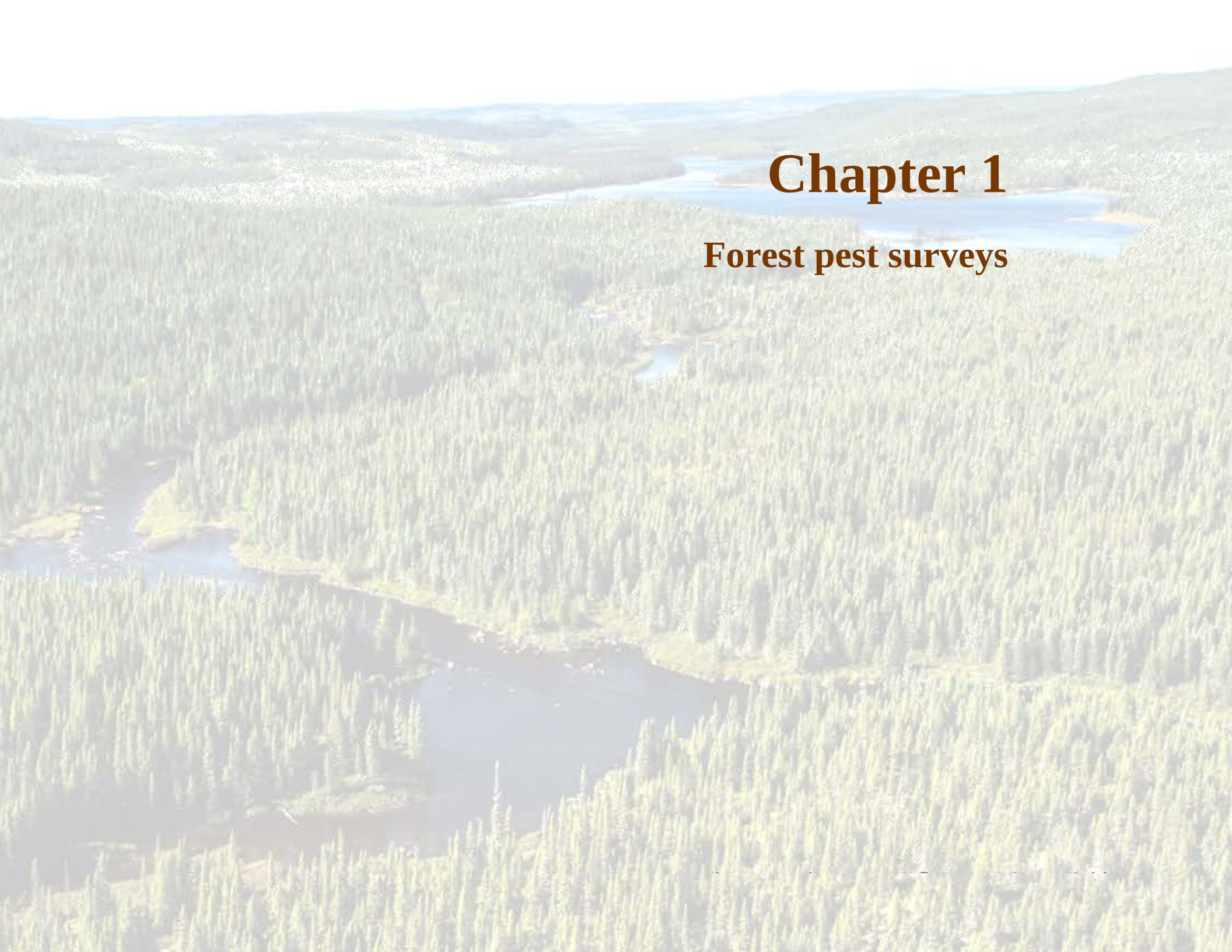

Chapter 1

Forest pest surveys

1. FOREST PEST SURVEYS

Forests provide a wide range of economic, social and environmental benefits to Canadians. In 2015, forest sector production contributed $22.1 billion to Canada's nominal gross domestic product (GDP). Urban trees provide benefits such as reducing energy use and improving air quality, water management, and carbon sequestration. Urban trees in the City of Toronto, for example, provide over $80 million, approximately $8 per tree, worth of environmental benefits and costs savings to residents each year (Alexander & McDonald, 2014). Invasive forest pests can cause significant economic losses in forests managed for timber production and have potentially negative impacts related to aesthetic, health, community and environmental benefits of urban trees and forest landscapes.

In 2015–2016, CFIA's Plant Health Surveillance Unit led nine forestry pest surveys for a total of 10,075 sites.

Significant events in 2015–2016:

- Asian gypsy moth detection at one site in British Columbia; European gypsy moth detections in all provinces
- Brown spruce longhorn beetle detections at one location in New Brunswick
- Hemlock woolly adelgid detection at one site in Ontario
- Pine shoot beetle detections in Québec and New Brunswick
- *Xylotrechus subscutellatus* (Coleoptera: Cerambycidae: Cerambycinae) was detected in British Columbia

Table 1. Invasive forestry pests prioritized for surveillance in 2015–2016.

Scientific name	Common name
Anoplophora glabripennis	Asian longhorned beetle
Agrilus planipennis	Emerald ash borer
Lymantria dispar asiatica or *Lymantria dispar japonica*	Asian gypsy moth
Lymantria dispar dispar	European gypsy moth
Tetropium fuscum	Brown spruce longhorn beetle
Tomicus piniperda	Pine shoot beetle
Adelges tsugae	Hemlock woolly adelgid
Ceratocystis fagacearum	Oak wilt

Changes in regulated areas in 2015–2016:

The pine shoot beetle regulated area was amended to include three new regional county municipalities (MRC) in Québec: MRC Kamouraska, MRC Rivière-du-Loup, and MRC Témiscouata (see Figure 43).

1.1 Asian longhorned beetle (*Anoplophora glabripennis*)

Background

The Asian longhorned beetle (ALHB) is an invasive insect that attacks and kills a wide variety of deciduous tree species. This beetle was detected for the first time in Canada in September of 2003. The infestation occurred along the municipal border of Vaughan and Toronto, Ontario. An eradication program was launched in November of 2003 by the CFIA in cooperation with municipal, regional and provincial agencies as well as Natural Resources Canada-Canadian Forest Service (NRCan-CFS). Eradication was declared in February 2013 in accordance with international phytosanitary standards. In August 2013, ALHB was detected outside of the eradicated area, in an industrial zone of Mississauga, ON. In December 2013, the CFIA established a regulated area in an effort to prevent the spread of the beetle. Intensive detection and eradication efforts are underway. Details on the progress of the eradication program can be found at the CFIA Forestry page at: www.inspection.gc.ca/english/plaveg/for/fore.shtml

The CFIA also conducts systematic detection surveys in a number of larger municipalities across Canada. The primary goal of this survey is to ensure that there are no established populations of ALHB in target urban centres.

Methodology

Currently, there is no attractant or lure available that could be used to detect adult populations of ALHB. The most reliable detection technique involves visual inspection of host trees for signs and symptoms of the beetle.

A methodical grid-based survey was developed in collaboration with NRCan-CFS to support a systematic approach for targeting trees for inspection. Each city is surveyed using a triangular grid consisting of contiguous survey points. The objective is to detect an infestation with a radius of 750 m or larger in any of the target areas. This grid model was utilized to ensure a high probability of detecting an infestation the approximate size of the 2003 core infestation in Greater Toronto Area. Host material present at each site was inspected for signs of ALHB and citrus longhorned beetle (CLHB) infestation.

Results

The ALHB survey was conducted in nine provinces for a total of 1476 sites (Table 2). No signs or symptoms of Asian longhorned beetle were observed during these surveys.

Table 2. ALHB survey results for 2015–2016.

Province	Municipalities	Sites
Alberta	Calgary, Edmonton, Lethbridge, Red Deer	48
British Columbia	Abbotsford, Castlegar, Central Saanich, Coldstream, Comox, Courtenay, Creston, Grand Forks, Kelowna, Langford, Nanaimo, Nelson, North Saanich, Parksville, Prince Rupert, Princeton, Rossland, Trail, Vernon, West Vancouver	369
New Brunswick	Bathurst, Clair, Dieppe, Fredericton, Grand Falls, Memramcook, Saint John	99
Newfoundland and Labrador	Corner Brook, Mt. Pearl, St. John's	33
Nova Scotia	Halifax, New Minas, Pictou County, Shelburne, Sydney, Truro, Wolfville	98
Ontario	Fort Erie, Oshawa, Whitby, Sarnia, Greater Toronto Area	497
Prince Edward Island	Brackley Beach, Charlottetown, Stanhope	33
Québec	Ste-Marie de Beauce, St-Joseph-de-Beauce, Beauceville, St-Georges-de-Beauce, Montmagny, Rivière-du-Loup, Rimouski, Ste-Luce, Laval, Bécancour, Boucherville, Drummondville, Sherbrooke	289
Saskatchewan	Regina, Saskatoon	10

N.B. Includes sites in the predetermined grid survey that were either not accessible or did not contain host trees (maples).

Maps showing surveyed sites for Asian longhorned beetle (ALHB):

- Survey map for *A. glabripennis*, Alberta
- Survey map for *A. glabripennis*, British Columbia
- Survey map for *A. glabripennis*, New Brunswick
- Survey map for *A. glabripennis*, Newfoundland and Labrador
- Survey map for *A. glabripennis*, Nova Scotia
- Survey map for *A. glabripennis*, Ontario
- Survey map for *A. glabripennis*, Prince Edward Island
- Survey map for *A. glabripennis*, Québec
- Survey map for *A. glabripennis*, Saskatchewan

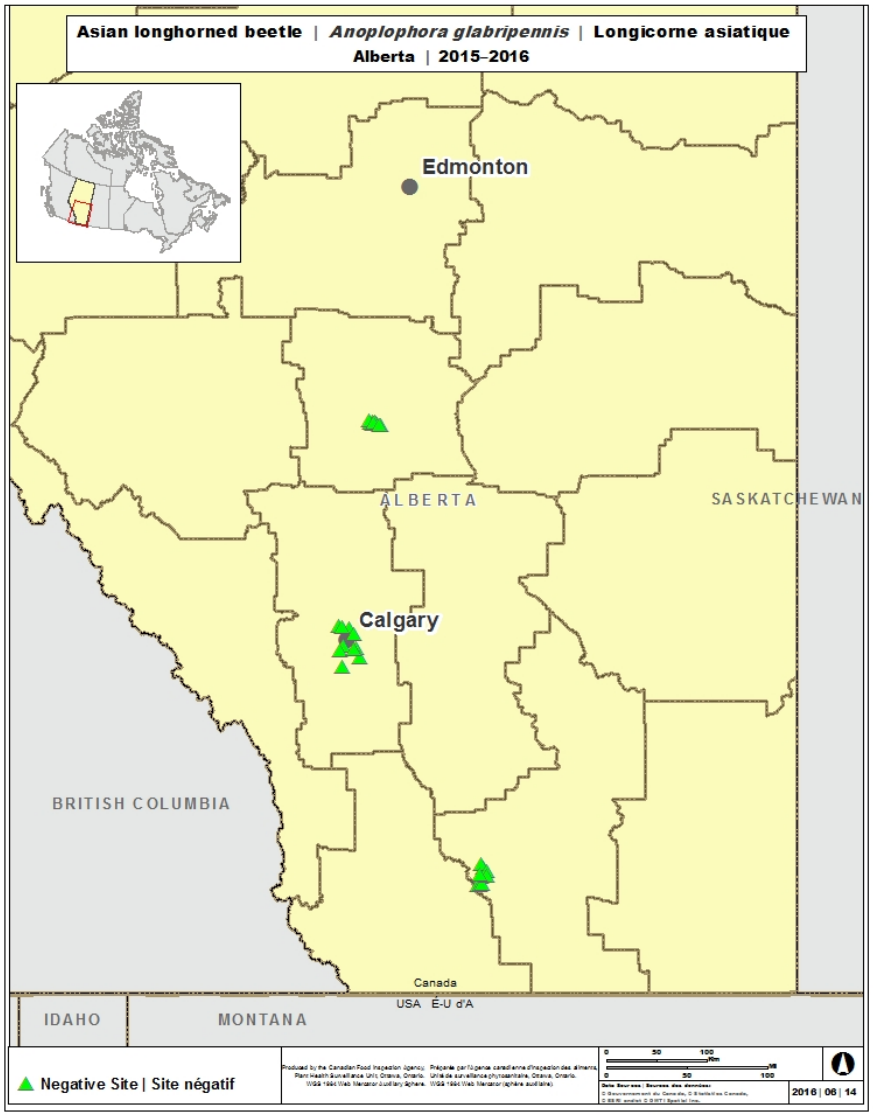

Figure 1. Survey map for *A. glabripennis*, Alberta

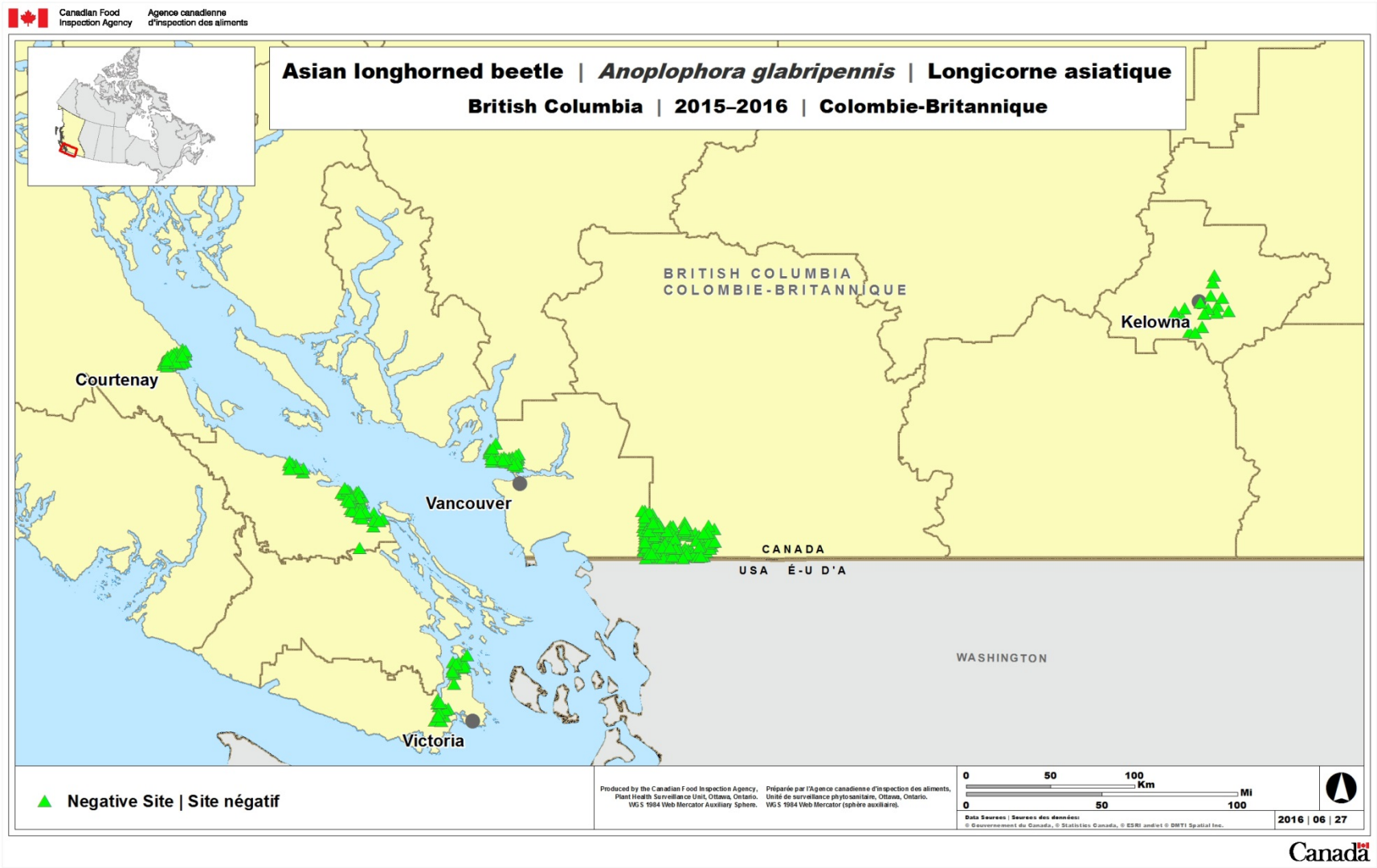

Figure 2. Survey map for *A. glabripennis*, British Columbia

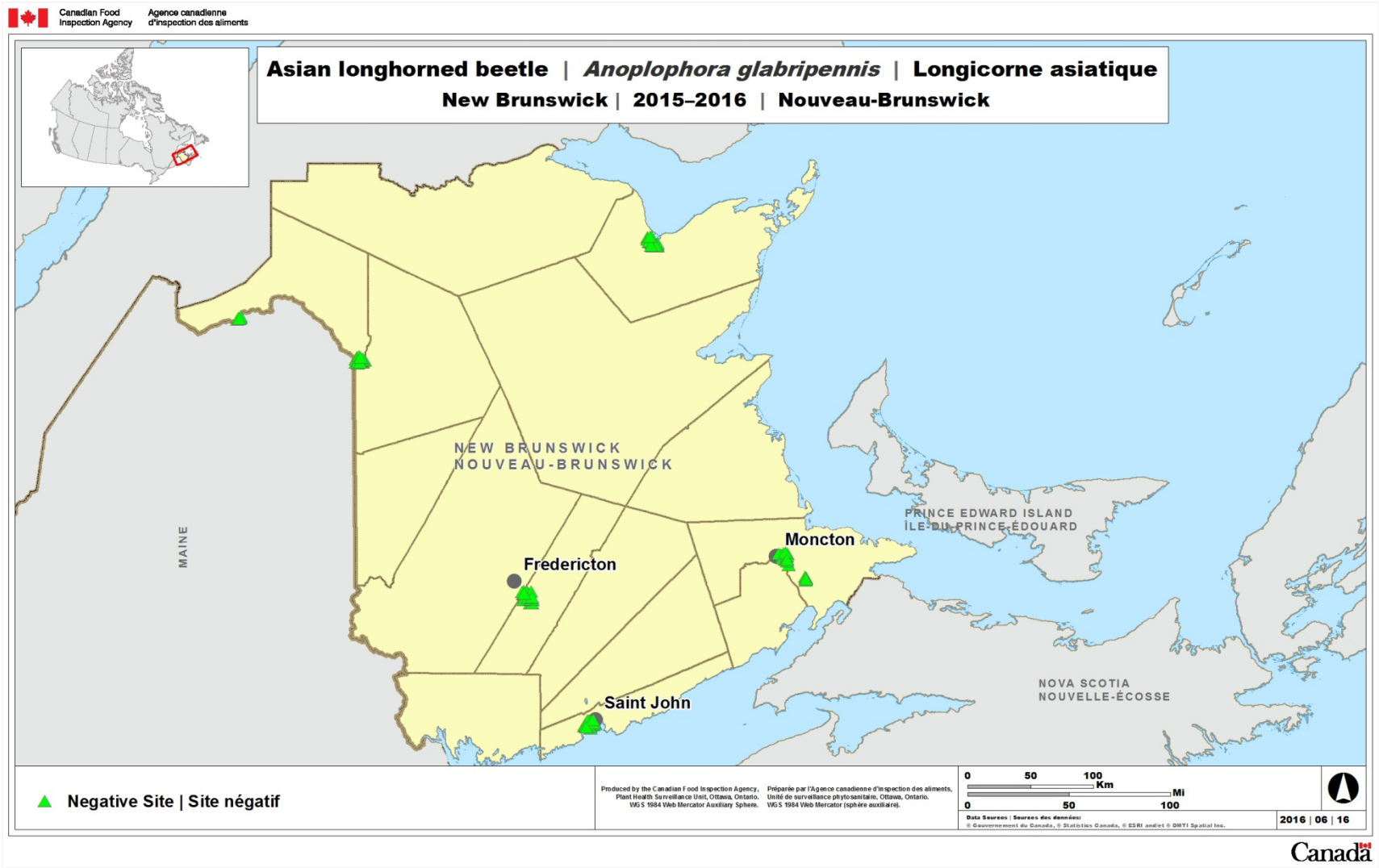

Figure 3. Survey map for *A. glabripennis*, New Brunswick

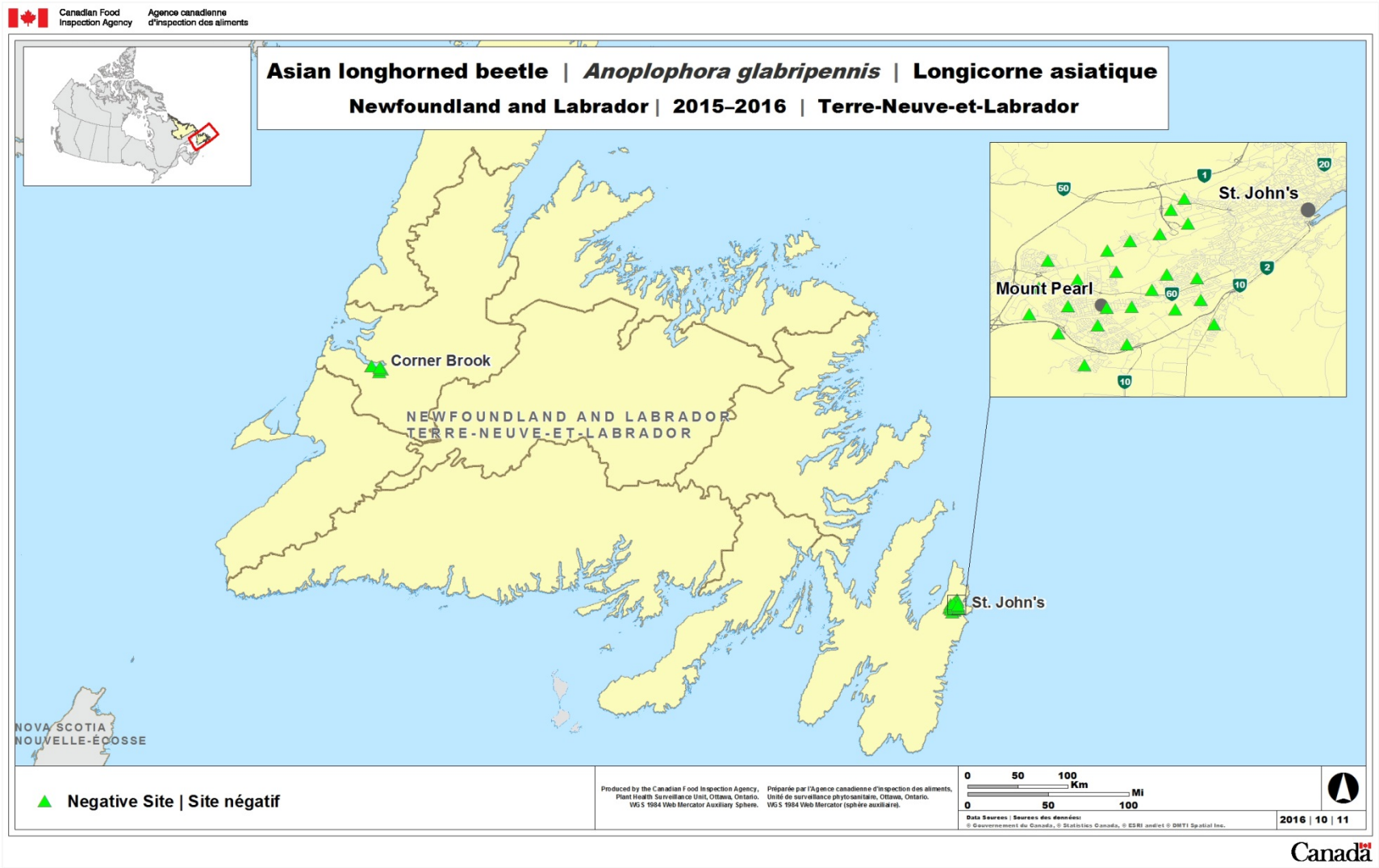

Figure 4. Survey map for *A. glabripennis*, Newfoundland and Labrador

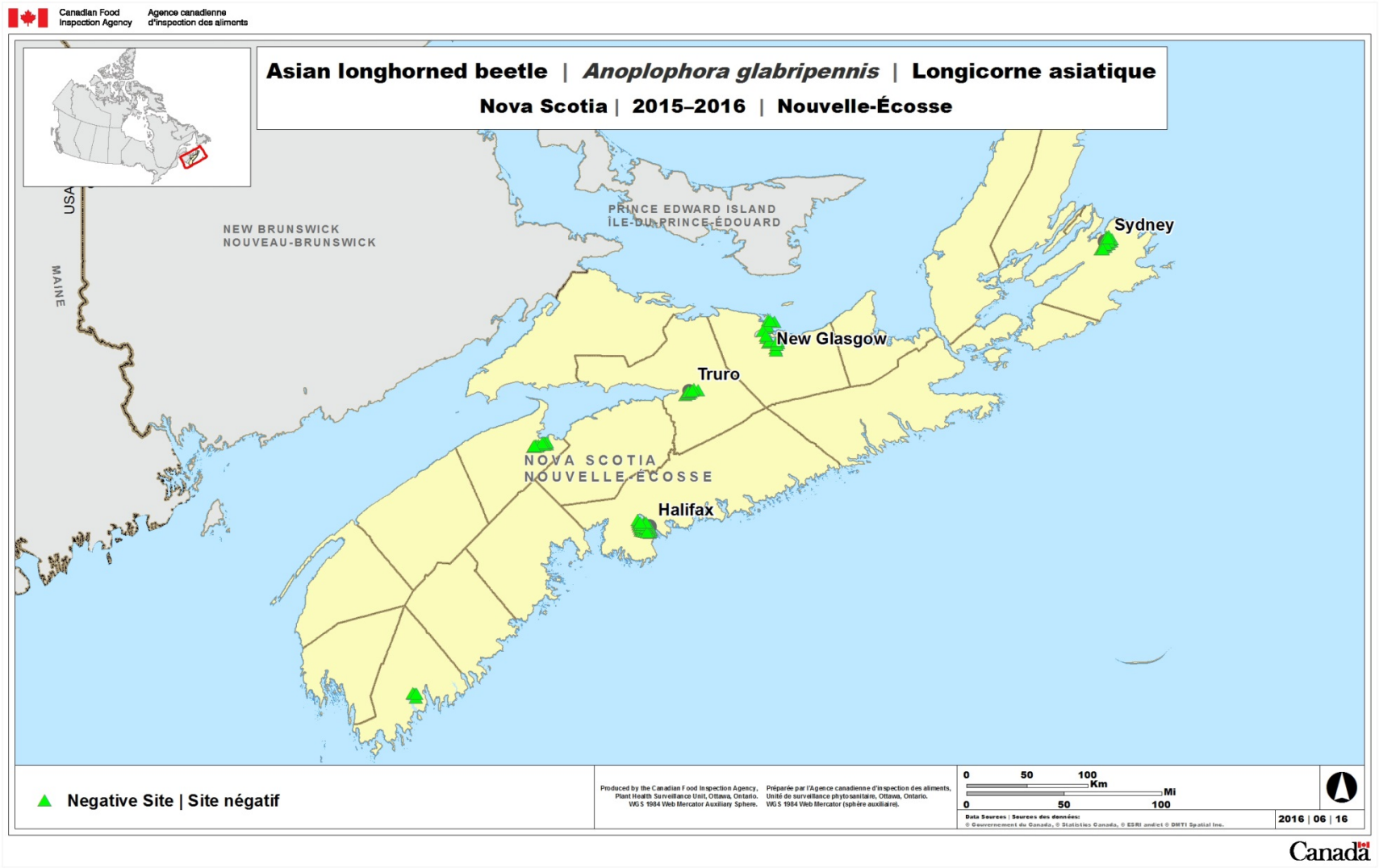

Figure 5. Survey map for *A. glabripennis*, Nova Scotia

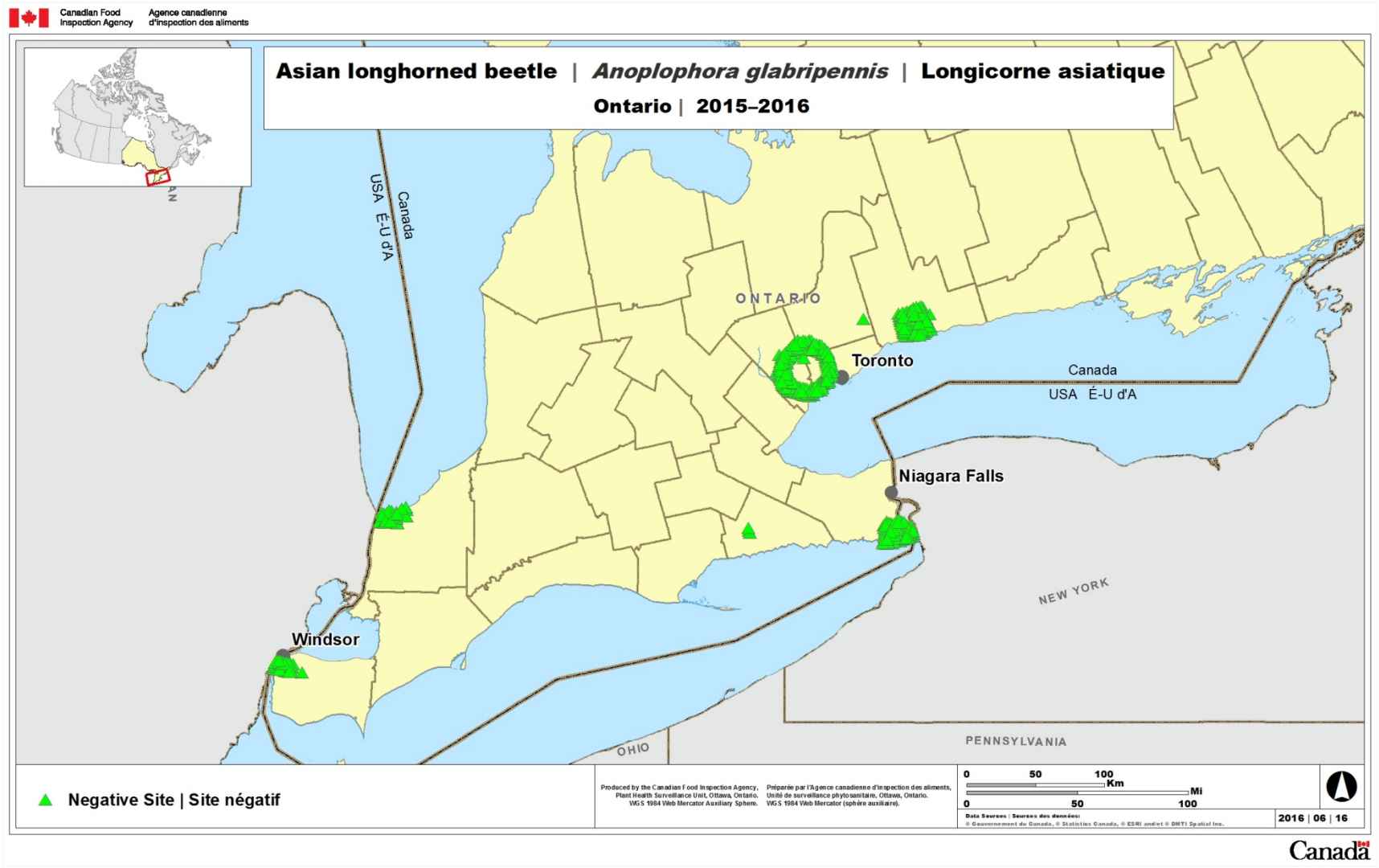

Figure 6. Survey map for *A. glabripennis*, Ontario

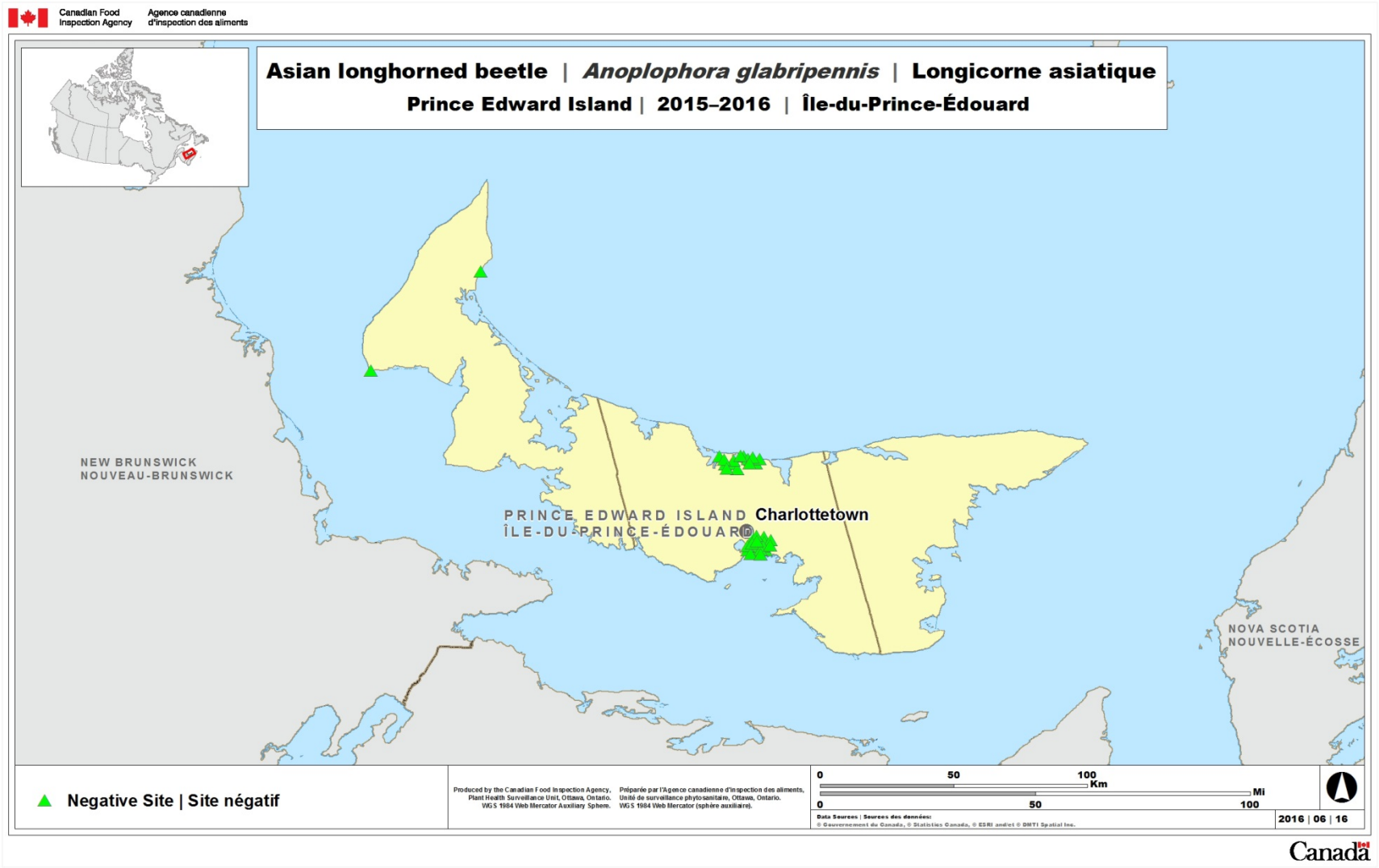

Figure 7. Survey map for *A. glabripennis*, Prince Edward Island

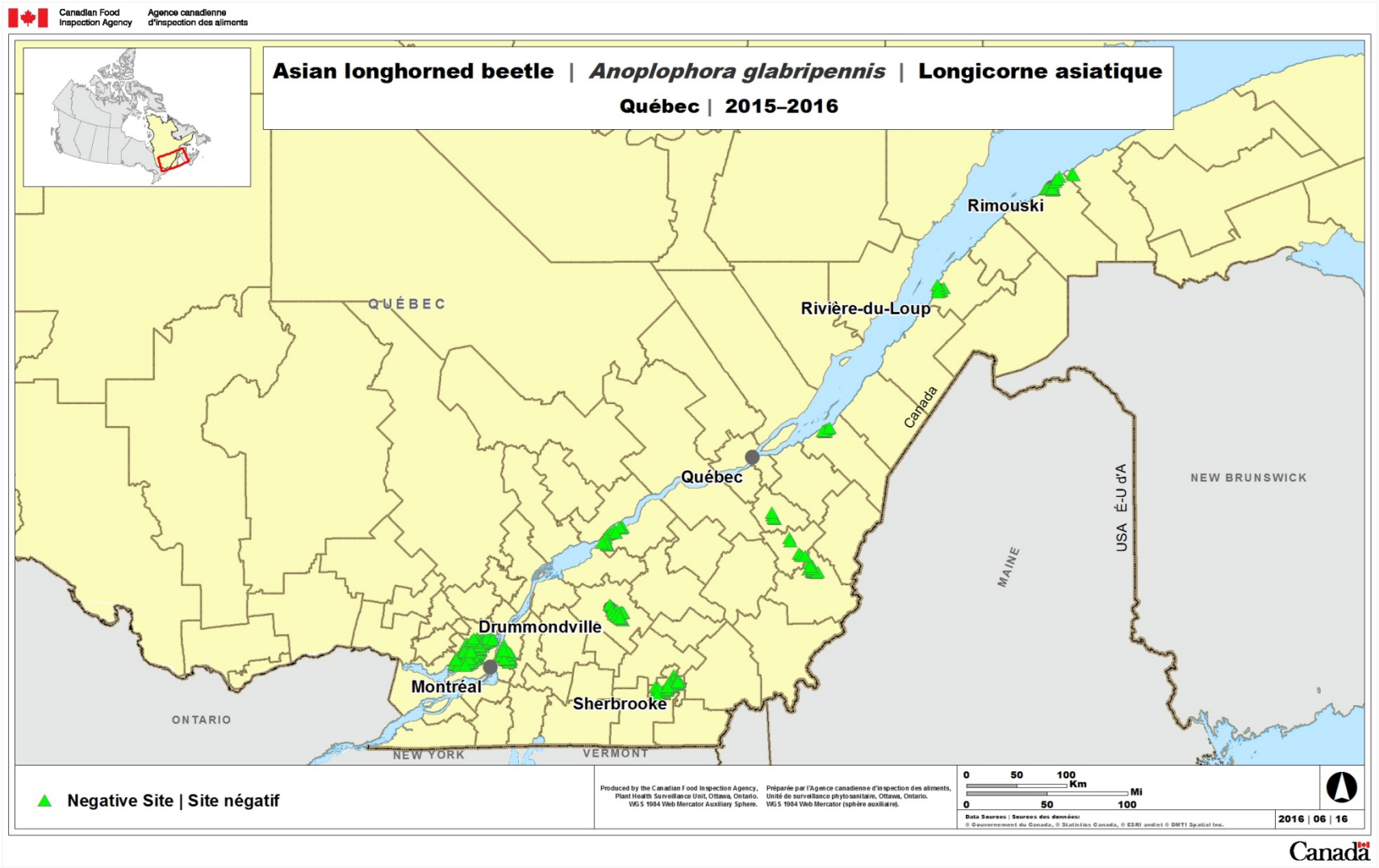

Figure 8. Survey map for *A. glabripennis*, Québec

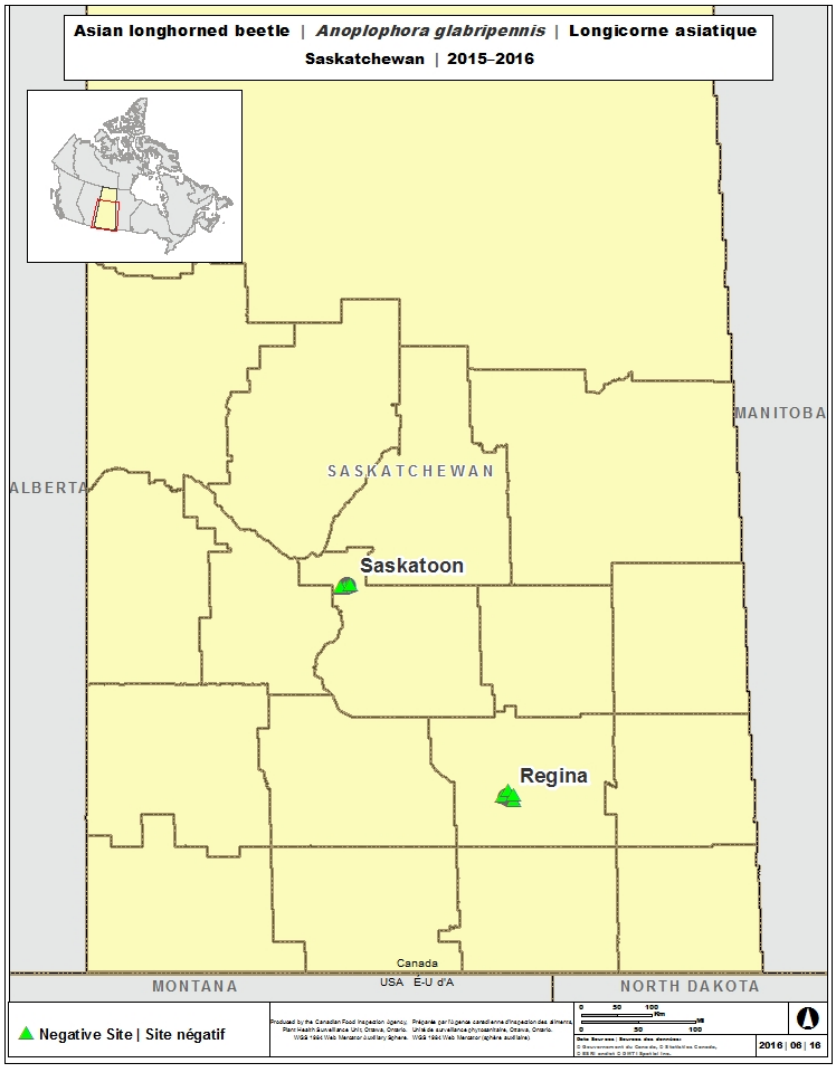

Figure 9. Survey map for *A. glabripennis*, Saskatchewan

1.2 Emerald ash borer (*Agrilus planipennis*)

Background

The emerald ash borer (EAB) was first detected in Canada in Windsor, Ontario in July 2002. Since the initial detection, this species has been found in numerous locations throughout Ontario and Québec. The primary goal of this survey is to determine whether EAB is present in areas where it is not known to occur in order to provide information in support of regulatory decisions. Additional background information on the pest and regulatory updates can be found on the CFIA Forestry page at: www.inspection.gc.ca/english/plaveg/for/fore.shtml

Methodology

A number of strategies were employed for EAB detection in Canada, including scouting for broad-scale ash decline, visual inspection, and trapping using green prism traps baited with two synergistic lures: a green leaf volatile, (Z)-3-hexenol, and a pheromone, (3Z)-lactone. Target sites for this survey include areas showing broad-scale ash decline and high risk sites where the pest is most likely to have been introduced through human activities, such as campgrounds, firewood dealers, rest stops along major transportation corridors, urban areas recently planted with host material, sawmills, and holiday destinations. Traps were also deployed within select urban centres using a grid-based approach.

Results

The survey was conducted in all provinces for a total of 500 sites (Table 3).

Table 3. Emerald ash borer survey results for 2015–2016.

Province	Sites	Results
Alberta	47	No detections.
British Columbia	26	No detections.
Manitoba	31	No detections.
New Brunswick	38	No detections.
Newfoundland and Labrador	8	No detections.
Nova Scotia	50	No detections.
Ontario	100	No new detections.
Prince Edward Island	10	No detections.
Québec	180	No new detections.
Saskatchewan	10	No detections.

N.B. Includes some survey sites delivered by external partners.

Maps showing surveyed sites for emerald ash borer:

- Survey map for *A. planipennis*, Alberta
- Survey map for *A. planipennis*, British Columbia
- Survey map for *A. planipennis*, Manitoba
- Survey map for *A. planipennis*, New Brunswick
- Survey map for *A. planipennis*, Newfoundland and Labrador
- Survey map for *A. planipennis*, Nova Scotia
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- Survey map for *A. planipennis*, Québec
- Survey map for *A. planipennis*, Saskatchewan

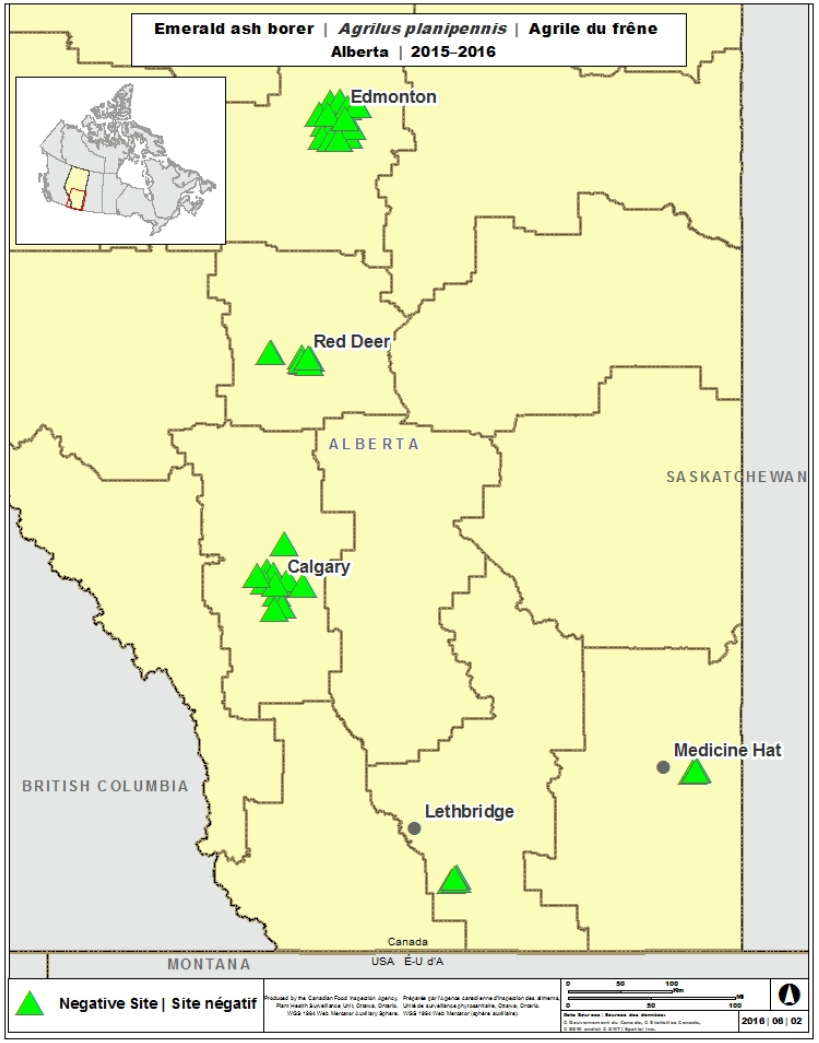


Figure 10. Survey map for *A. planipennis*, Alberta

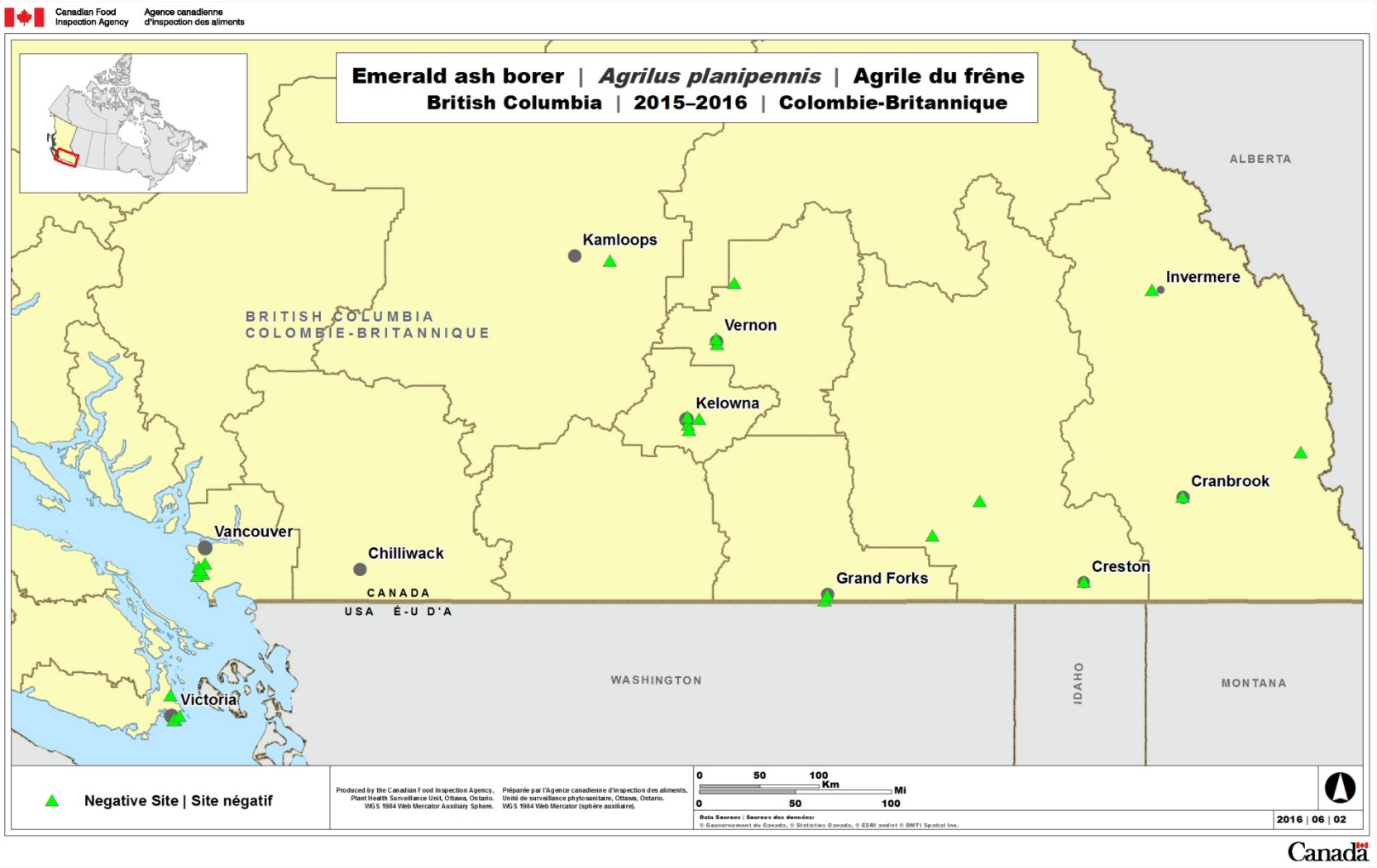


Figure 11. Survey map for *A. planipennis*, British Columbia

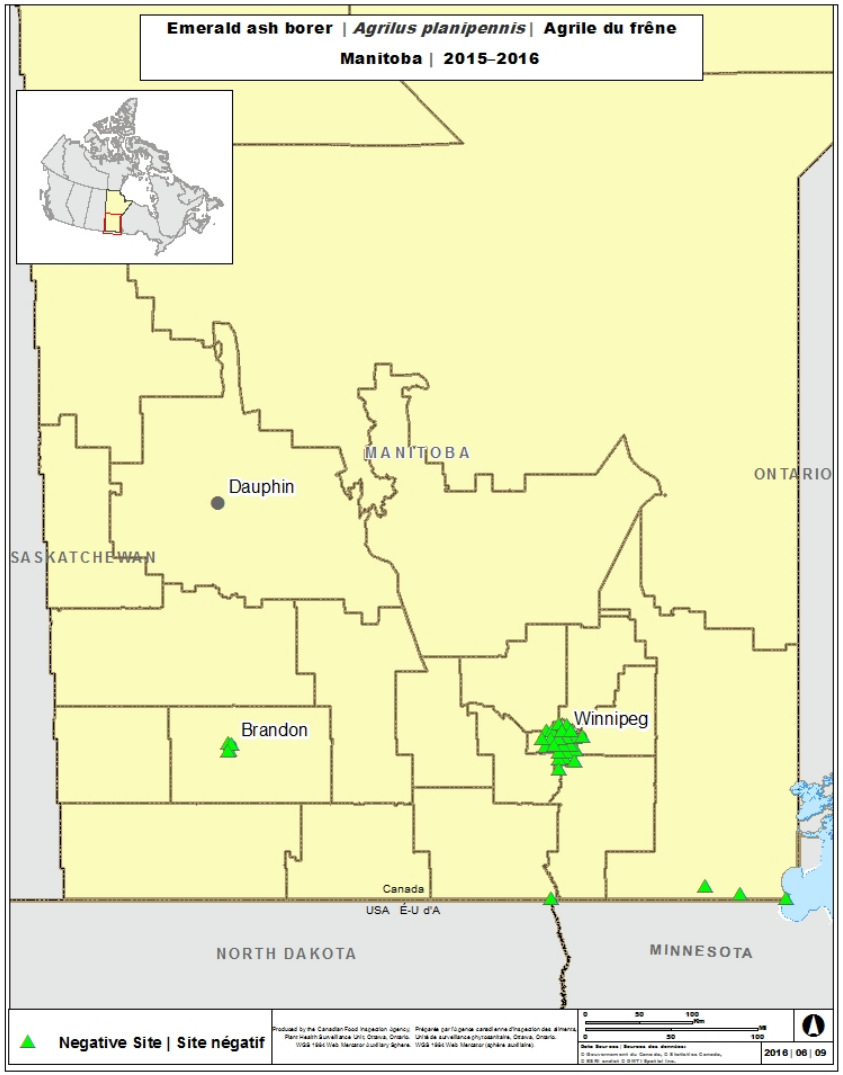


Figure 12. Survey map for *A. planipennis*, Manitoba

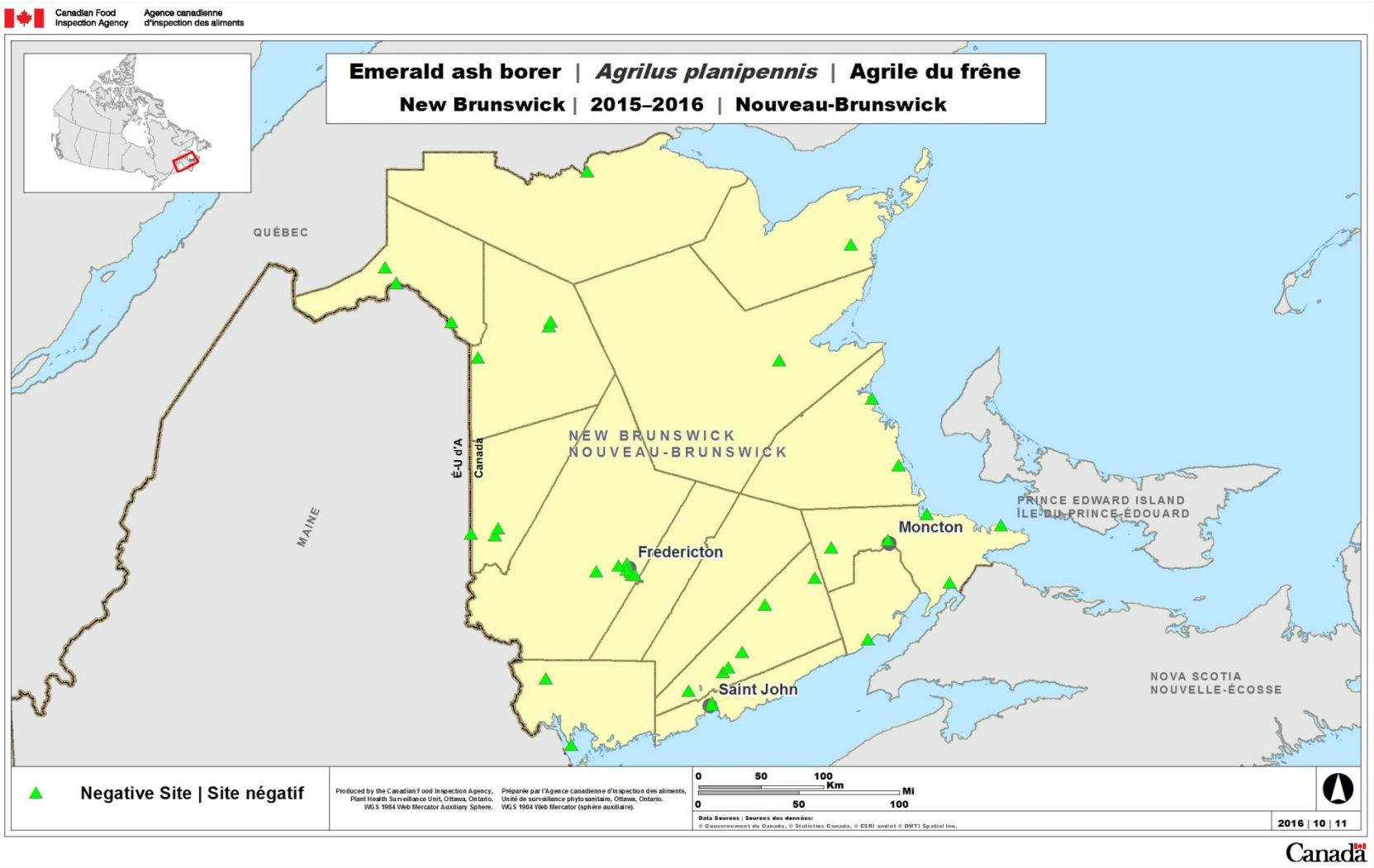


Figure 13. Survey map for *A. planipennis*, New Brunswick

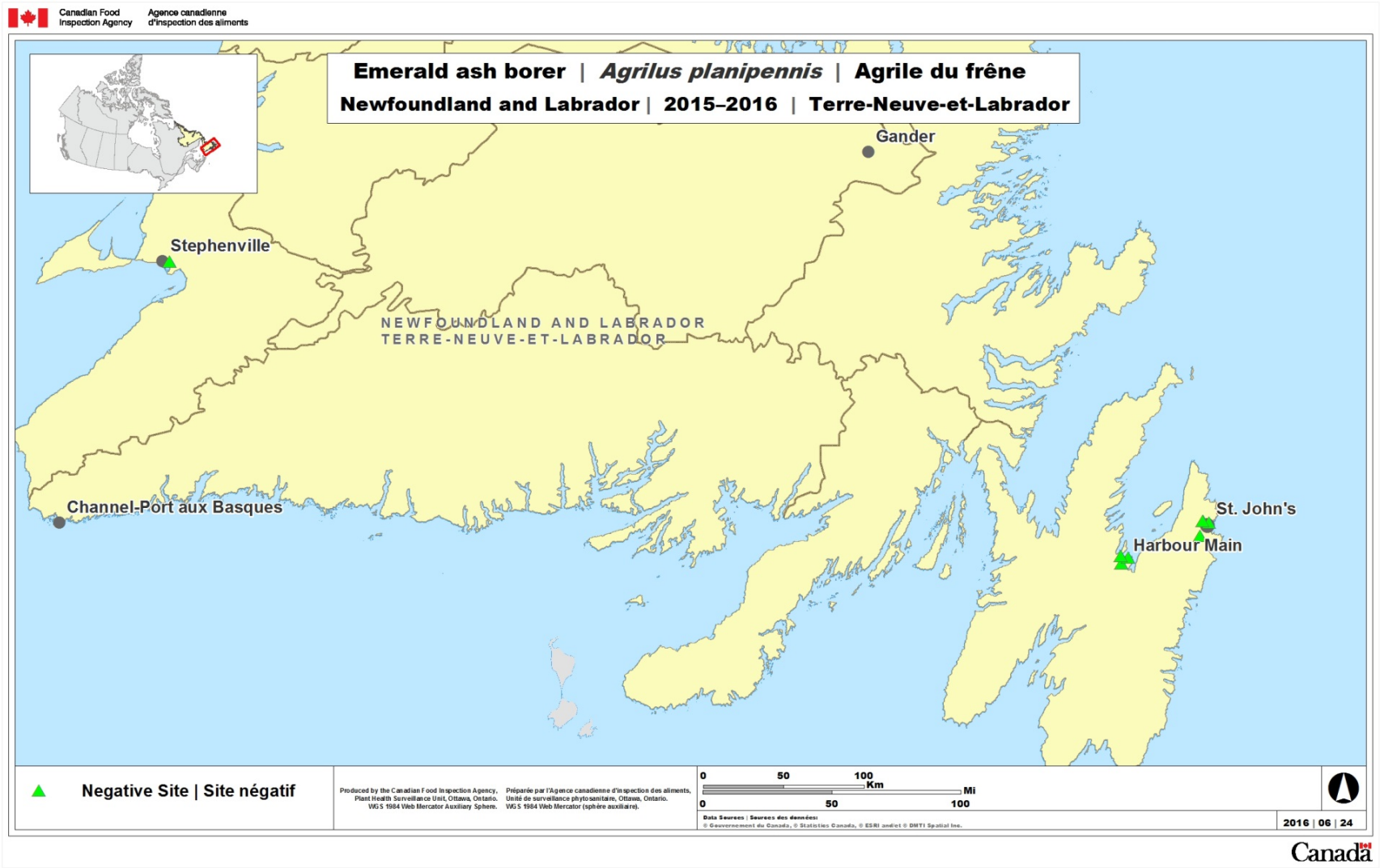


Figure 14. Survey map for *A. planipennis*, Newfoundland and Labrador

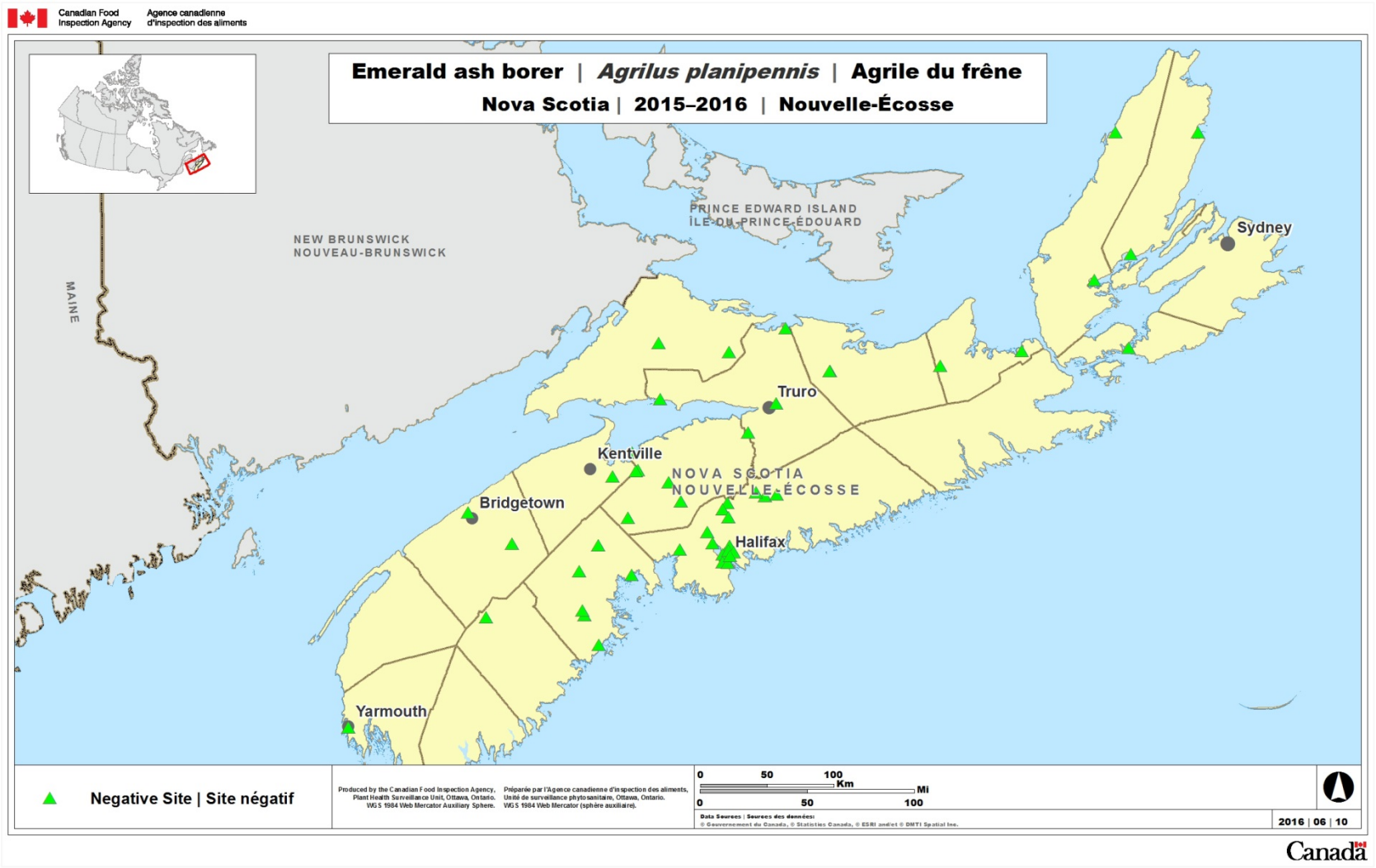


Figure 15. Survey map for *A. planipennis*, Nova Scotia

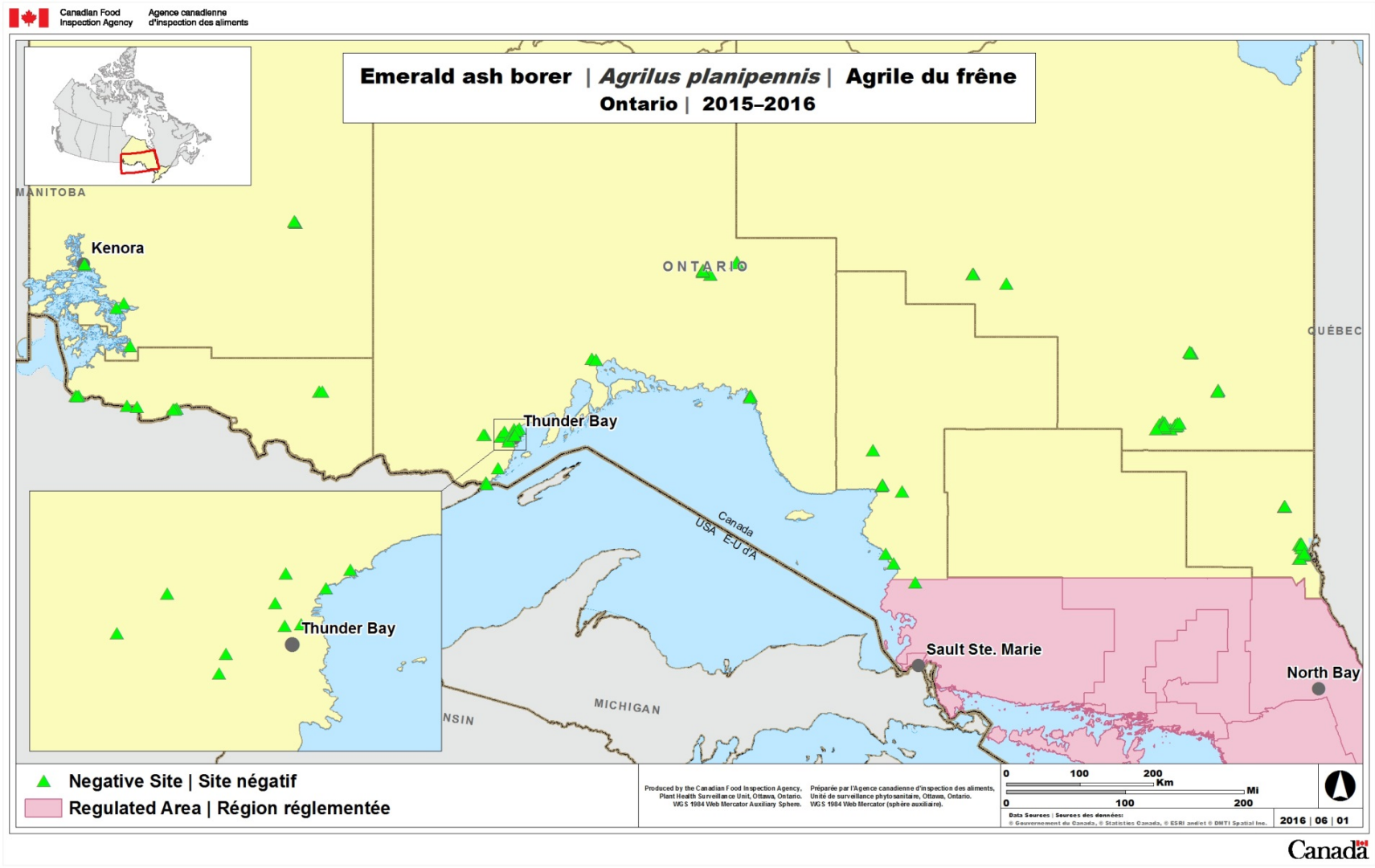


Figure 16. Survey map for *A. planipennis*, Ontario

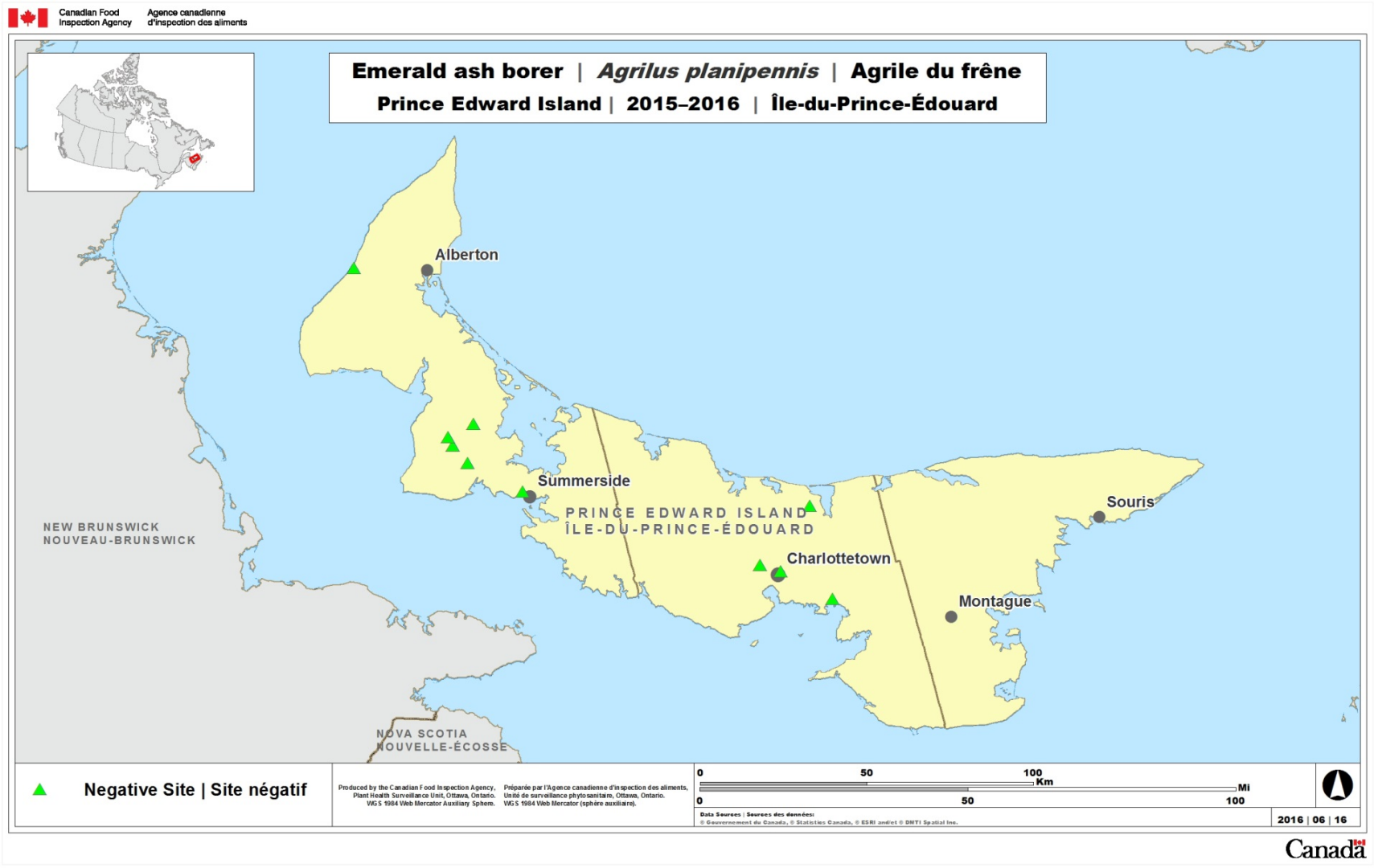


Figure 17. Survey map for *A. planipennis*, Prince Edward Island

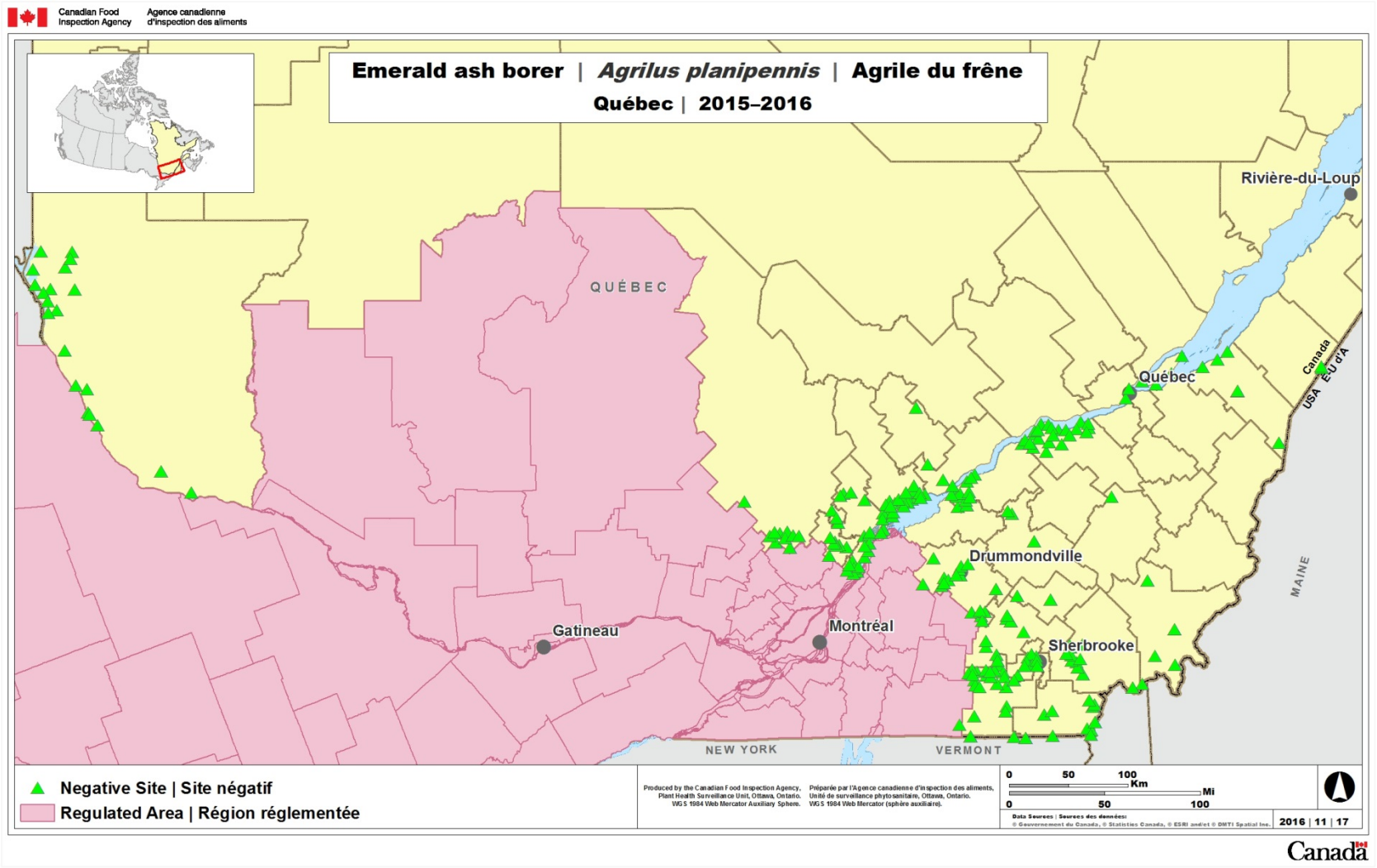


Figure 18. Survey map for *A. planipennis*, Québec

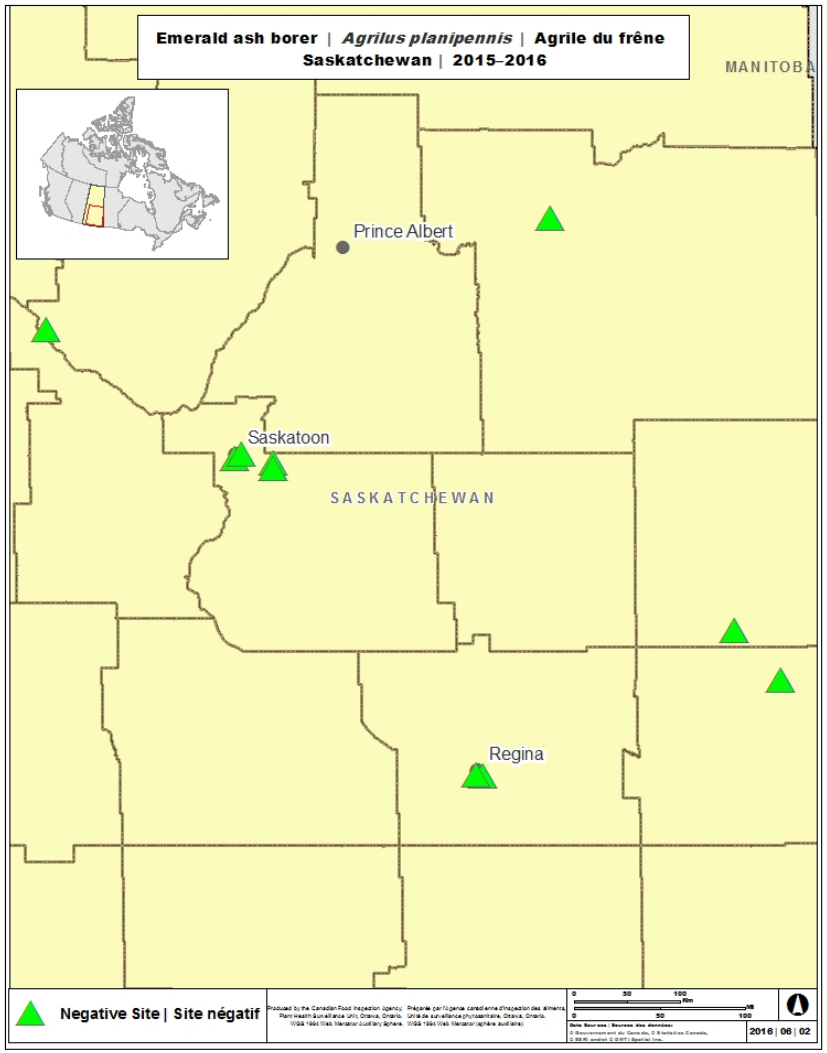


Figure 19. Survey map for *A. planipennis*, Saskatchewan

1.3 Invasive alien forest insect surveys

Background

The invasive alien forest insect surveys (IAS) are pathway-based surveys designed to detect a broad range of wood borers and bark beetles. The surveys focus on urban areas where the risk of invasive alien insects moved with international wood packaging and dunnage is greatest. There are two components to these surveys. The first survey is a semiochemical trapping program, which targets a variety of wood borers such as those from the following taxa: Scolytinae, Siricidae, Buprestidae and Cerambycidae. The second survey consists of rearing insects collected from declining trees in urban environments. The rearing survey complements the trapping surveys for species or groups of insects that do not readily respond to commercially available semiochemicals, particularly insect borers of hardwoods.

The primary goal of these surveys is to detect new introductions of non-indigenous species not known to be present in Canada. These surveys complement policies directed at the prevention of invasive alien forest insects that may enter North America on commodities that use non-manufactured wood packaging and marine cargo supported by loose wood dunnage (CFIA policy directive D-98-08: "*Entry requirements for wood packaging material into Canada*").

Methodology

IAS Trapping Survey

From 2002 to 2011, traps were baited with three types of lures: the Contech Inc exotic bark beetle lure (2-methyl-3-buten-2-ol, cis-verbenol, racemic ipsdienol); ultra high release ethanol and ultra high release alpha-pinene; or ultra high release ethanol by itself. From 2012 to 2014, traps were baited with two types of lures: C6 ketol, C8 ketol and ultra high release ethanol; or ultra high release ethanol and ultra high release alpha-pinene. In 2015, traps were baited with two different sets of lures: general longhorned beetle lure (fuscumol, fuscumol acetate and ultra high release ethanol); or a *Monochamus* lure (alpha-pinene, ethanol, ipsenol and monochamol). Although both lure types target longhorned beetles (Coleoptera: Cerambycidae), they will catch other wood boring insects.

Lindgren traps (12-funnels) were placed in forested areas within 5 km of high risk sites, including industrial zones receiving large volumes of international commodities, industrial and municipal disposal facilities/landfills, wood packaging disposal facilities, international ports and terminals and freight forwarding facilities. In British Columbia, each site contained 4 traps baited with the *Monochamus* lure and two traps with the general longhorned beetle lure. In Ontario and Québec, 75% of sites will be in hardwood forests, with all six traps baited with general longhorned beetle lures and 25% of sites will be in coniferous forests, with all six traps baited with *Monochamus* lures. In the Atlantic provinces, each site will have three traps

with *Monochamus* lures and three traps with general longhorned beetle lures. Traps are placed beginning in March and collected at the end of September.

Two *Xylotrechus subscutellatus* (Coleoptera: Cerambycidae: Cerambycinae) specimens were captured in Richmond, British Columbia. One adult beetle was collected from a trap on July 18 and another beetle from the same trap on August 18. In order to target an industrial area which had imported wooden handicrafts infested with longhorned beetles belonging to the Cerambycinae subfamily, the trap was baited with C6 ketol, C8 ketol and ultra high release ethanol. *Xylotrechus subscutellatus* is native to Sri Lanka and southern India. None of its native hosts (e.g. coffee, rosewood, teak, croton, etc.) occur in Richmond. Standard funnel traps deployed at ground level, green funnel traps placed in tree canopies and visual ground surveys will occur in 2016 to determine if the 2015 trap catches are interceptions or the result of an established population.

IAS Rearing Survey

The rearing survey consists of obtaining two log sections from a tree that is targeted for removal by a city's hazard tree removal program. Trees are selected for sampling based on a pre-determined set of criteria based on signs of decline. Logs are placed in a custom designed rearing facility for up to two years under climate-controlled conditions. Emerging insects are regularly collected from the bolts. Rearing facilities are located in the cities of North Vancouver, Toronto, Halifax Regional Municipality and Montreal.

Results

The IAS trapping survey was conducted in 6 provinces for a total of 62 sites (Table 4). In Alberta, the IAS trapping survey was conducted by StopDED, Alberta Sustainable Resource Development and various municipalities in collaboration with CFIA.

Figure 20. Trapping for invasive alien forest insect surveys

Table 4. Invasive alien forest insects trapping survey results for 2015–2016.

Province	Sites	Results
British Columbia	8	*Xylotrechus subscutellatus* (Col.: Cerambycidae) (Richmond).
New Brunswick	5	No new detections of regulated pests.
Newfoundland and Labrador	3	No new detections of regulated pests.
Nova Scotia	10	No new detections of regulated pests. *Tetropium fuscum* (Col. Cerambycidae) (Dartmouth) was detected.
Ontario	20	No new detections of regulated pests. *Hylastes opacus* (Col. Scolytinae) (Markham, Newmarket), *Larinus planus* (Col. Curculionidae), *Popillia japonica* (Col. Scarabaeidae) (Leamington, Toronto), *Tomicus piniperda* (Col. Scolytinae) (Brantford, Markham, Newmarket) were detected.
Québec	16	No new detections of regulated pests. *Tomicus piniperda* (Col. Scolytinae) (Plessisville, Saint Flavien, Sorel) was detected.

Maps showing surveyed sites for the invasive alien forest trapping survey:

- Survey map for the invasive alien forest insects, British Columbia
- Survey map for the invasive alien forest insects, New Brunswick
- Survey map for the invasive alien forest insects, Newfoundland and Labrador
- Survey map for the invasive alien forest insects, Nova Scotia
- Survey map for the invasive alien forest insects, Ontario
- Survey map for the invasive alien forest insects, Québec

For additional information concerning the rearing survey, contact the Plant Health Surveillance Unit (surveillance@inspection.gc.ca).

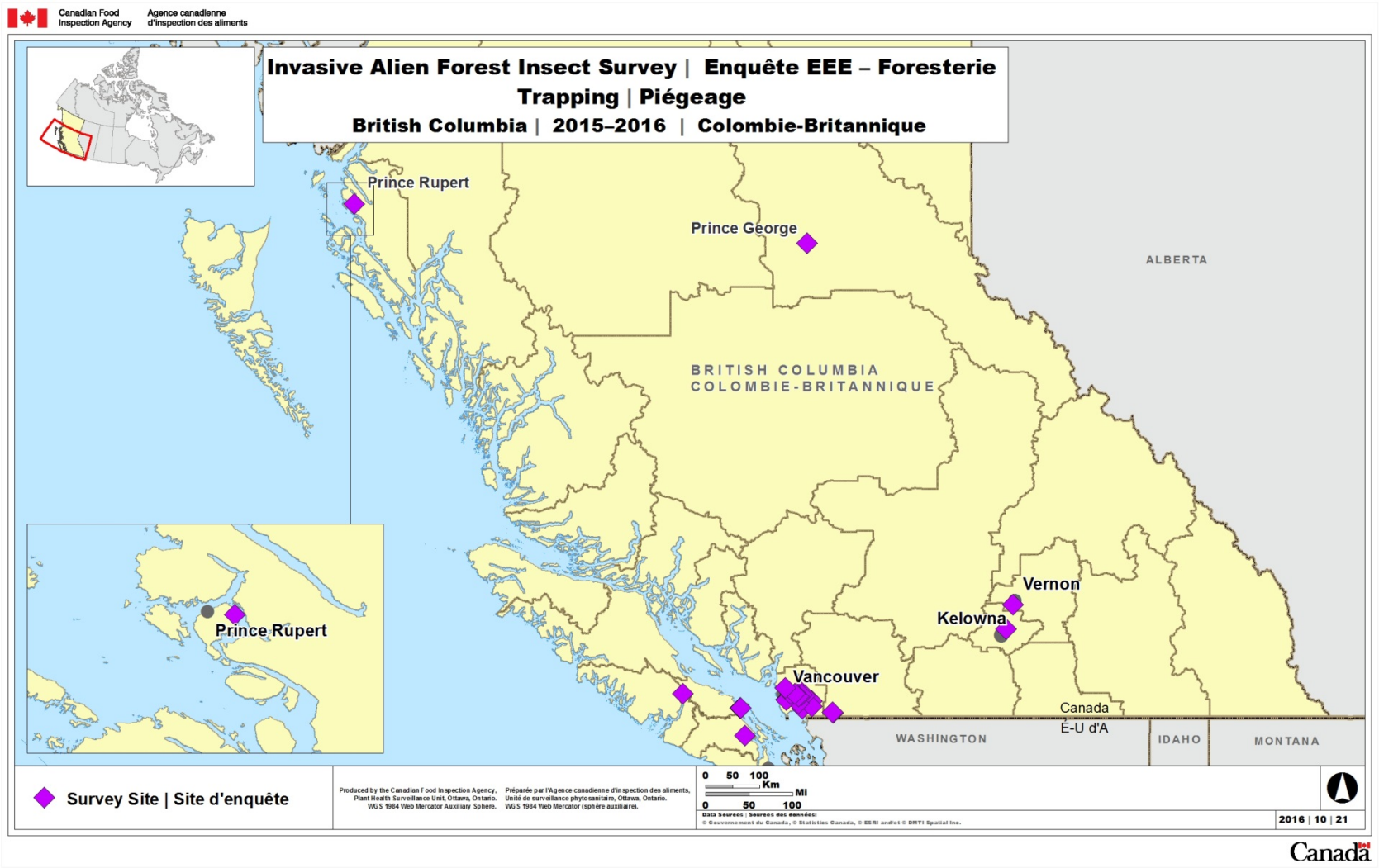


Figure 21. Survey map for the invasive alien forest insects, British Columbia

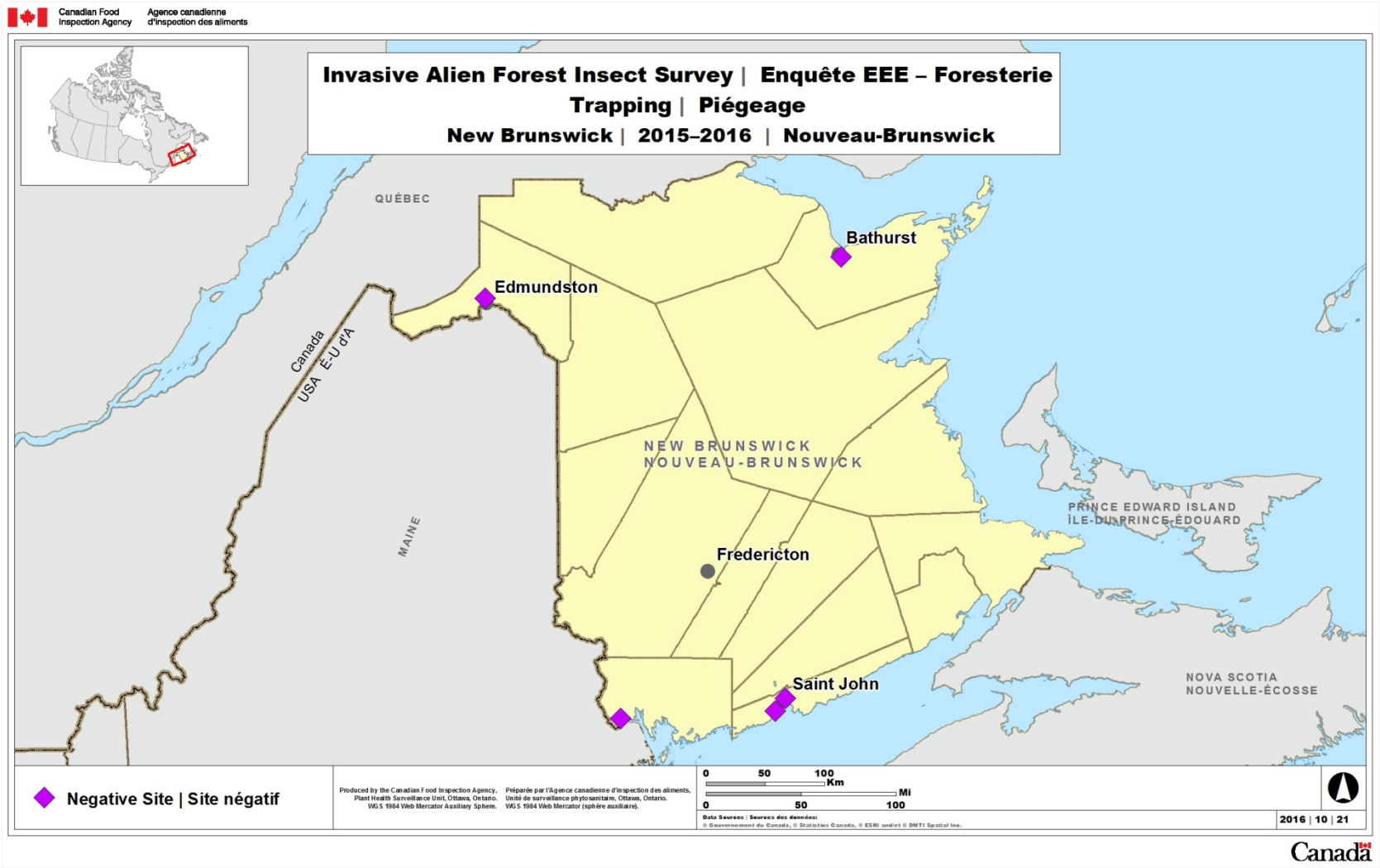


Figure 22. Survey map for the invasive alien forest insects, New Brunswick

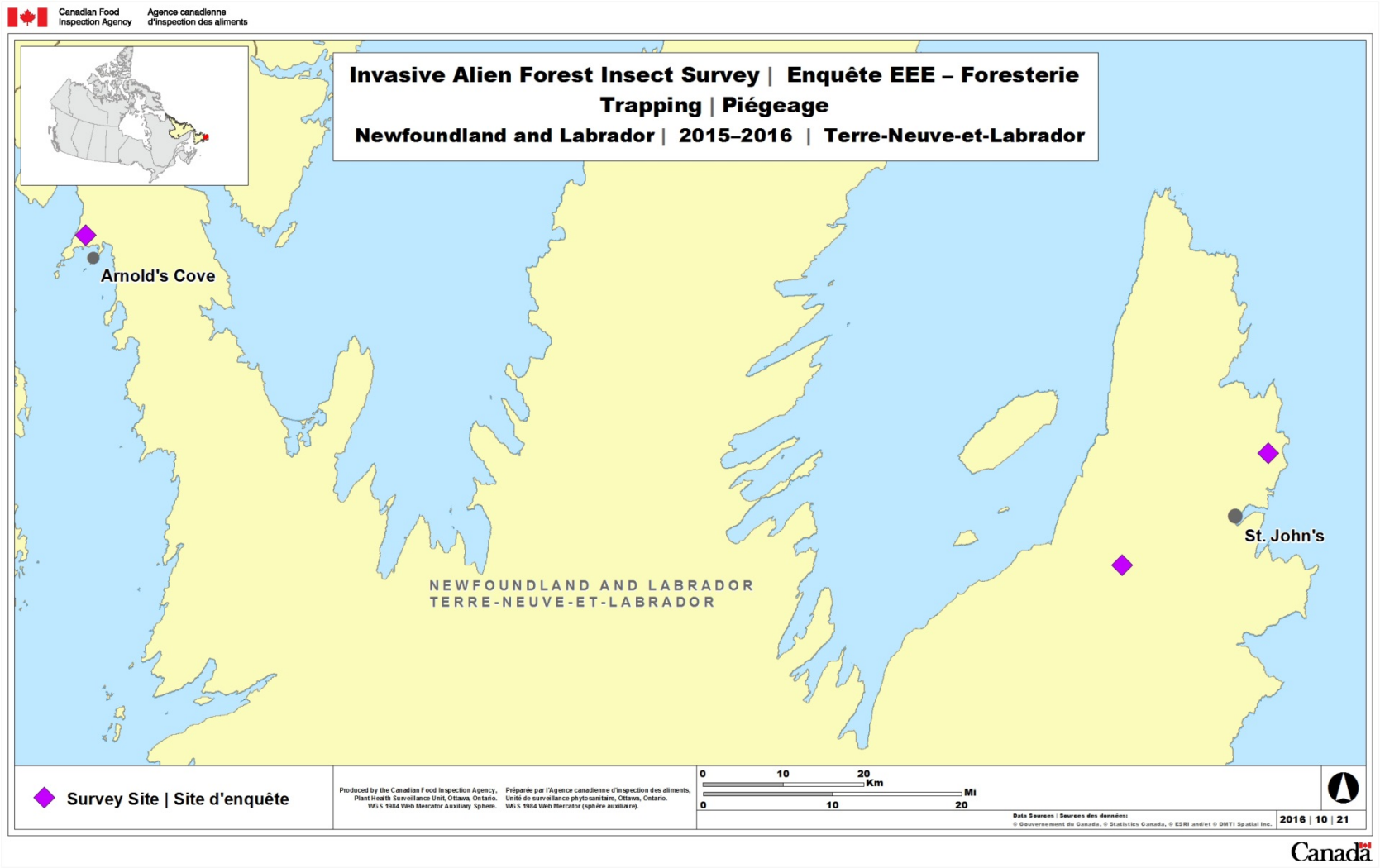


Figure 23. Survey map for the invasive alien forest insects, Newfoundland and Labrador

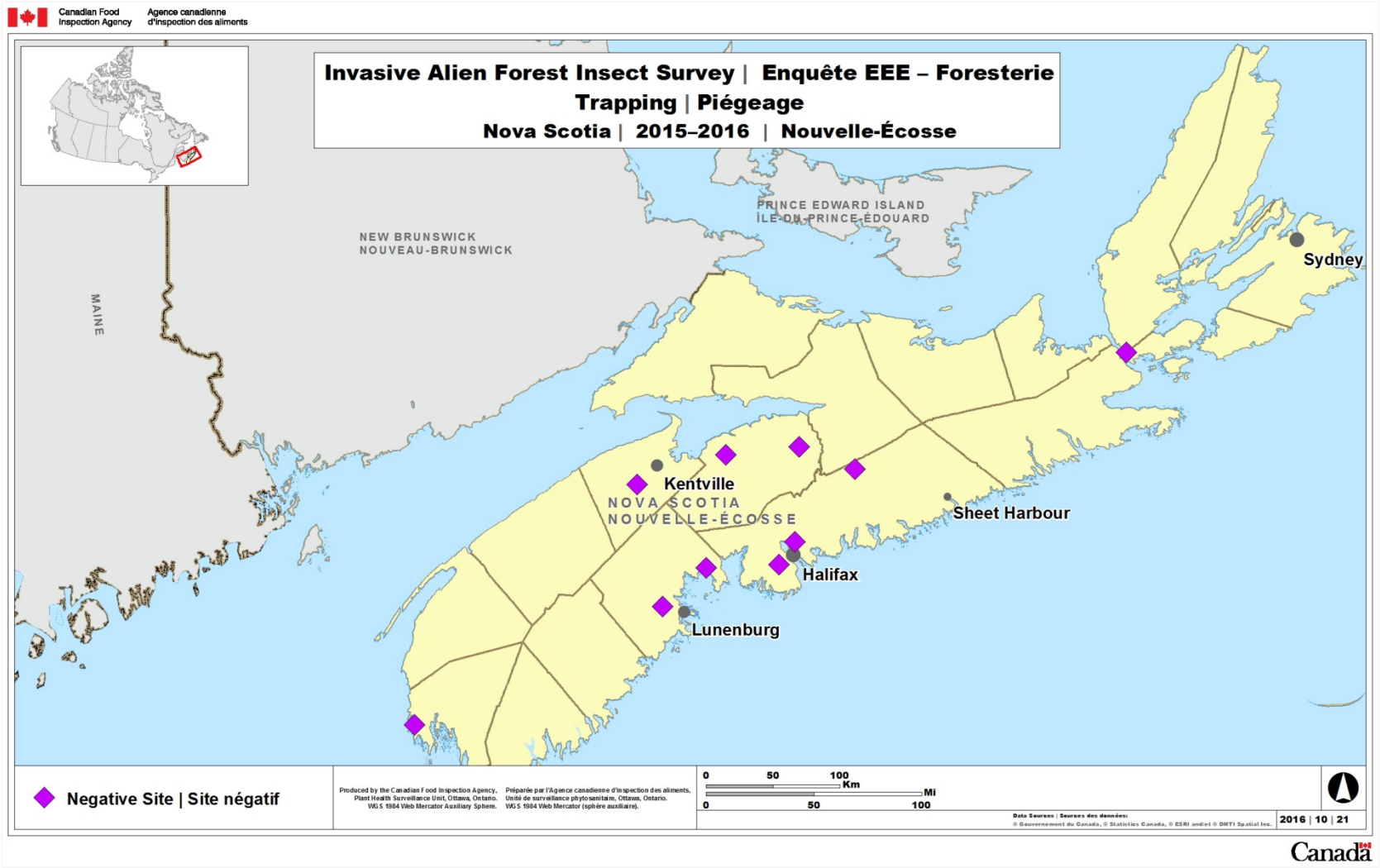


Figure 24. Survey map for the invasive alien forest insects, Nova Scotia

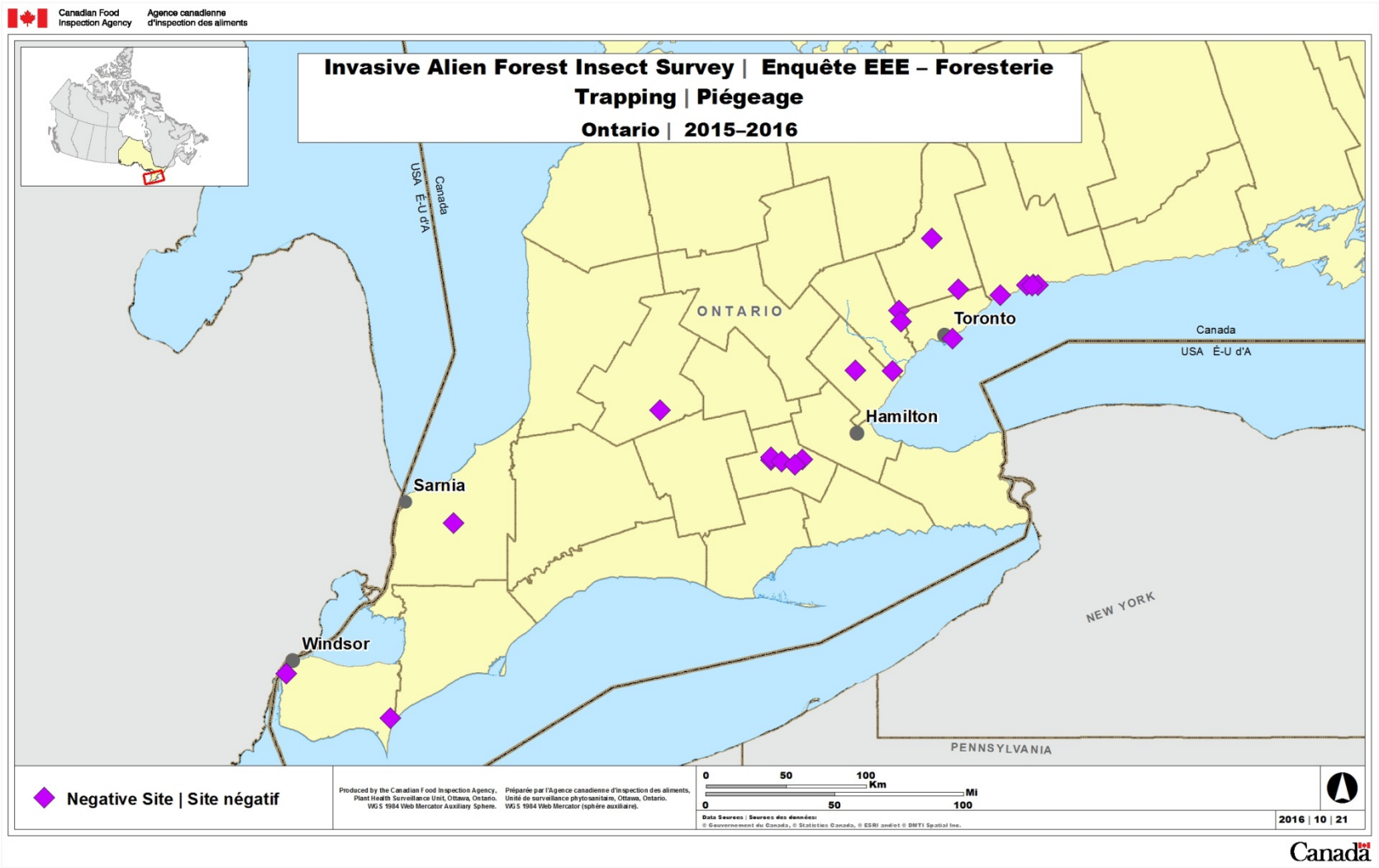


Figure 25. Survey map for the invasive alien forest insects, Ontario

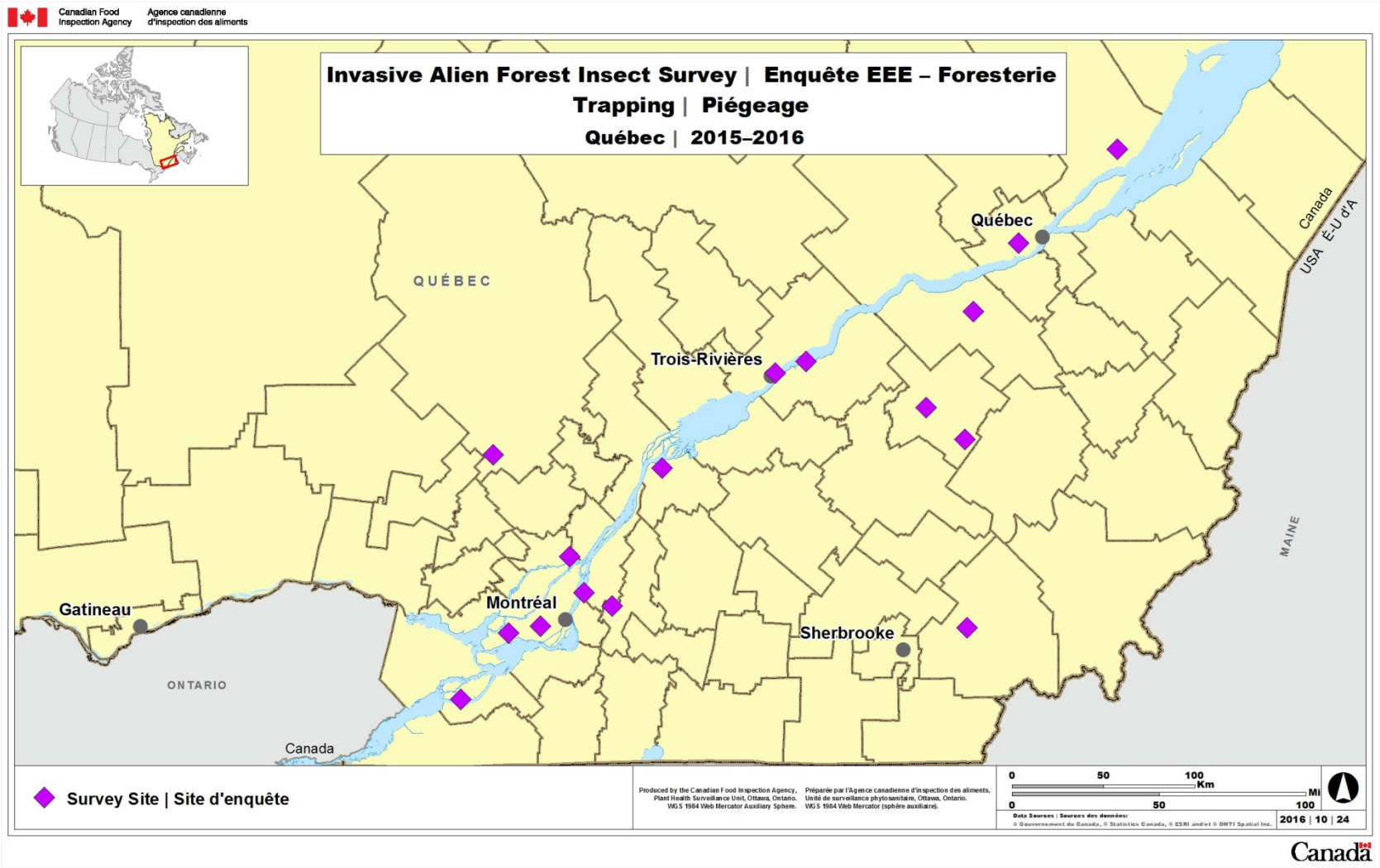
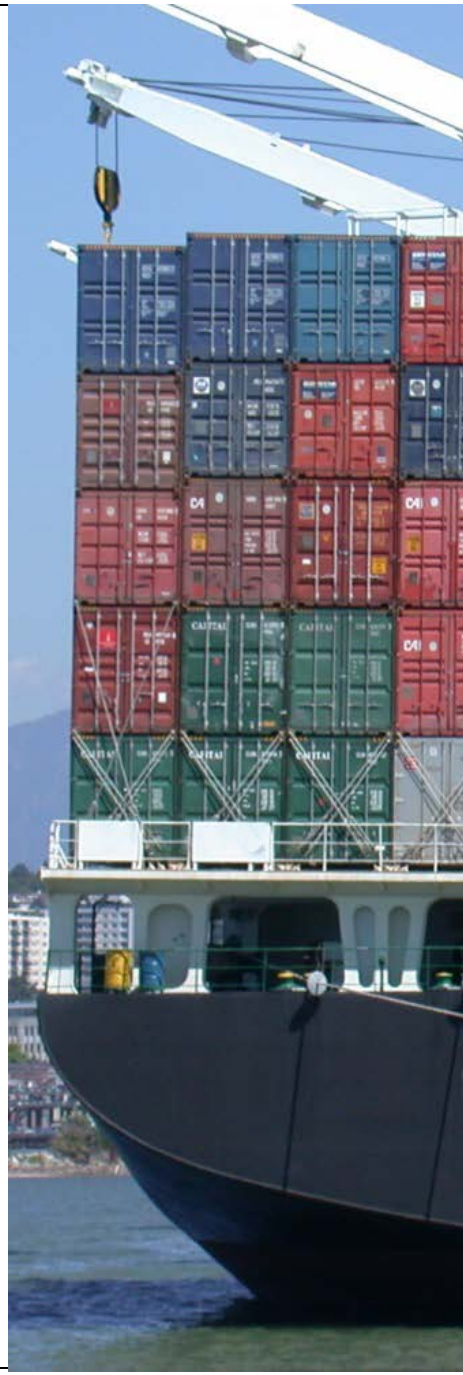


Figure 26. Survey map for the invasive alien forest insects, Québec



1.4 Asian gypsy moth *(Lymantria dispar asiatica* or *Lymantria dispar japonica)*

Background

Asian gypsy moth (AGM) has been introduced into North America on several occasions, but eradication programs have prevented populations from establishing. This survey is being conducted in support of CFIA policy directive D -95-03: "*Plant protection policy for marine vessels arriving in Canada from areas regulated for Asian gypsy moth* (*Lymantria dispar, Lymantria albescens, Lymantria postalba, Lymantria umbrosa*)". Asian gypsy moth is defined for regulatory purposes as those gypsy moth subspecies of *Lymantria dispar* in which the females are capable of sustained directed flight, whereas European gypsy moth includes females not capable of flight.

Methodology

The AGM trapping survey targets high risk sites of potential introduction linked to vessel and container pathways (e.g. international ports/terminals, container storage yards, intermodal terminals, industrial zones and international auto terminals). Trapping is performed using sticky Delta traps baited with + disparlure pheromone. All moths captured in non-gypsy moth regulated areas of Canada) are subjected to DNA analysis to determine whether they should be considered Asian gypsy moth or European gypsy moth (i.e. biotype). A subset of moths collected from this survey in gypsy moth regulated areas in infested provinces are tested using molecular analysis to determine biotype.

Results

The AGM specific survey was conducted in 3 provinces for a total of 108 sites (Table 5). There was one detection in Vancouver, British Columbia.

Table 5. Asian gypsy moth survey results for 2015–2016.

Province	Sites	Results
British Columbia	71	One detection in Vancouver.
New Brunswick	7	No detections.
Nova Scotia	30	No detections.

Maps for Asian gypsy moth are presented together with European gypsy moth results (Section 1.5).

1.5 European gypsy moth (*Lymantria dispar dispar*)

Background

The European gypsy moth is established in southern areas of Ontario and Québec, southwestern areas of New Brunswick and Nova Scotia, and in Charlottetown and Summerside, Prince Edward Island. Pheromone-based monitoring surveys are conducted annually in non-regulated areas of Canada. Surveys are also conducted to verify eradication of the insect in areas where eradication programs have been undertaken. This survey provides information in support of a number of regulatory programs and policies (e.g. CFIA policy directive D-98-09: "*Comprehensive policy to control the spread of North American gypsy moth, Lymantria dispar in Canada and the United States*").

Methodology

Trapping was performed using Delta traps baited with (+)-disparlure pheromone. Two systems of trapping can be used depending on the status of the area to survey. Detection trapping is used to determine if European gypsy moth is present in an area currently considered free from the pest, and delimitation trapping is used to determine the extent of a population once a detection has been confirmed. The two systems use different trapping densities. Trapping is focussed on areas where risk of introduction is greatest, e.g., urban and suburban areas, tourist destinations, campsites, provincial parks and some transportation corridors.

Results

The survey was conducted in all provinces for a total of 7,429 sites (Table 6). There were detections in all provinces.

Figure 27. Adult gypsy moth

Table 6. European gypsy moth survey results for 2015–2016.

Province	Sites	Results
Alberta	420	Detection at one site near Fort McMurray with 1 specimen.
British Columbia	4834	20 positive sites with a total of 30 specimens.
Manitoba	511	Detections in Lee River, Carmen, and Winnipeg with a total of 4 positive sites and 6 specimens.
New Brunswick	197	47 positive sites for a total of 142 specimens.
Newfoundland and Labrador	261	Detections at two sites in St. John's, with 1 specimen at each site.
Nova Scotia	208	67 positive sites for a total of 210 specimens.
Ontario	197	Detections in Algoma District, Sudbury District, and Thunder Bay District.
Prince Edward Island	129	52 positive sites for a total of 237 specimens.
Québec	200	108 positive sites for a total of 539 specimens.
Saskatchewan	472	Detection at one site in Regina with 1 specimen.

Maps showing surveyed sites for *L. dispar dispar*:

- Survey map for *L. dispar dispar*, Alberta
- Survey map for *L. dispar dispar*, British Columbia
- Survey map for *L. dispar dispar*, Manitoba
- Survey map for *L. dispar dispar*, New Brunswick
- Survey map for *L. dispar dispar*, Newfoundland and Labrador
- Survey map for *L. dispar dispar*, Nova Scotia
- Survey map for *L. dispar dispar*, Ontario
- Survey map for *L. dispar dispar*, Prince Edward Island
- Survey map for *L. dispar dispar*, Québec
- Survey map for *L. dispar dispar*, Saskatchewan

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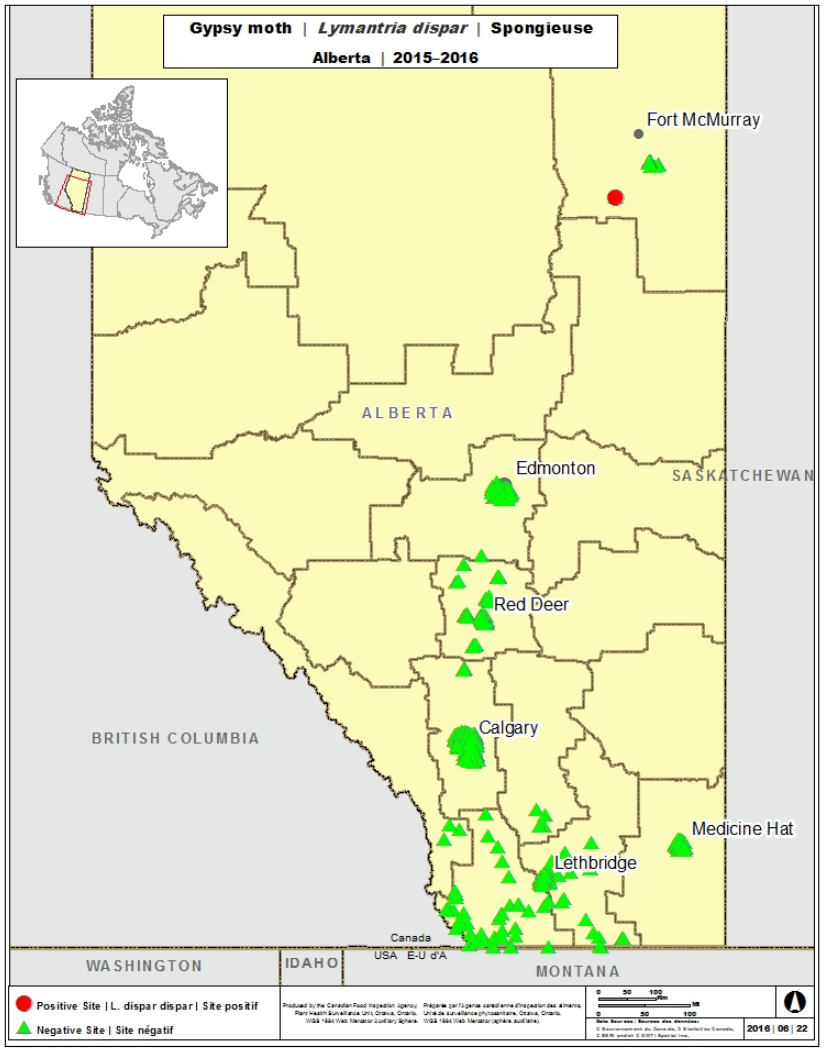


Figure 28. Survey map for *L. dispar dispar*, Alberta

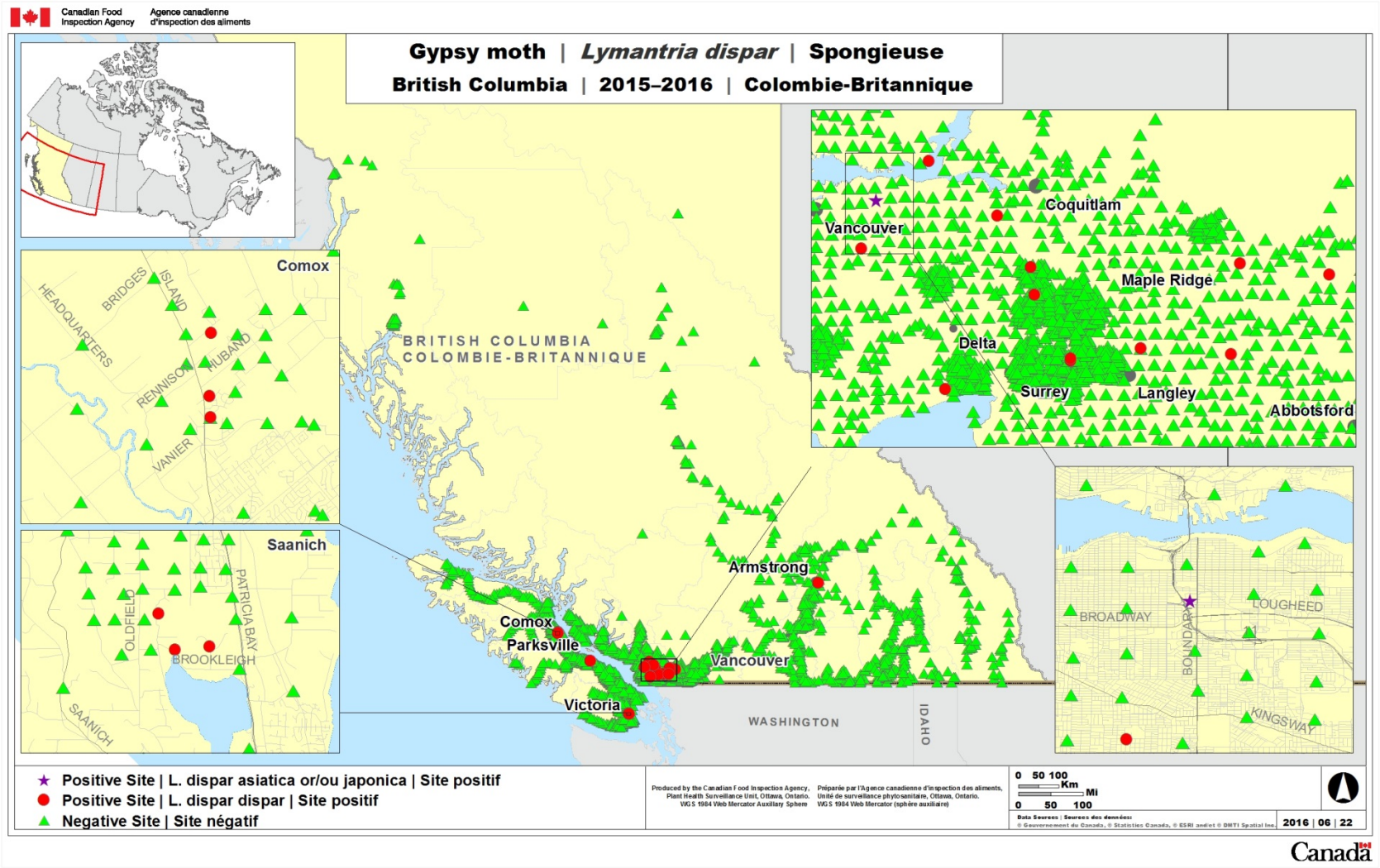


Figure 29. Survey map for *L. dispar*, British Columbia

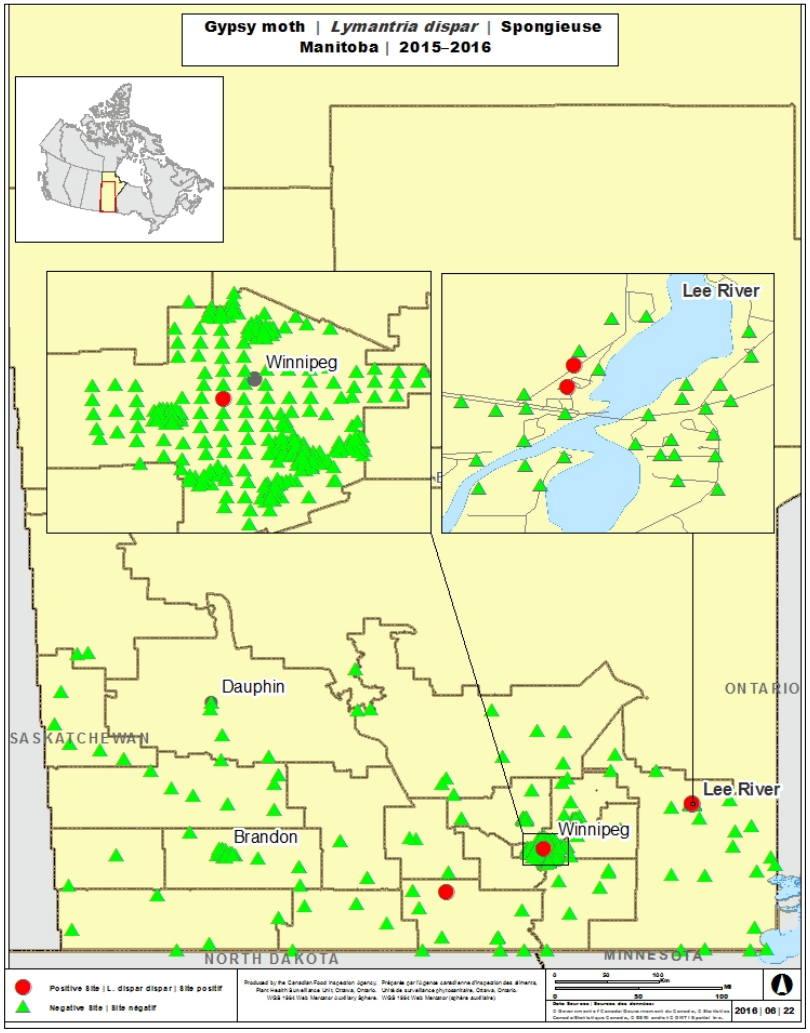


Figure 30. Survey map for *L. dispar dispar*, Manitoba

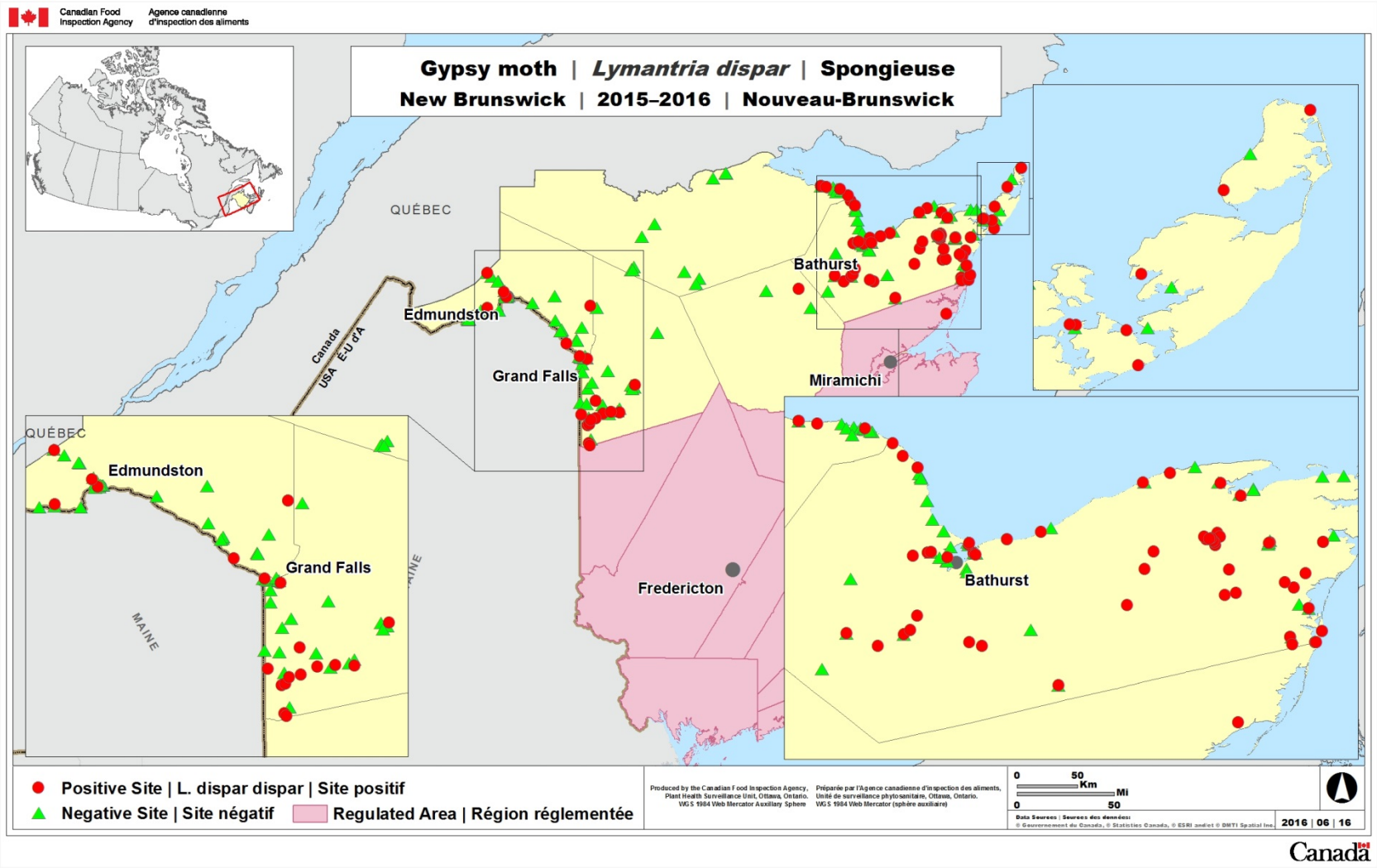


Figure 31. Survey map for *L. dispar dispar*, New Brunswick

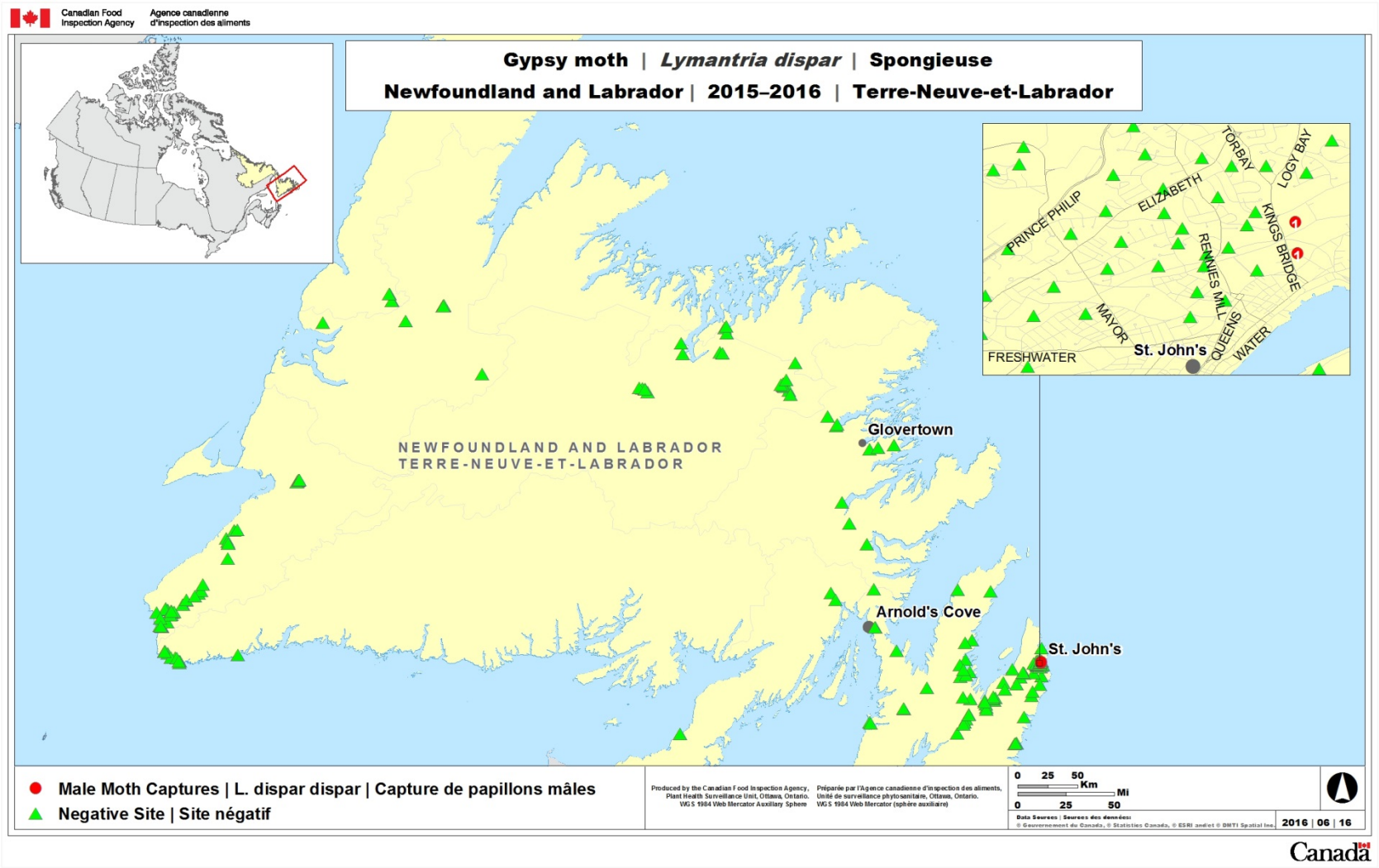


Figure 32. Survey map for *L. dispar dispar*, Newfoundland and Labrador

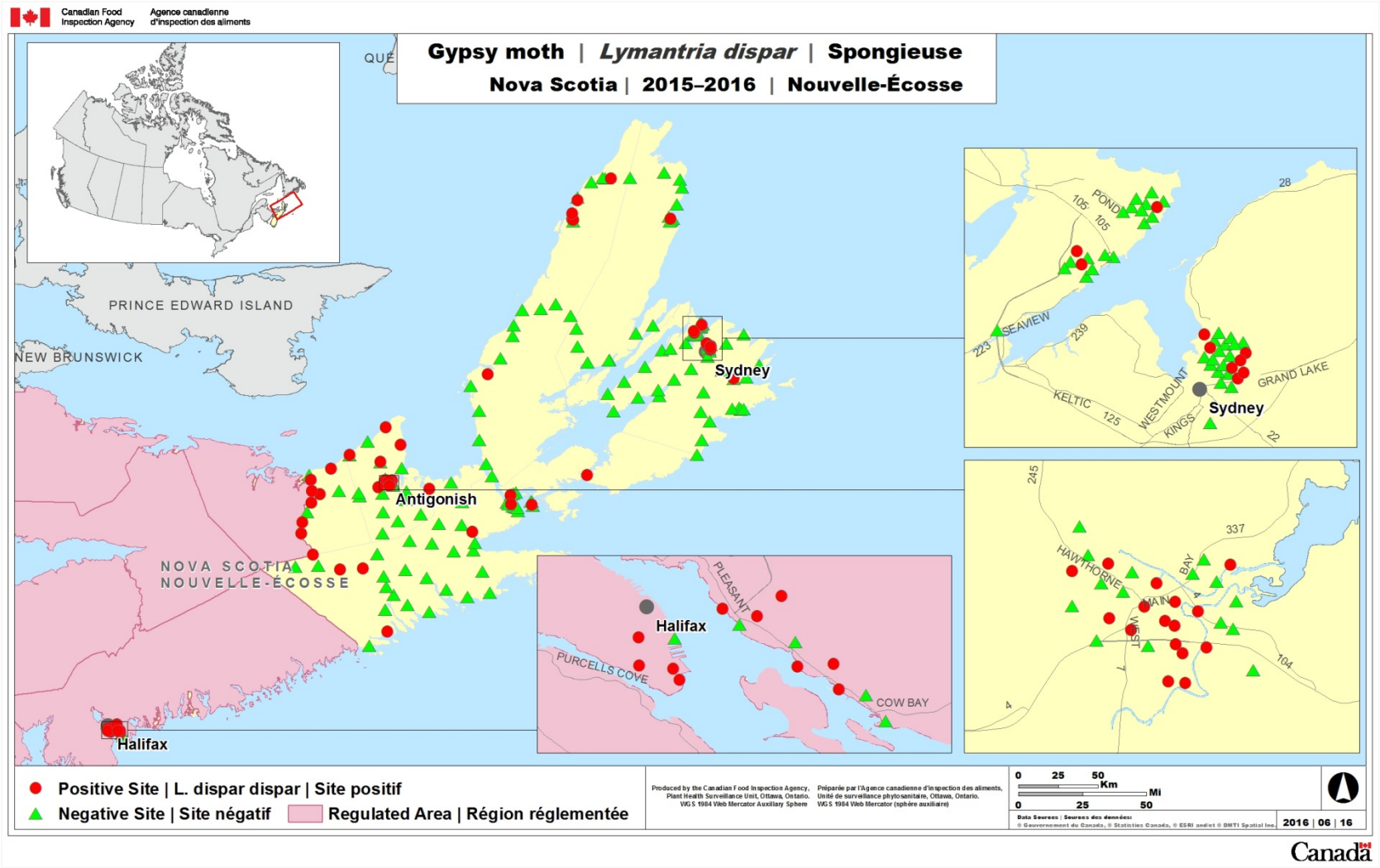


Figure 33. Survey map for *L. dispar dispar*, Nova Scotia

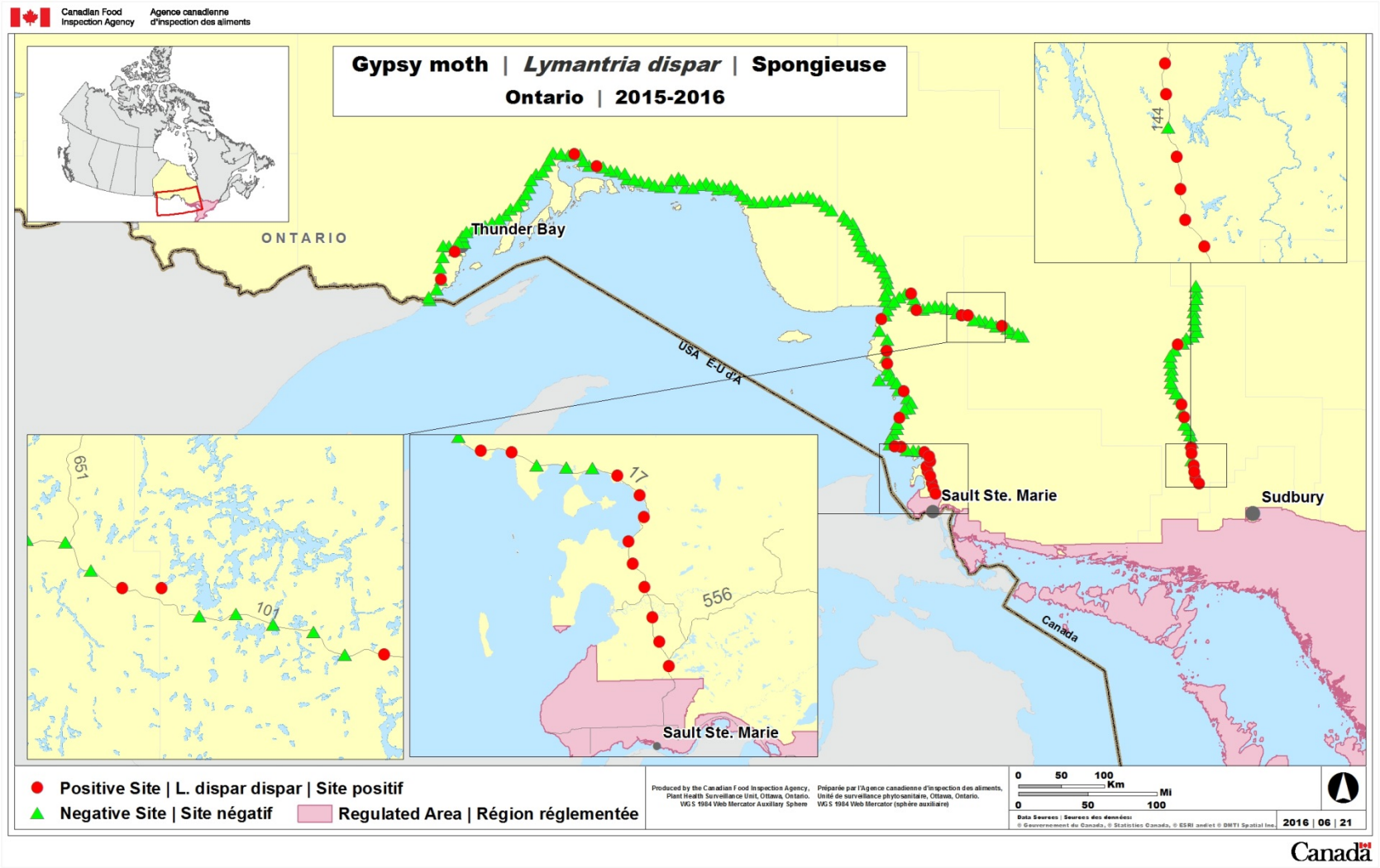


Figure 34. Survey map for *L. dispar dispar*, Ontario

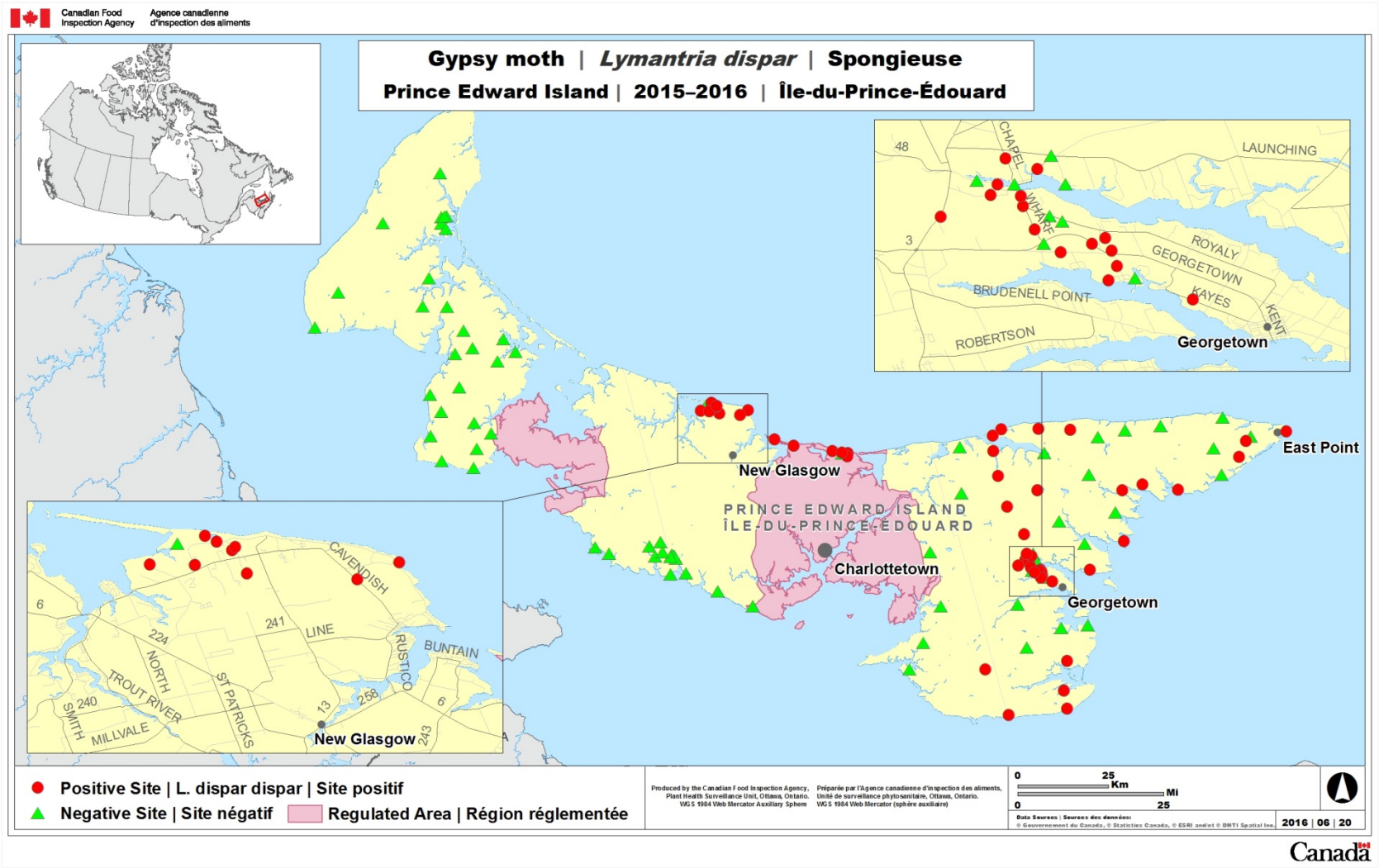


Figure 35. Survey map for *L. dispar dispar*, Prince Edward Island

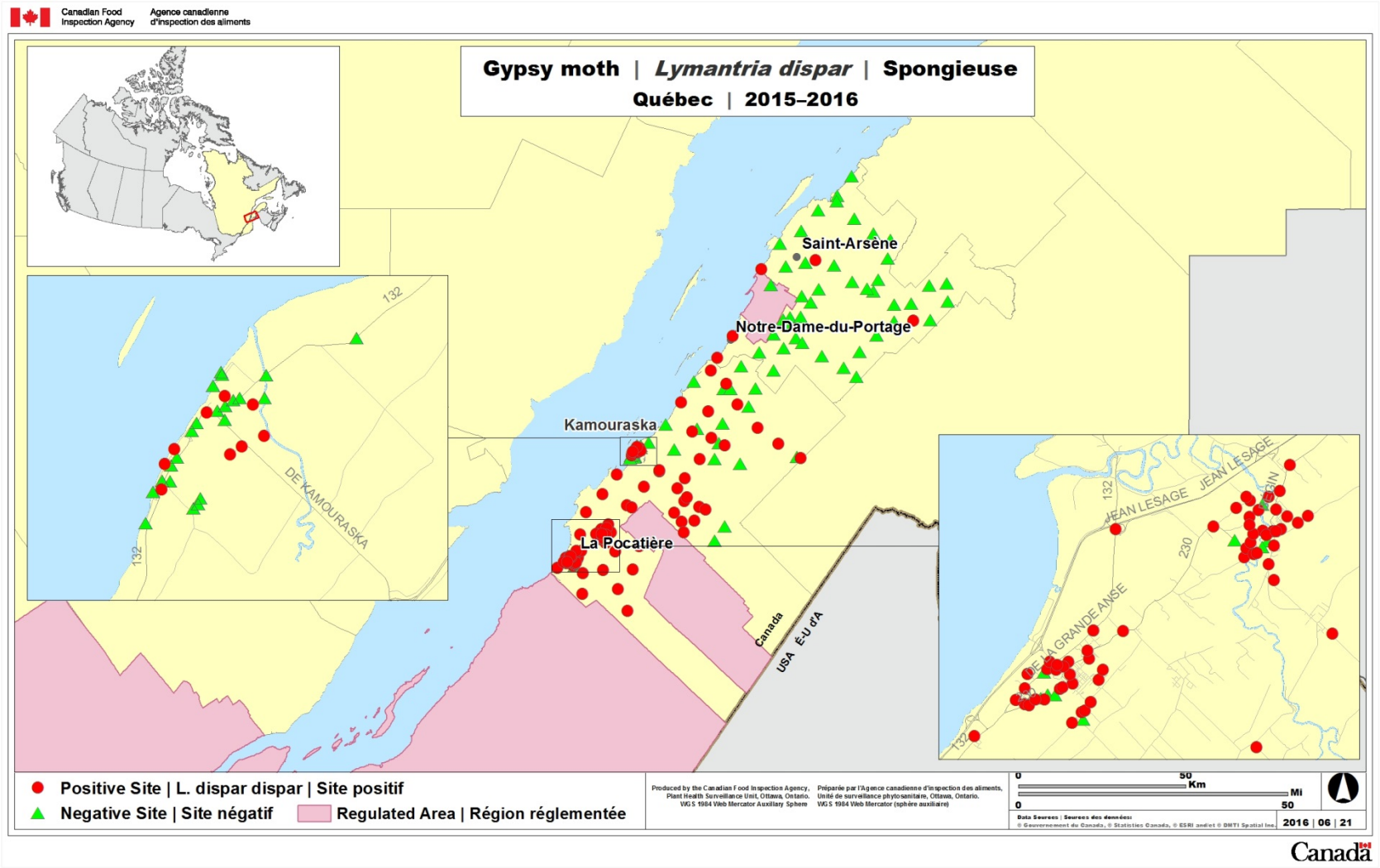


Figure 36. Survey map for *L. dispar dispar*, Québec

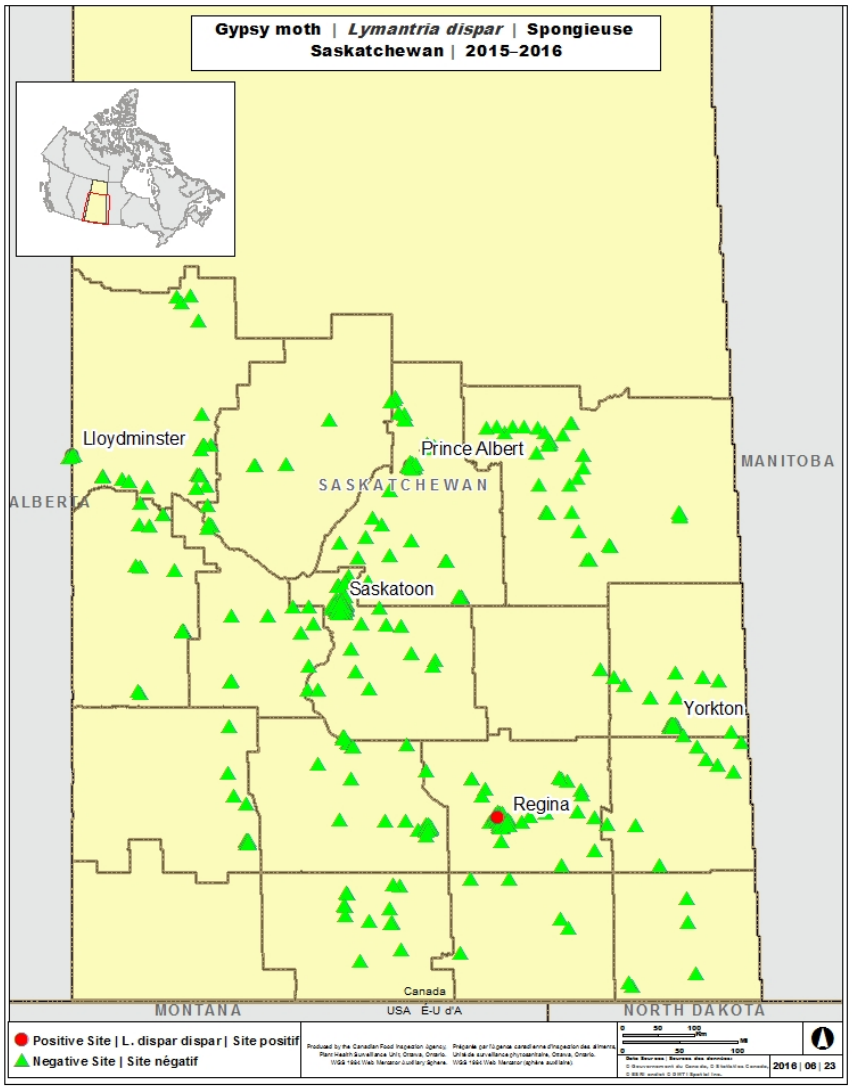


Figure 37. Survey map for *L. dispar dispar*, Saskatchewan

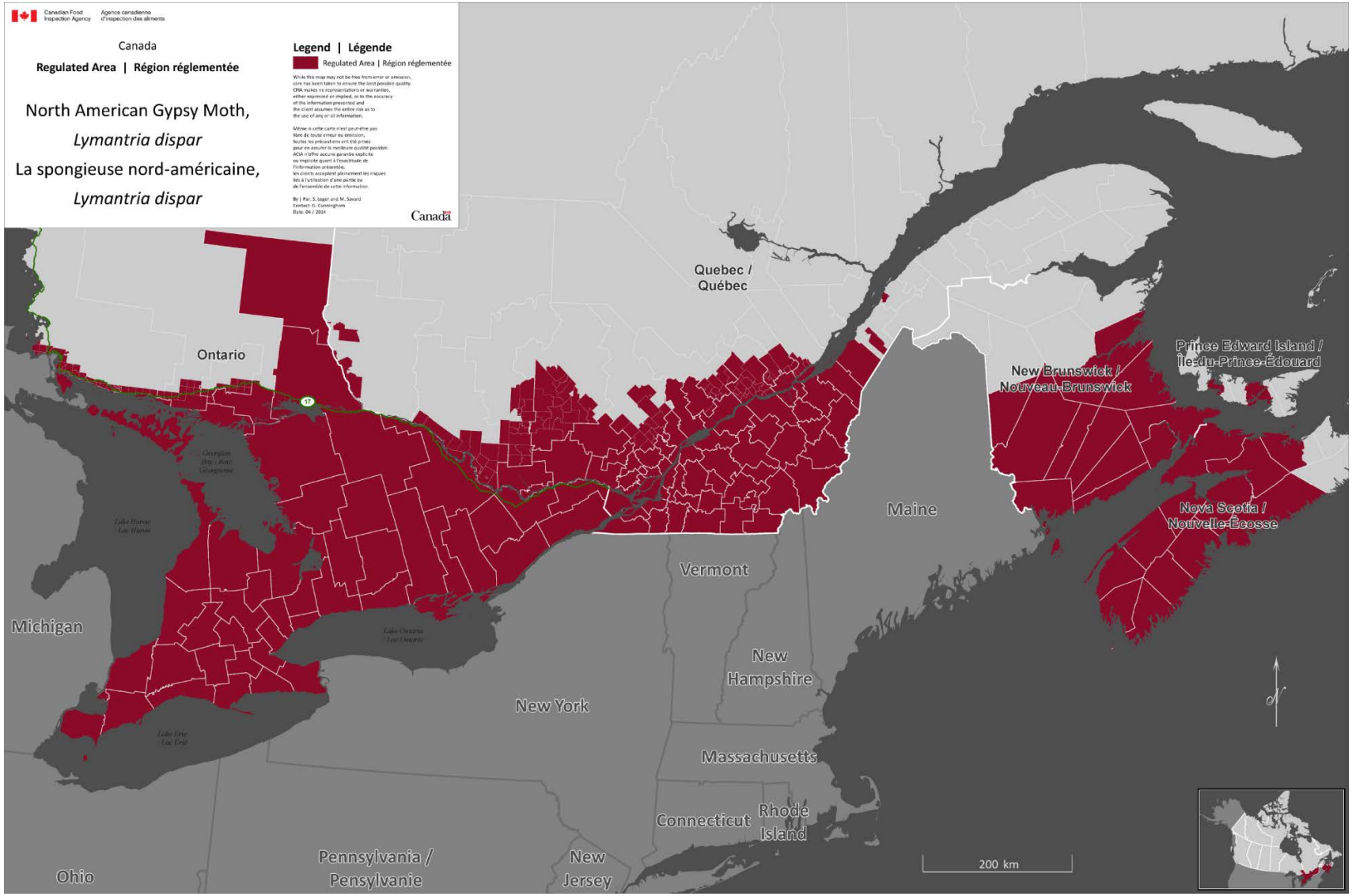
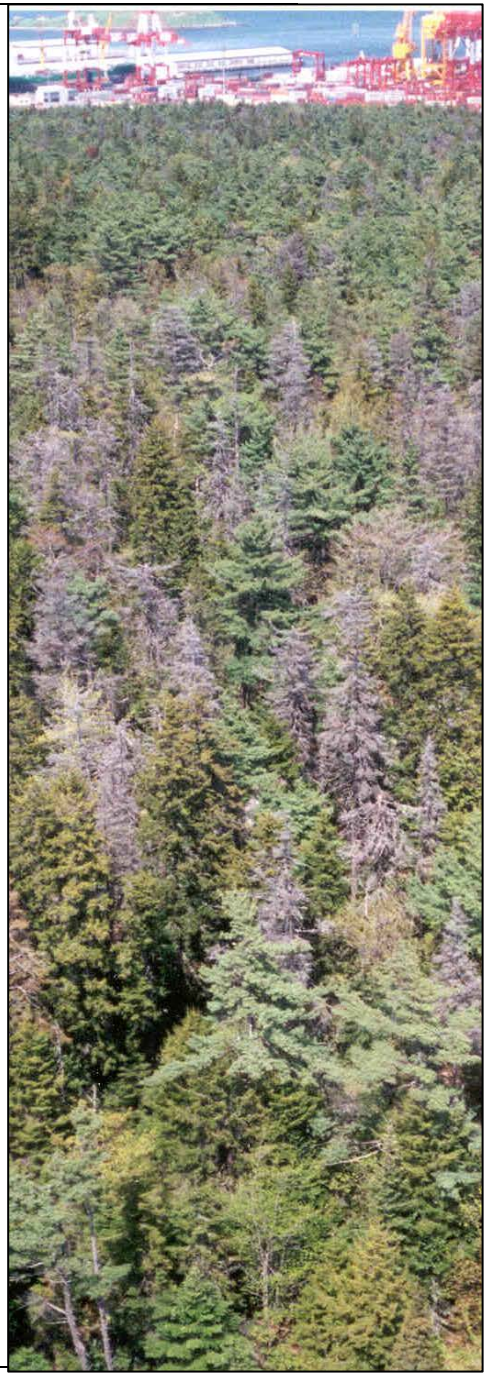


Figure 38. Gypsy moth regulated area in 2015–2016.

1.6 Brown spruce longhorn beetle (*Tetropium fuscum*)



Background

The brown spruce longhorn beetle (BSLB), *Tetropium fuscum* (Fabricius), an introduced wood boring pest, is native to north and central Europe and Japan, where it uses stressed and dying conifers as hosts, most notably Norway spruce (*Picea abies*). In 1999, the beetle was detected in Point Pleasant Park, Halifax, Nova Scotia, and subsequent investigations confirmed that beetles collected in the park as early as 1990 were, in fact, *Tetropium fuscum*. BSLB is considered to be a pest of quarantine significance in Canada and is regulated under the Plant Protection Act by the CFIA.

Methods

Panel traps baited with host volatiles and a pheromone are used for this survey. All traps were baited with a combination of two ultra-high-release host-volatile lures and a BSLB pheromone lure "fuscumol" developed by NRCan-CFS. Trapping was conducted at two types of sites: priority sites such as sawmills, pulpmills, campgrounds and ports with three traps per site and general forested areas with one trap per site.

The 2015 BSLB survey consisted of two activities:

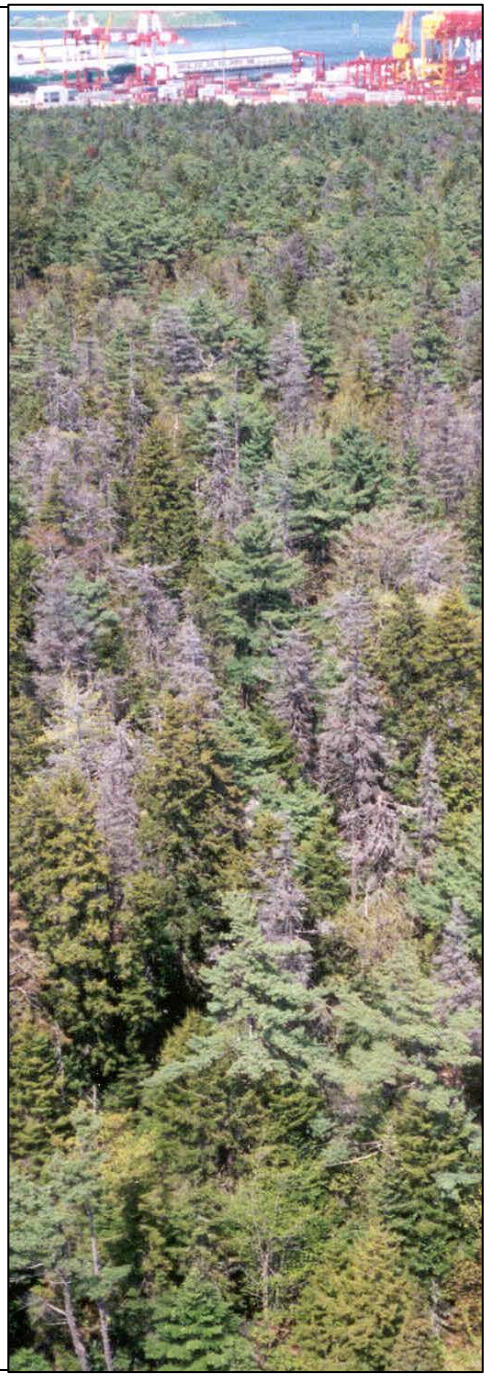
1. **Detection Survey**

   The detection survey for BSLB included extensive trapping in Eastern Canada outside of the regulated province of Nova Scotia.

2. **Follow-up Trapping Survey - Kouchibouguac National Park, New Brunswick**

   CFIA, with strong cooperation from Parks Canada and NRCan-CFS, continued extensive trapping within the park in order to determine if there was an infestation present. This trapping followed the single BSLB that was detected in 2014 within the South Kouchibouguac Campground about 2 km from the 2011 detection along a park hiking trail. There were 15 sites targeted that included intensive trapping grids in the campground areas with a total of 49 traps.

   No BSLB emerged from the 9 trees that were selected for sampling and rearing, during the fall 2014 visual survey of the South Kouchibouguac Campground Park.



Survey Results

The survey results are summarized in Table 7 and illustrated in Figure 38. There was one positive location in New Brunswick. Two traps located within 300 m of the Memramcook, Westmorland County detection of 2014 were positive for BSLB. One trap had two beetles and the other had one. The two traps were about 40 metres apart. There are now a total of 3 sites where BSLB has been detected outside the BSLB regulated area (Figure 38).

Table 7. 2015 BSLB Survey Summary

Province	Total Sites	Number of BSLB Positive Sites	Number of Detected BSLB Specimens
New Brunswick	211	1	3
Prince Edward Island	37	0	0
Newfoundland and Labrador	20	0	0
Québec	32	0	0
Totals	300	1	3

Maps showing surveyed sites for brown spruce longhorn beetle:

- Survey map for *T. fuscum*, Eastern Canada
- Positive sites outside the regulated area for *T. fuscum*, 2011–2015

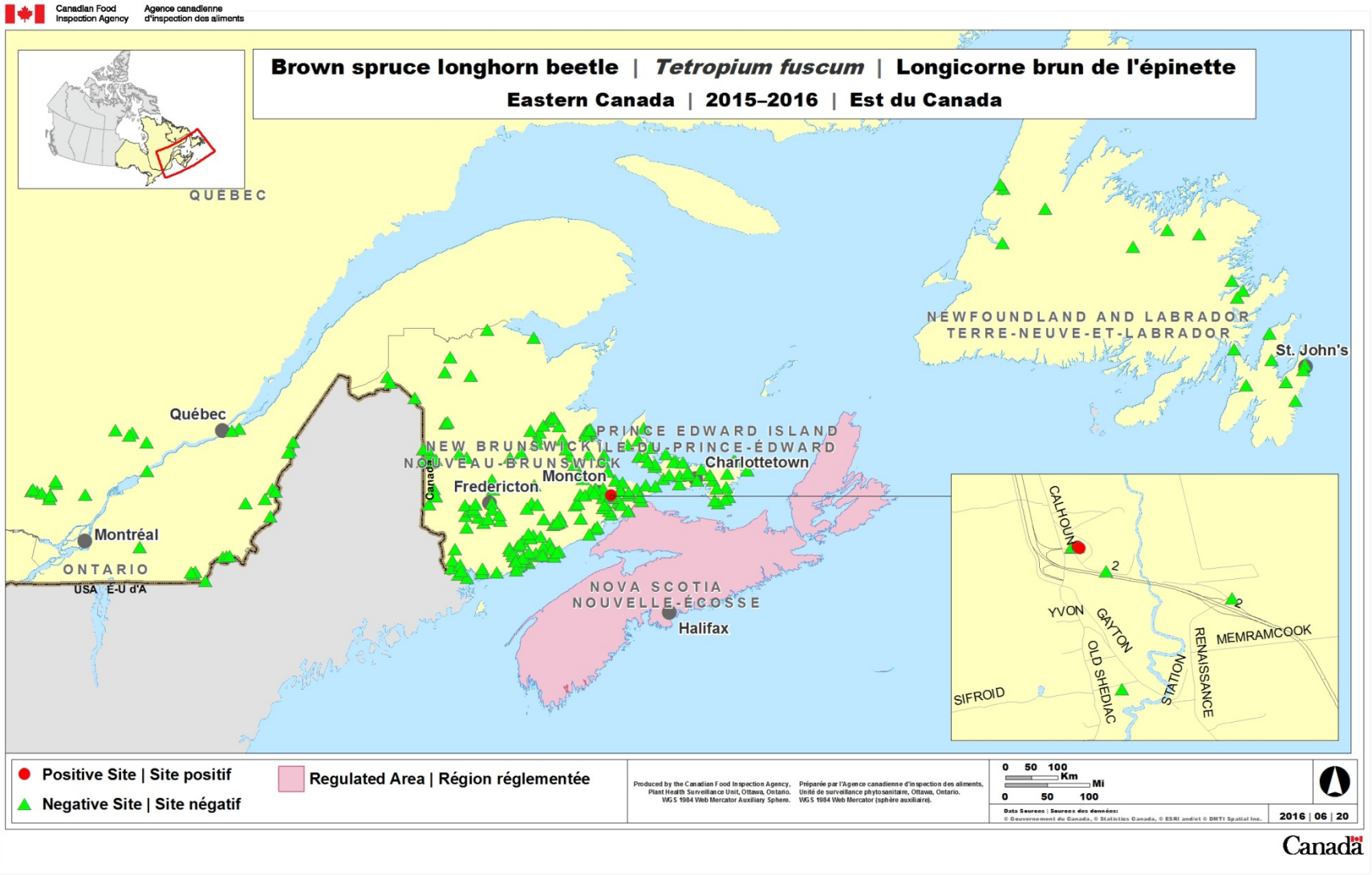


Figure 39. Survey map for *T. fuscum*, Eastern Canada

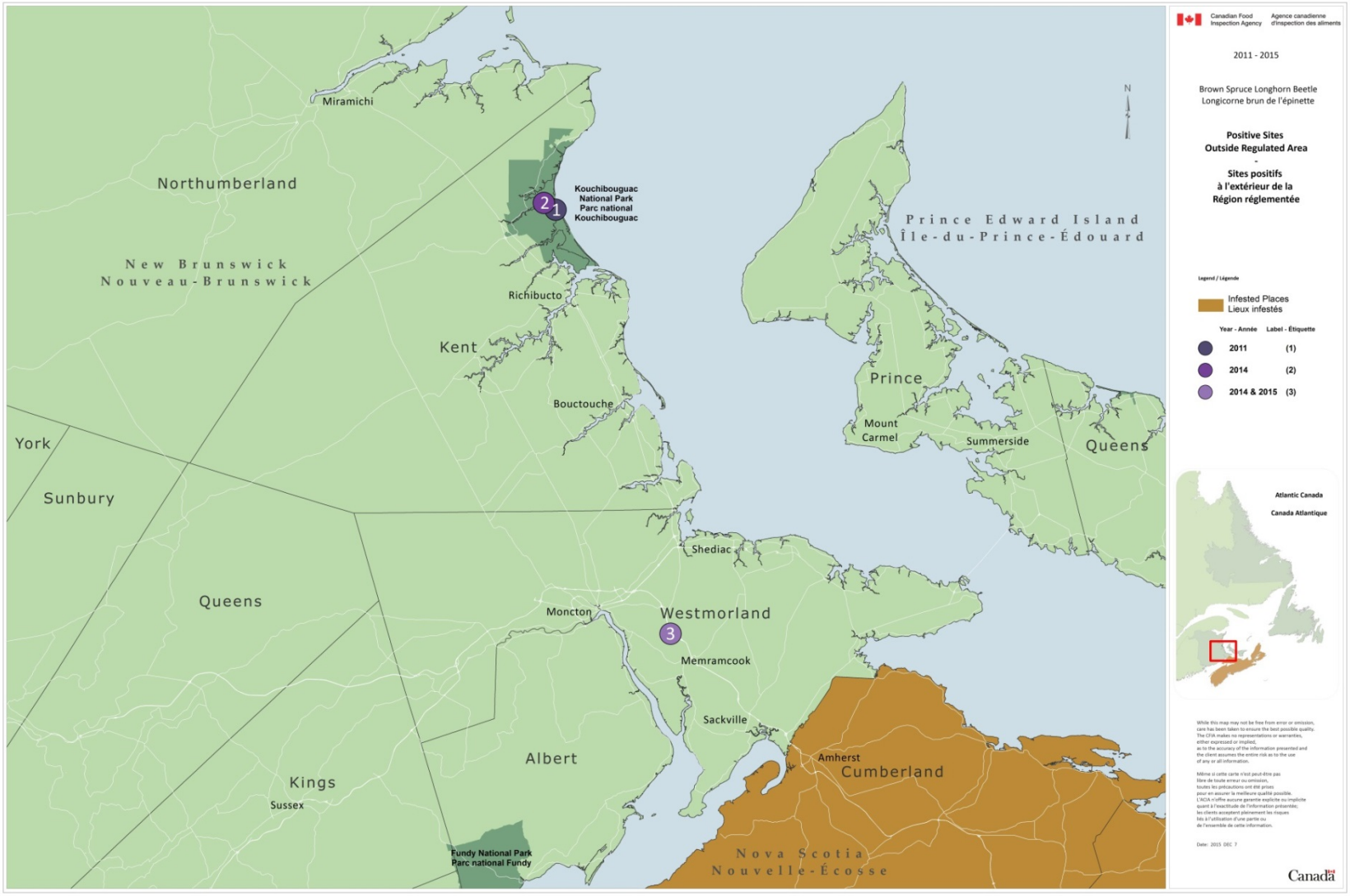


Figure 40. Positive sites outside the regulated area for *T. fuscum*, 2011–2015

1.7 Pine shoot beetle (*Tomicus piniperda*)

Background

Pine shoot beetle (*Tomicus piniperda* L.) is a destructive shoot feeding pest that is native to Europe, North Africa and Asia. The first discovery of pine shoot beetle in North America was in Ohio in 1992. By 1994 it was identified in ten counties in southwestern Ontario. Pine (*Pinus* spp.) is the principle host tree for this pest. However, adults have been reported to breed in logs of spruce (*Picea* spp.), fir (*Abies* spp.) and larch (*Larix* spp.) when population levels become elevated. The most serious damage has taken place on commercial pine tree plantations.

Methodology

Targeted areas for this survey included pine forests (eg. fencerows, woodlots, Christmas tree farms, greenbelts) adjacent to or near saw mills, pulp mills, pole producers, firewood vendors and nurseries that import pine from infested counties. Trapping for adults was conducted from mid-March to the end of May. Lindgren funnel traps were baited with *Enhanced Pine Shoot Beetle* pheromone lures (alpha-pinene, myrtenol, trans-verbenol).

Results

The survey was conducted in 3 provinces at 67 sites (Table 8). The regulated area was amended to include three new MRC's in Québec: Kamouraska, Témiscouata, and Rivière-du-Loup (Figure 43).

Table 8. Pine shoot beetle survey results for 2015–2016.

Province	Sites	Results
New Brunswick	22	Detections in Connors and Edmundston.
Nova Scotia	15	No detections.
Québec	30	Detections were made at 12 sites.

Figure 41. Pine shoot beetle

Map showing surveyed sites for pine shoot beetle:

- Survey map for *T. piniperda*

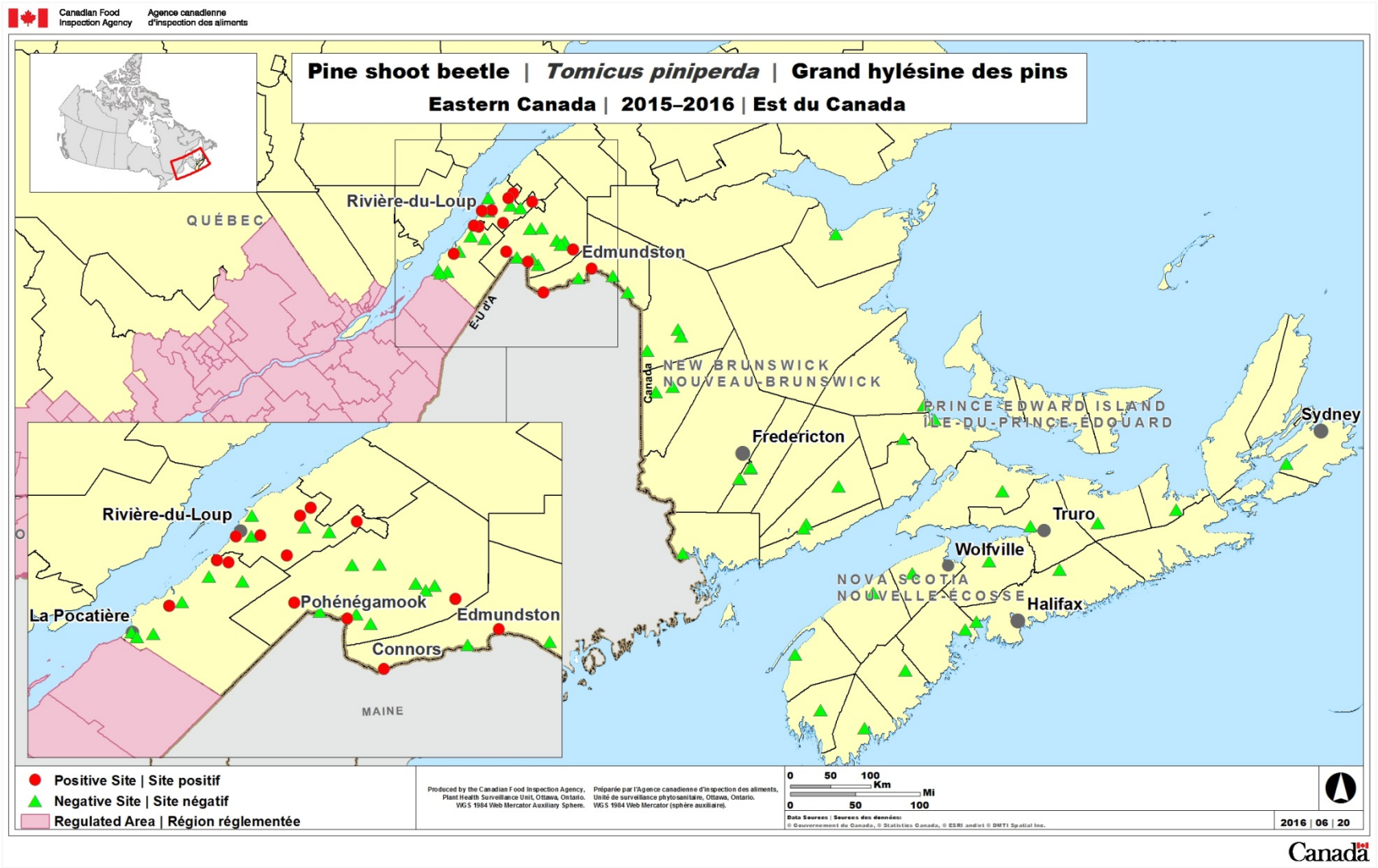


Figure 42. Survey map for *T. piniperda*

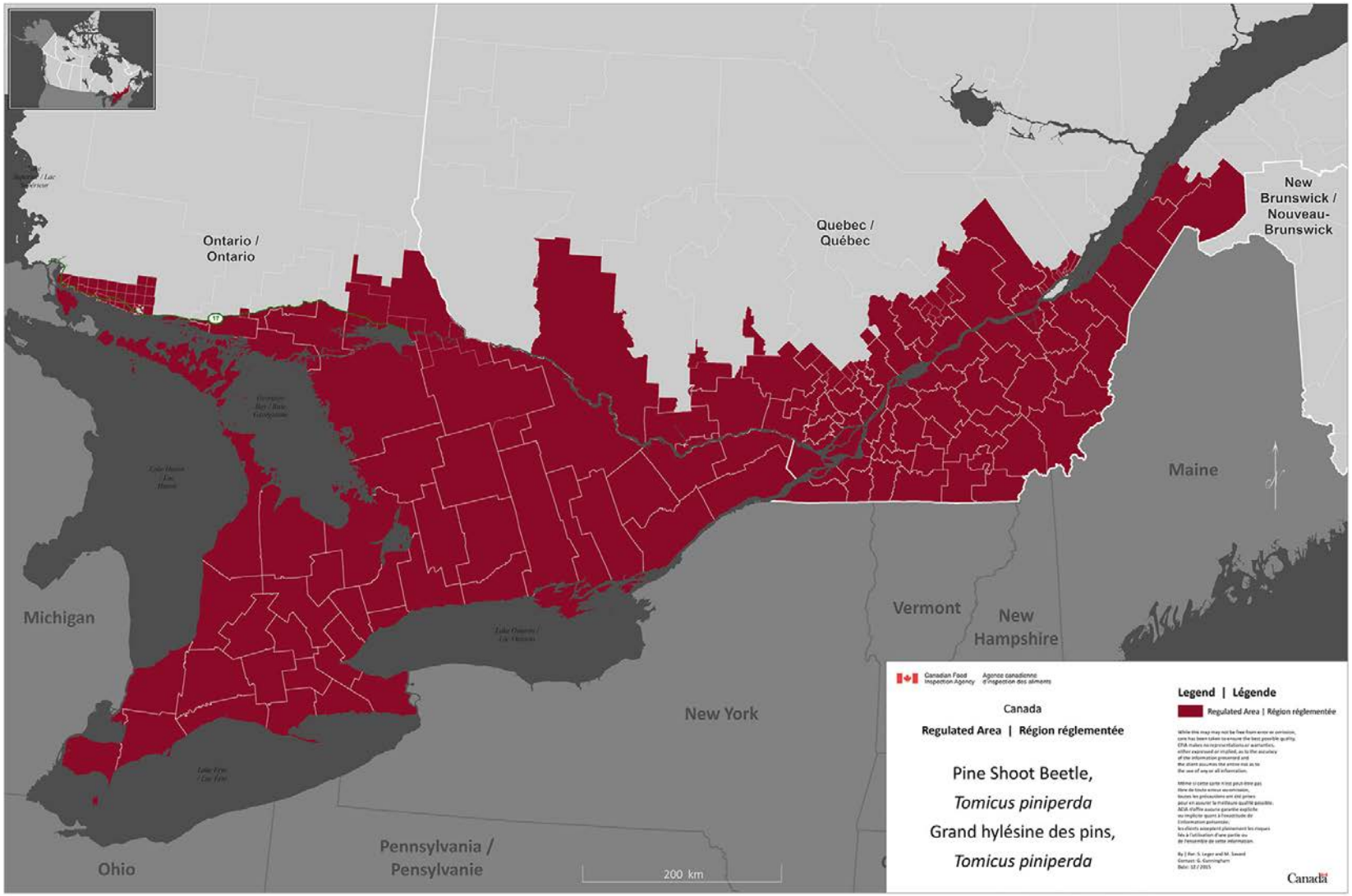


Figure 43. Pine shoot beetle regulated area.

1.8 Hemlock woolly adelgid (*Adelges tsugae*)

Background

Hemlock woolly adelgid (HWA) is a destructive pest of susceptible species of hemlock (*Tsuga* spp.) that is native to India, Japan, Taiwan, and China. HWA was first reported in North America in British Columbia in 1919, and can now be found in Alaska, Washington, Oregon, and California, resulting in minor damage to both western hemlock (*T. heterophylla*) and mountain hemlock (*T. mertensiana*). HWA was first identified in the eastern United States in Virginia in 1951. Since this time it has steadily spread and is now reported from 20 eastern states. In the eastern United States, HWA has resulted in significant mortality of both eastern hemlock, (*T. Canadensis*) and Carolina hemlock, (*T. caroliniana*). HWA threatens the existence of these two species in many locations.

In 2012, HWA was detected on four small landscape trees at a private residence in Etobicoke, Ontario. In 2013, HWA was detected on a single tree in a natural area in Niagara Falls, Ontario. Following each detection, delimitation surveys were conducted to determine the extent of the population and all infested trees were destroyed. Follow-up surveys are ongoing at both sites to verify eradication efforts and inform policy decisions.

Surveys for HWA are conducted in support of CFIA Policy Directive D-07-05: *"Phytosanitary requirements to prevent the introduction and spread of the hemlock woolly adelgid (Adelges tsugae Annand) from the United States and within Canada"*.

Methodology

This survey was conducted between November and June to visually assess hemlock trees for signs and symptoms of attack. Given that HWA is most likely to spread through natural dispersal (wind, water, birds and small mammals) and through infested nursery stock, target sites included nurseries, urban parks and greenspaces, and hemlock forest stands within 100 km of the United States border.

Results

This survey was conducted at 131 sites in 4 provinces (Table 9). In 2015–2016, one infested tree was detected at the Niagara Gorge site where HWA had previously been detected in 2013.

Table 9. Hemlock woolly adelgid detection survey results for 2015–2016.

Province	Sites	Results
New Brunswick	26	No detections.
Nova Scotia	19	No detections.
Ontario	57	One infested tree detected at Niagara Gorge site (where the pest had been detected in 2013).
Québec	29	No detections.

Map showing surveyed sites for hemlock woolly adelgid:

- Survey map for *A. tsugae*, New Brunswick
- Survey map for *A. tsugae*, Nova Scotia
- Survey map for *A. tsugae*, Ontario
- Survey map for *A. tsugae*, Québec

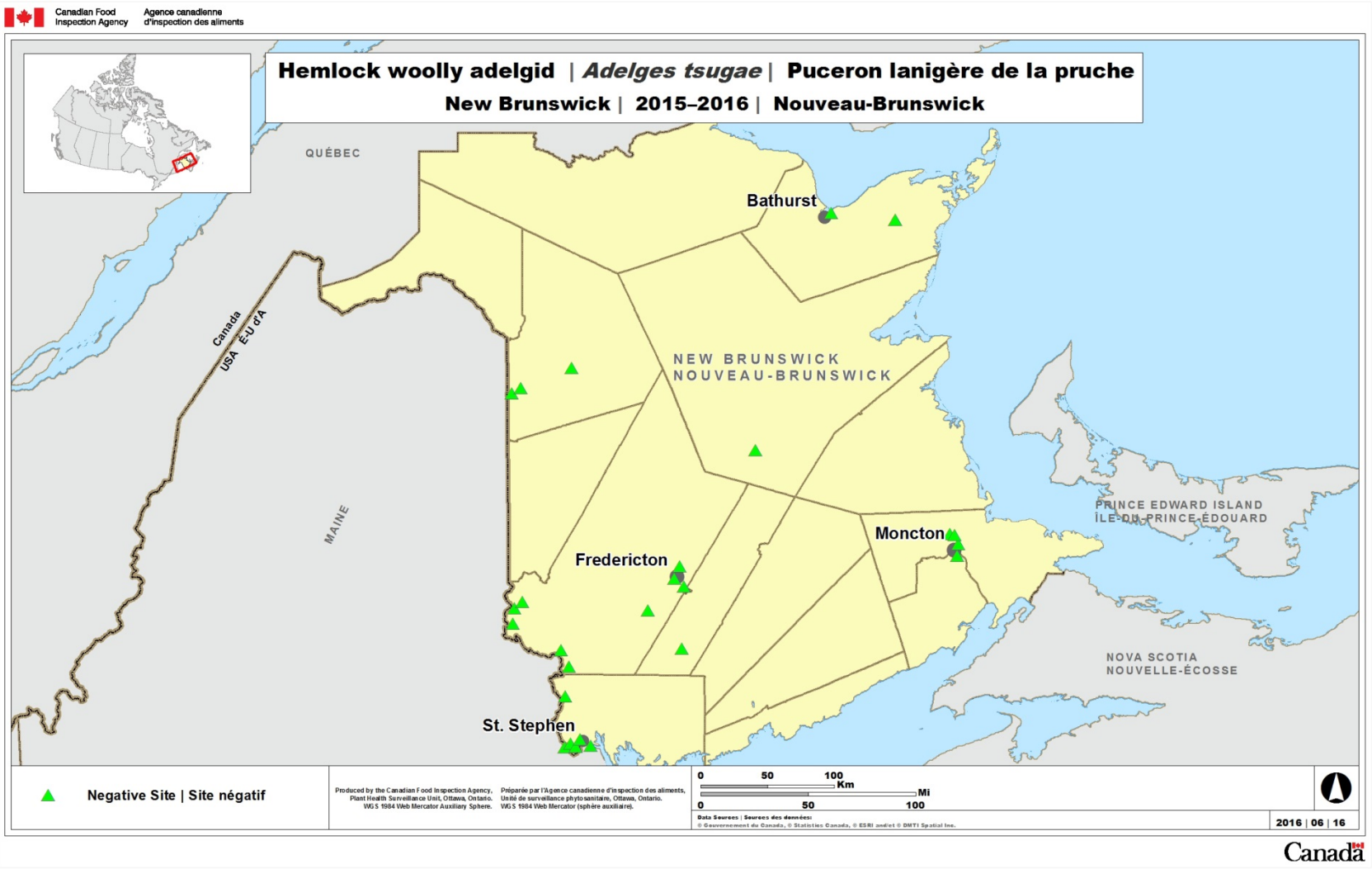


Figure 44. Survey map for *A. tsugae*, New Brunswick

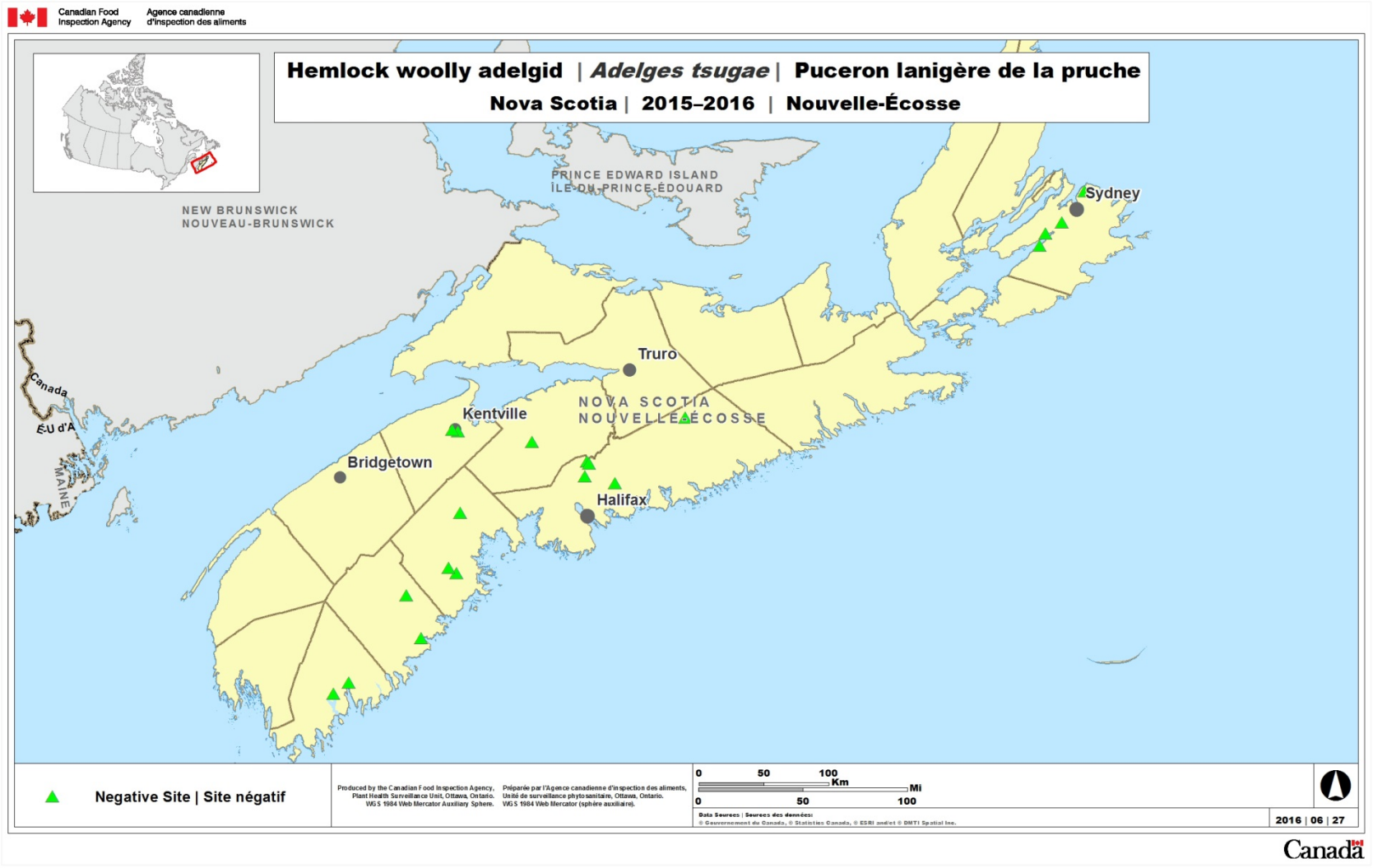


Figure 45. Survey map for *A. tsugae*, Nova Scotia

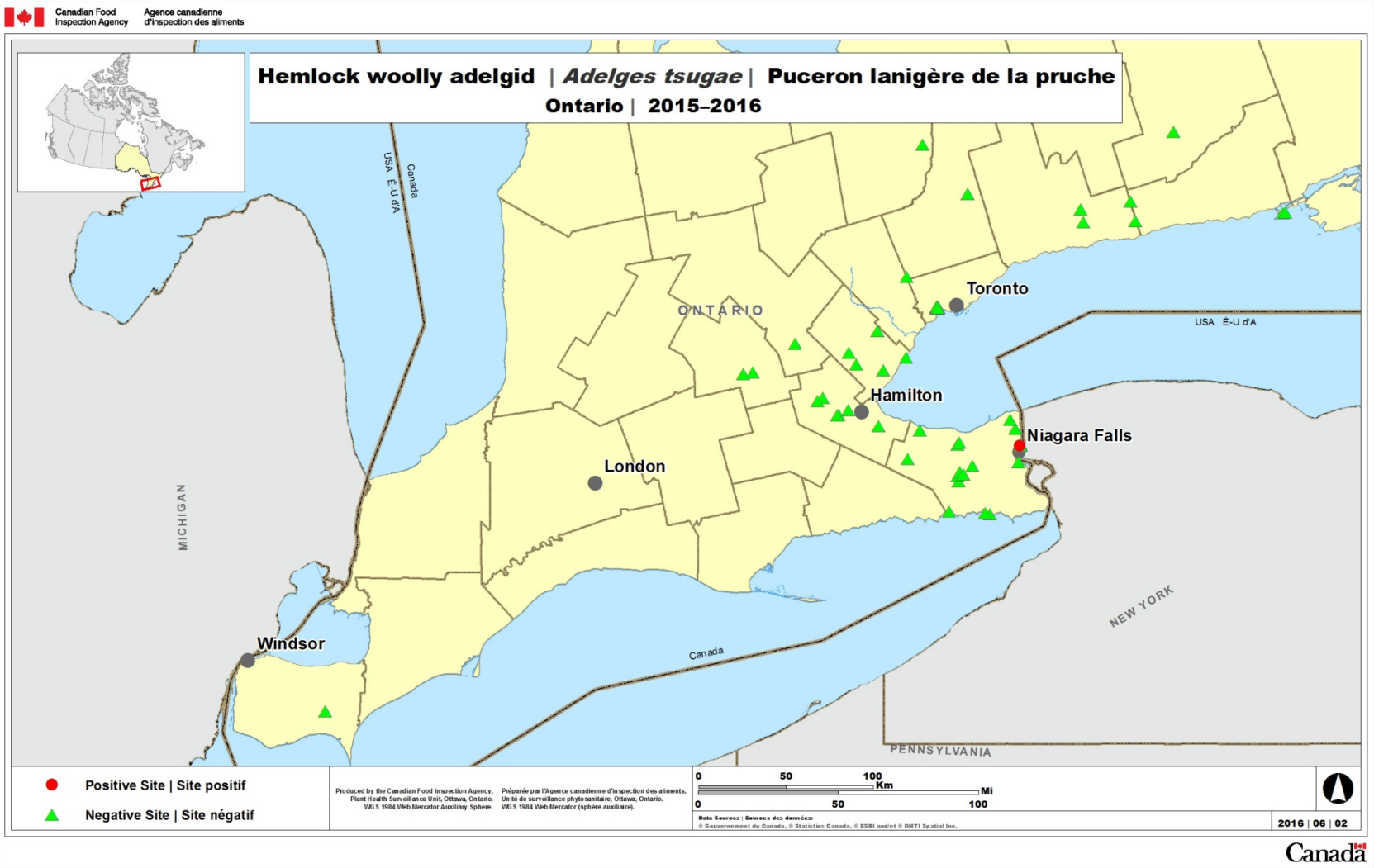


Figure 46. Survey map for *A. tsugae*, Ontario

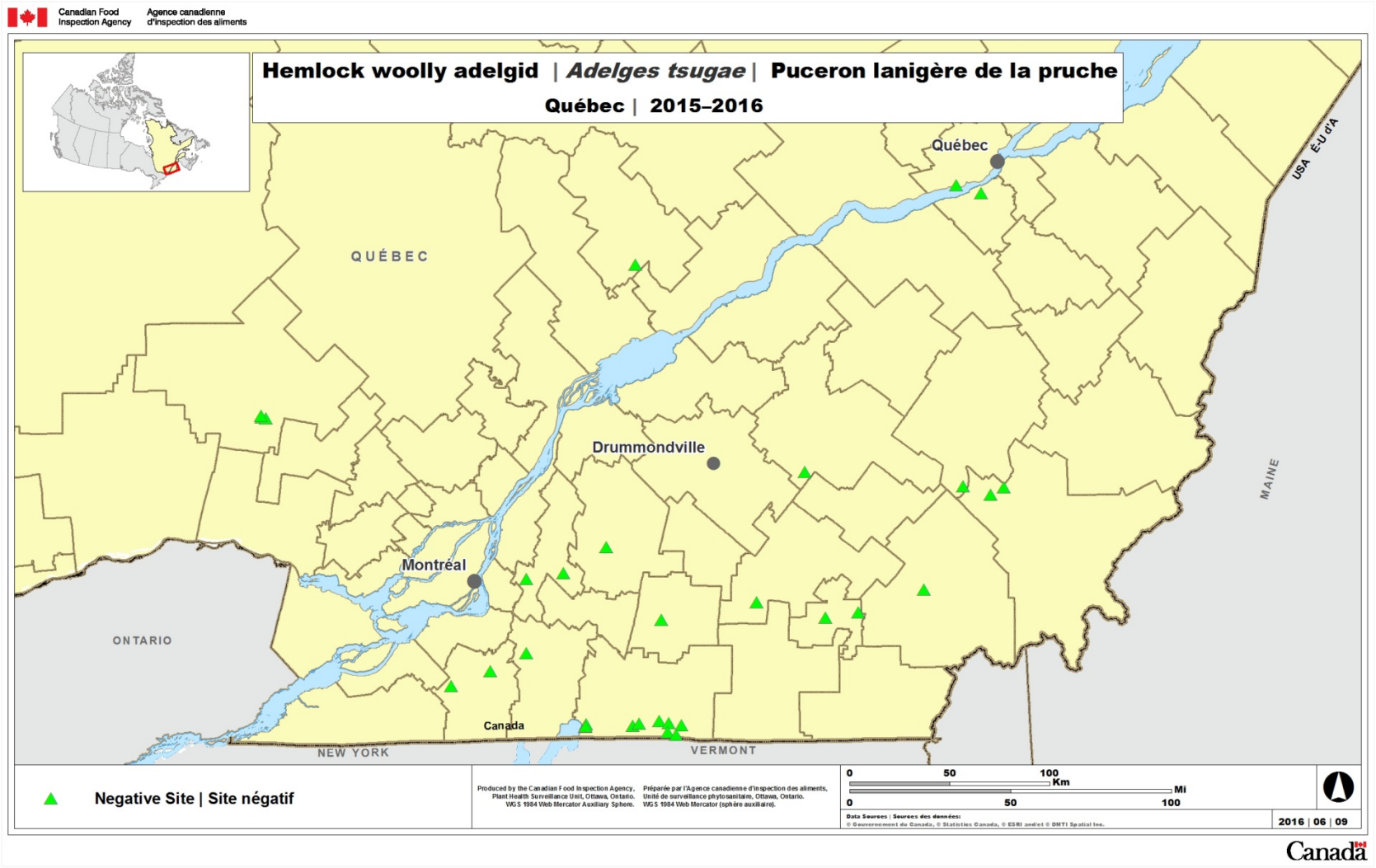


Figure 47. Survey map for *A. tsugae*, Québec

1.9 Oak wilt (*Ceratocystis fagacearum*)

Figure 48. Discoloured leaves infected with oak wilt (USDA Forest Service).

Background

Oak wilt (*Ceratocystis fagacearum*) is a vascular wilt disease that is capable of killing trees in a single season. It was first recognized as an important forest pest in 1944 in Wisconsin and is now known to occur in 23 states within the U.S. This disease is not known to occur in Canada. Oak wilt is spread from diseased to healthy trees through root grafting, and by oak bark beetles and sap beetles. All oak species are susceptible to oak wilt, but red oaks are more frequently infected and can die quite quickly.

This survey is being conducted in support of plant health policy directive D-99-03, "*Phytosanitary measures to prevent the entry of oak wilt disease* (*Ceratocystis fagacearum* (*Bretz*) *Hunt*) *from the continental United States"*. The primary goal of this visual survey is early detection of the pest in areas where it is not known to occur and was conducted in partnership with Ontario Ministry of Natural Resources and Forestry.

Figure 49. Vertical cracks in bark, indicating presence of spore mats under the bark (John Gibbs, Forestry Commission, Bugwood.org)

Methodology

Visual ground surveys took place between the beginning of July and the second week of August. Visual inspection of host trees was completed for signs and symptoms of oak wilt. Detection surveys were focused on areas where oak wilt could have been introduced through human-assisted movement of infected commodities, including campgrounds, mills or other facilities importing oak logs from infected US states, border crossings and areas in southwestern Ontario (e.g. northwestern Lambton county, western Essex county) adjacent to Michigan, where infections are known to occur. Within a targeted area, surveys prioritized forests containing red oak, followed by white oaks. However, white oaks with noticeable crown decline and leaf symptoms were also examined.

Figure 50. Oak wilt compression mat beneath the bark (Iowa State University).

Results

This survey was conducted in Ontario at 14 sites. There were no detections.

Map showing surveyed sites for oak wilt:

- Survey map for *C. fagacearum*, Ontario

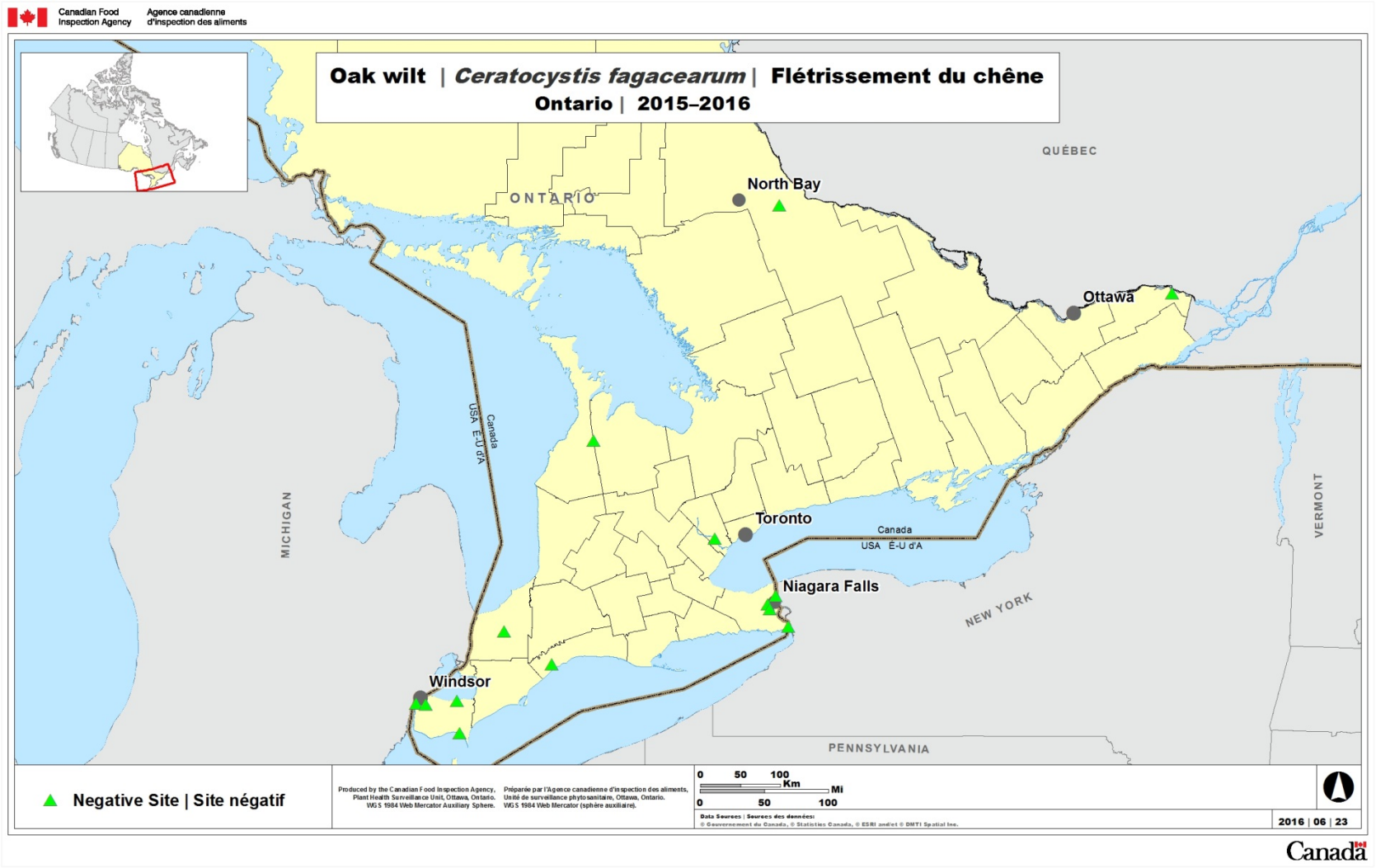


Figure 51. Survey map for *C. fagacearum*, Ontario

Chapter 2

Invasive plant surveys

2. INVASIVE PLANT SURVEYS

Invasive plants in crops and pastures cost an estimated $2.2 billion each year by reducing crop yields and quality, and increasing costs of weed control and harvesting. The CFIA's Invasive Plants Program focusses on preventing the introduction and spread of invasive plants in Canada because these species can invade agricultural, horticultural, forestry and natural areas, causing serious damage to our economy and environment.

In 2015–2016, CFIA's Plant Health Surveillance Unit led two invasive plants surveys for a total of 202 sites.

Significant events in 2015–2016: Jointed goatgrass was detected in the seed and grain handling facilities survey in Essex, Ontario.

Changes in regulated areas in 2015–2016: None

Table 10. Invasive plants in Canada prioritized for surveillance in 2015–2016.

Scientific name	Common name
Eriochloa villosa	Woolly cupgrass
Aegilops cylindrica	Jointed goatgrass
Crupina vulgaris	Common crupina
Alopecurus myosuroides	Slender foxtail
Centaurea iberica	Iberian starthistle
Centaurea solstitialis	Yellow starthistle
Nassella trichotoma	Serrated tussock
Paspalum dilatatum	Dallis grass
Solanum eleagnifolium	Silverleaf nightshade

Figure 52. Yellow starthistle

2.1 Invasive plant survey – Field Survey

Background

Jointed goatgrass (*Aegilops cylindrica)* is an agricultural weed native to western Asia and southeastern Europe. It was most likely introduced into North America as a contaminant in wheat seed in the 1880s. It has since become one of the most difficult weeds to control in grain fields in the Great Plains and Pacific Northwestern regions of the United States where it infests over 5 million acres of winter wheat. Jointed goatgrass lowers crop yields through direct competition, reduces harvesting efficiency and lowers crop quality by contaminating harvested grain.

In Canada, jointed goatgrass was first detected near Port Colborne, Ontario in 2006. This invasive plant poses a serious threat to winter wheat production.

Methodology

Detection surveys were conducted in areas where jointed goatgrass has not been reported or surveyed previously. Winter wheat, spring wheat and other cereal crops were targeted for surveillance. The survey was conducted from May to July. Winter wheat, spring wheat and other cereal crops were targeted for surveillance. Visual surveys were conducted along field perimeters as well as field gateways, farm lanes leading to the field and ditches running parallel to the field. Delimitation surveys are ongoing at previous detection sites to monitor progress of eradication programs.

Results

This survey was conducted in 7 provinces at 130 sites (Table 11).

Table 11. IAS Field Survey results for 2015–2016.

Province	Sites	Results
Alberta	18	No detections.
British Columbia	15	No detections.
New Brunswick	7	No detections.
Nova Scotia	16	No detections.
Ontario	47	No detections.
Prince Edward Island	6	No detections.
Québec	21	No detections.

Map showing surveyed sites for invasive plants survey:

- Survey map for invasive plants, Atlantic Canada
- Survey map for invasive plants, Ontario
- Survey map for invasive plants, Québec
- Survey map for invasive plants, Western Canada

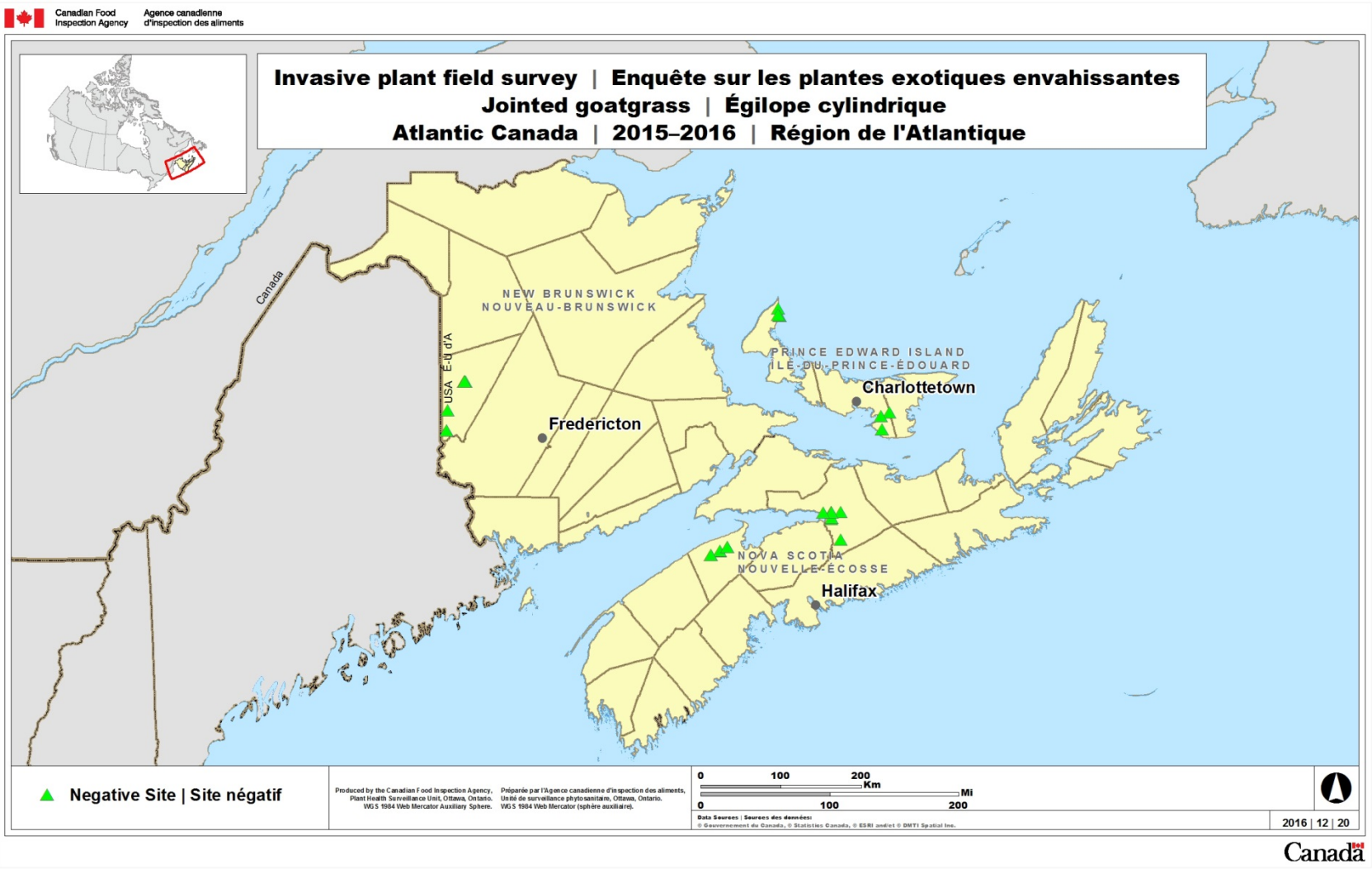


Figure 53. Survey map for invasive plants, Atlantic Canada

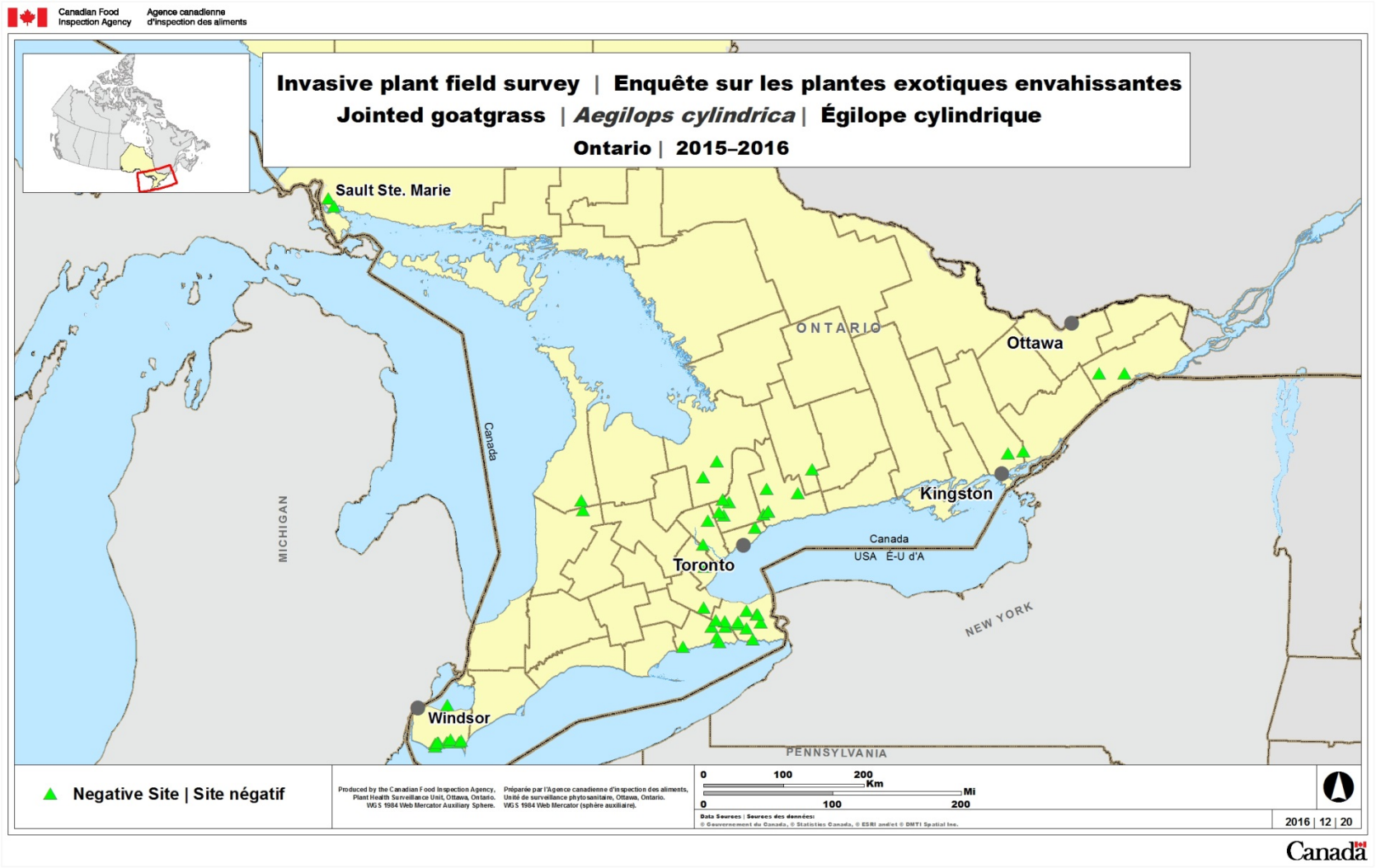


Figure 54. Survey map for invasive plants, Ontario

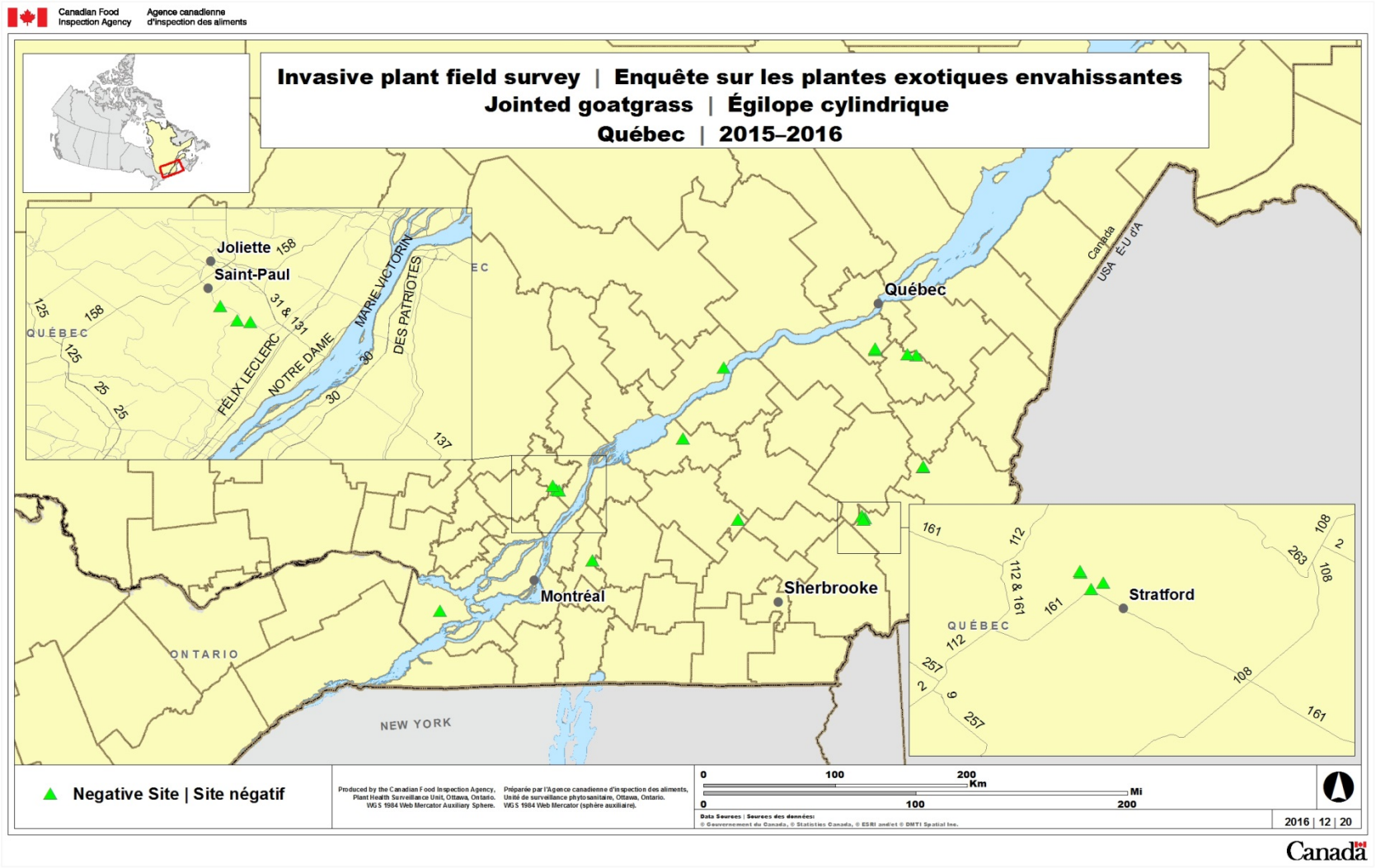


Figure 55. Survey map for invasive plants, Québec

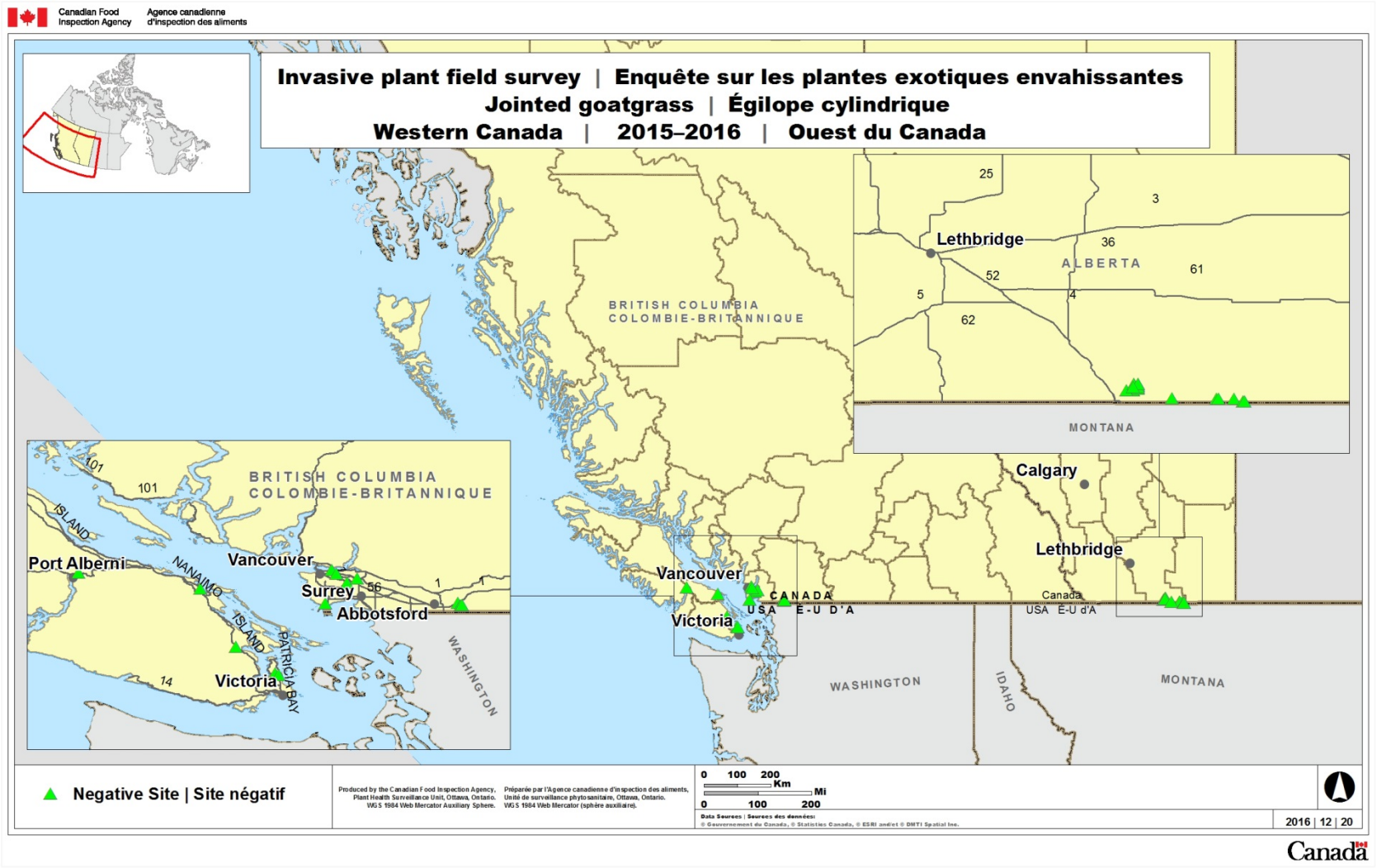


Figure 56. Survey map for invasive plants, Western Canada

2.2 Invasive plant survey – Seed and grain handling facilities

Background

The introduction of the Invasive Alien Species program within CFIA has increased efforts to regulate many plants as pests in the same way that insects and diseases are regulated. A number of additional plants have been added to the Federal Noxious Weeds list under the *Seeds Act* that are now being considered for inclusion in the list of pests regulated under the *Plant Protection Act.* One of the major pathways of introduction of these invasive alien plants into Canada is through contaminated lots of imported seed and grain.

The main objectives of this survey are to detect new populations of the target plant species and to provide information in support of the development of regulatory policies on invasive alien plants.

Methodology

Visual surveys were conducted in both early (June) and late summer (August to early September) to maximize the periods when plant inflorescences were present, allowing for more successful detection of the targeted plant species. Jointed goatgrass (*Aegilops cylindrica*) and common crupina (*Crupina vulgaris*) were targeted in early summer. In late summer, the targeted species were slender foxtail (*Alopecurus myosuroides*), Iberian starthistle (*Centaurea iberica*), yellow starthistle (*Centaurea solstitialis*), woolly cupgrass (*Eriochloa villosa*), serrated tussock (*Nassella trichotoma*), Dallis grass (*Paspalum dilatatum*), and silverleaf nightshade (*Solanum eleagnifolium*).

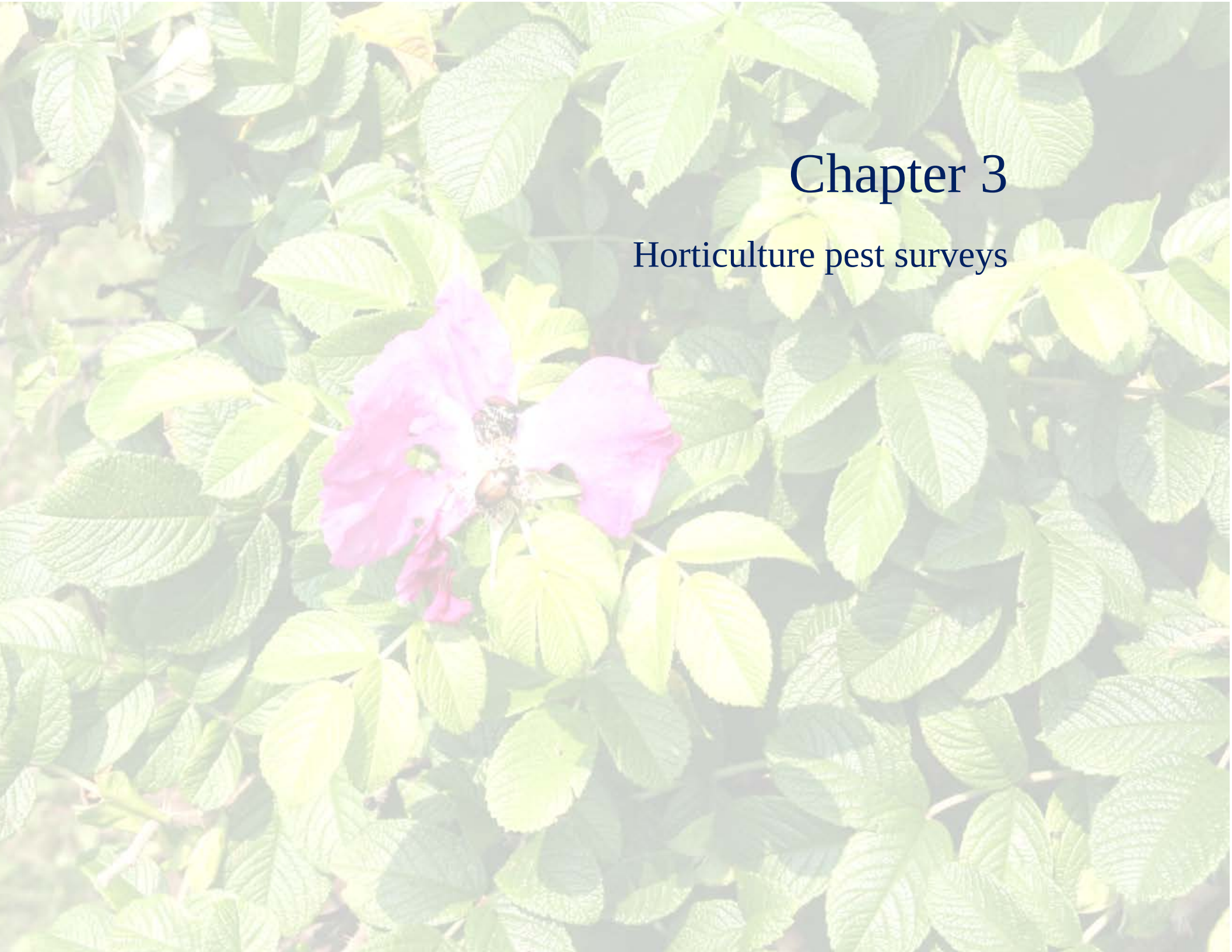
Target sites for this survey included facilities storing, handling or processing imported seed and grain (e.g. elevators, flour mills, oil crushers, seed cleaners, feed mills including bird seed, etc.), as well as the ditches and waste areas adjacent to those sites. Surveys at target sites included visual inspection of areas where auger or conveyer belt dust and debris have settled, in loading and unloading areas, and in composting/disposal areas, as well as along driveways and railway tracks, where applicable.

Results

The survey was conducted at 74 sites in 7 provinces (Table 12).

Table 12. Invasive plant survey results for seed and grain handling facilities in 2015–2016.

Province	Sites	Results
Alberta	4	No detections.
British Columbia	9	No detections.
New Brunswick	4	No detections.
Nova Scotia	4	No detections.
Ontario	24	Jointed goatgrass detected in Essex, ON.
Prince Edward Island	5	No detections.
Québec	24	No detections.



Chapter 3

Horticulture pest surveys

3. HORTICULTURE PEST SURVEYS

The Canadian horticulture industry includes field and greenhouse fruits and vegetables, as well as ornamental and medicinal plants. In 2015, the total farm gate value of Canadian greenhouse vegetable production was $1.3 billion, field vegetable production was $1.04 billion, and fruit production was $912 million (StatsCan, 2016a,b). The CFIA establishes and maintains policies and standards for the horticulture industry to prevent the introduction and spread of regulated pests into Canada.

In 2015–2016, CFIA's Plant Health Surveillance Unit conducted nine horticulture pest surveys for a total of 1,447 sites.

Significant events in 2015–2016: Ramorum blight and apple maggot detections in British Columbia

Changes in regulated areas in 2015–2016: None

Table 13. Invasive pests of the Canadian horticulture industry prioritized for surveillance in 2015–2016.

Scientific name	Common name
Phytophthora ramorum	Ramorum blight
Grapholita molesta	Oriental fruit moth
Popillia japonica	Japanese beetle
Rhagoletis mendax	Blueberry maggot
Rhagoletis pomonella	Apple maggot
Anoplophora chinensis	Citrus longhorned beetle
Lobesia botrana	European grapevine moth
Peronspora hyoscyami f.sp. *tabacina*	Tobacco blue mold
	Plum pox virus

Figure 57. Symptoms of ramorum blight.

3.1 Ramorum blight (*Phytophthora ramorum*) - National detection survey

Background

Since 2003, ramorum blight has been detected in a number of retail/wholesale nurseries in the southern coastal area of British Columbia. The primary goal of this survey is to provide information on the national status of ramorum blight in Canadian nurseries. More specifically, monitoring of ramorum blight is required to support eradication programs and detect new populations.

Methodology

The national survey targeted propagation nurseries in British Columbia, Ontario, Québec, and Nova Scotia. In addition to those selected for the national survey, facilities where ramorum blight was previously found were monitored according to post-eradication protocols PI-010 ("*Eradication protocol for propagation nurseries confirmed with Phytophthora ramorum*") and PI-011 ("*Eradication protocol for retail nurseries confirmed with Phytophthora ramorum*").

The national ramorum blight survey was conducted from May to November (depending on survey location), with the majority of the inspection conducted during the spring months. The survey covered 30% to 100% of the production and wholesale nurseries in each province depending on the size of the industry. This survey focused primarily on symptomatic high-risk hosts from the genera: *Rhododendron* (includes azalea), *Camellia*, *Pieris*, *Kalmia*, and *Viburnum*. Where there were few or no plants of these five genera present at the facility, host species listed in Appendix 1 of CFIA Policy Directive D-01-01: "*Phytosanitary requirements to prevent the entry and spread of Phytophthora ramorum*" were inspected.

Results

The ramorum blight survey was conducted in 4 provinces for a total of 74 sites (Table 14). There were detections in British Columbia.

Table 14. Ramorum blight survey results for 2015–2016.

Province	Sites	Samples	Results
British Columbia	41	2649	Ramorum blight was detected in Abbotsford.
Nova Scotia	1	12	No detections.
Ontario	29	48	No detections.
Québec	3	5	No detections.

Maps showing surveyed sites for ramorum blight:

- Survey map for *P. ramorum*, Canada

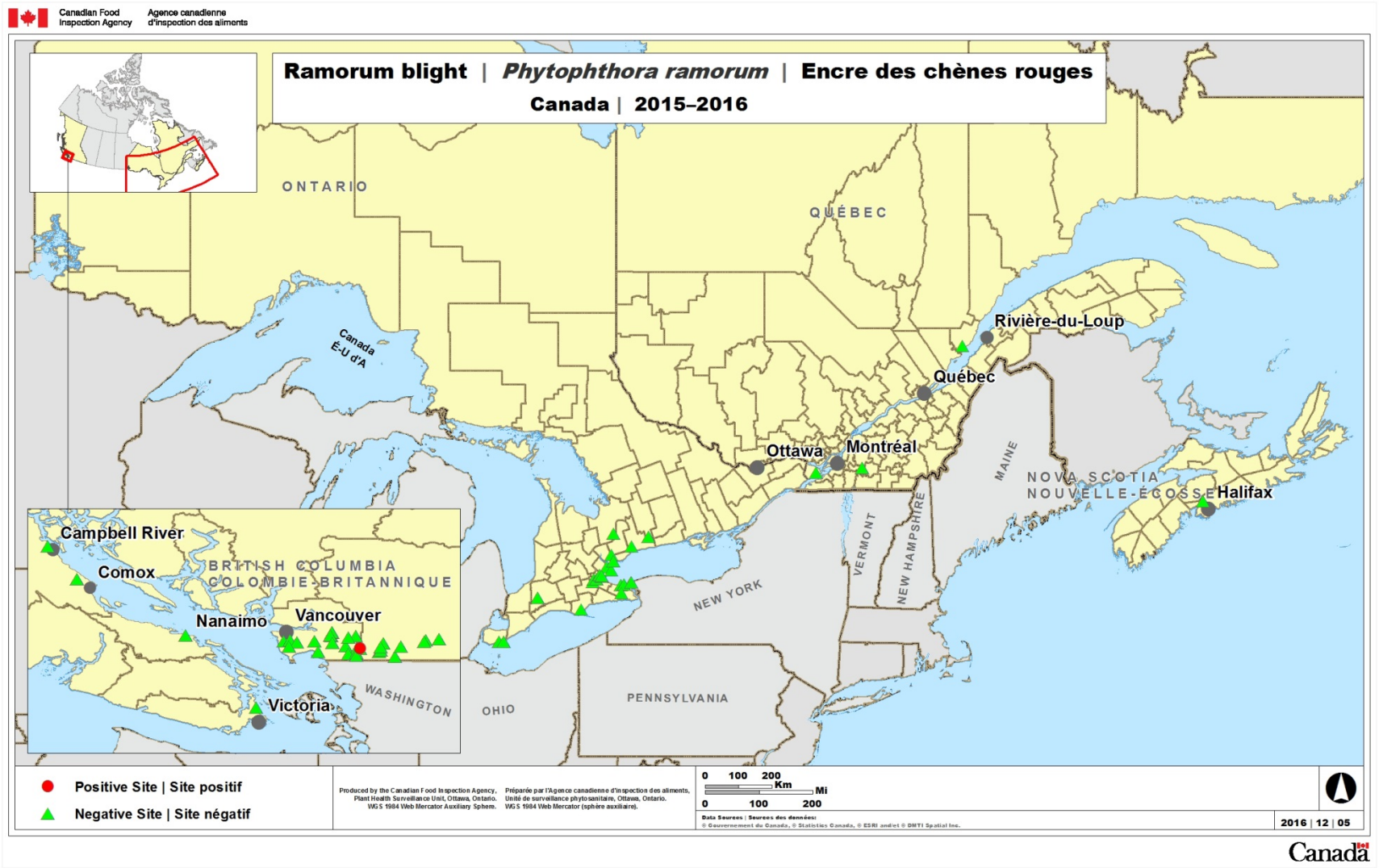


Figure 58. Survey map for *P. ramorum*, Canada

3.2 Oriental fruit moth (*Grapholita molesta*)

Background

The oriental fruit moth is native to China and Korea. It was first detected in Ontario in 1925. It was intercepted and eradicated in1957 in British Columbia and annual surveys since that time have been negative for this pest. The oriental fruit moth likely spreads to other countries in cocoons on dormant trees or in infested fruit. The principle host is *Prunus* spp.

Methodology

Surveys were conducted in orchards, hobby farms, ornamental nurseries and wholesale fruit handlers where target hosts were present (*Prunus persica, P. amygdalus, P. armeniaca, P. avium, P. domestica,* other *Prunus* spp., *Malus* spp., and *Cydonia oblonga*). Adult oriental fruit moths were surveyed using pheromone-baited Delta traps (Pherocon controlled-release septa). Traps were placed on target hosts by June 15th and were removed by September 20th, or the first frost, whichever date was earliest. Target hosts were also visually inspected for visible signs of damage and for presence of larval specimens.

Results

This survey was conducted at 124 sites in British Columbia. There were no detections.

Map showing surveyed sites for *Grapholita molesta:*

- Survey map for *G. molesta,* British Columbia

Figure 59. Oriental fruit moth

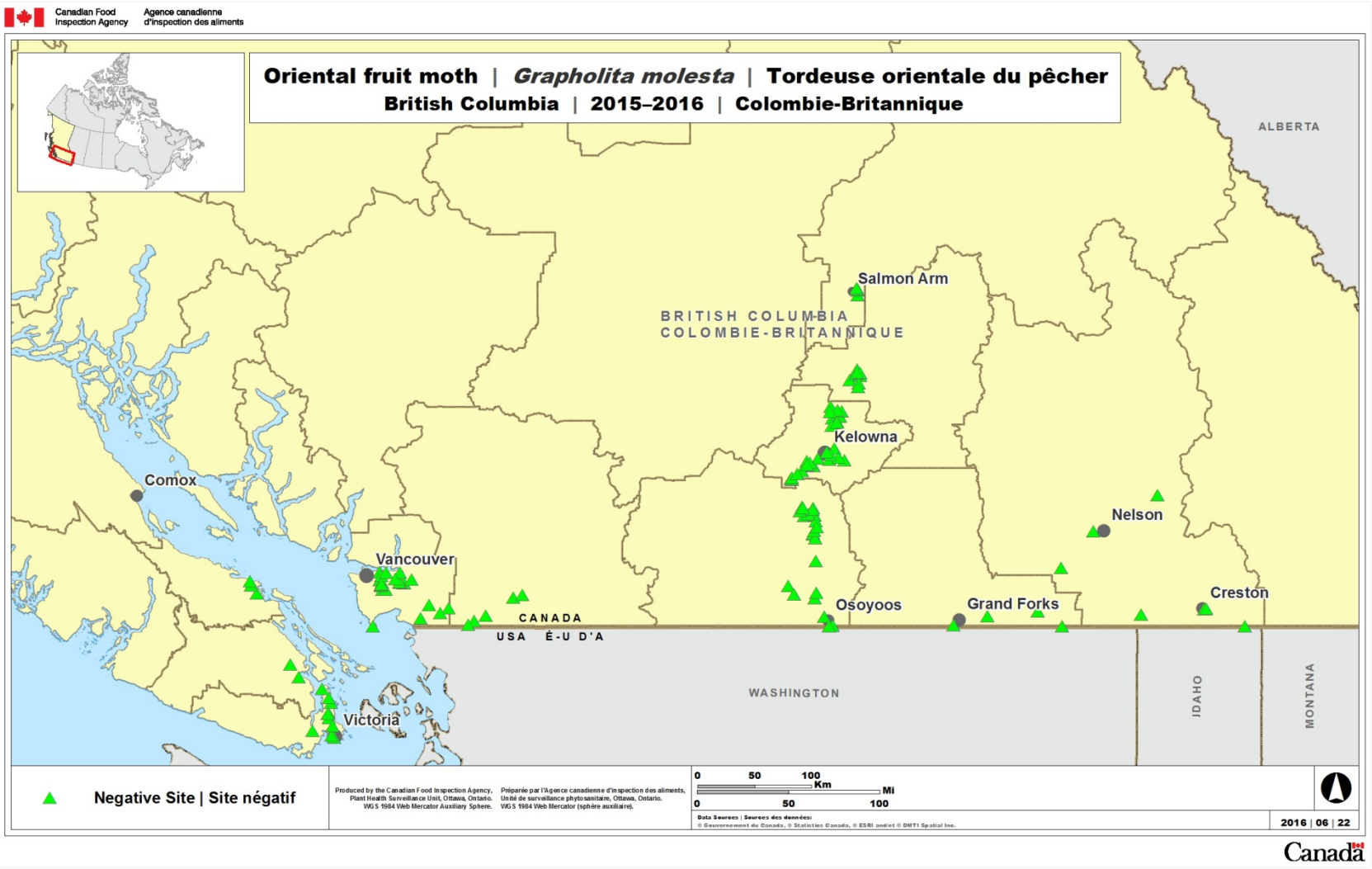
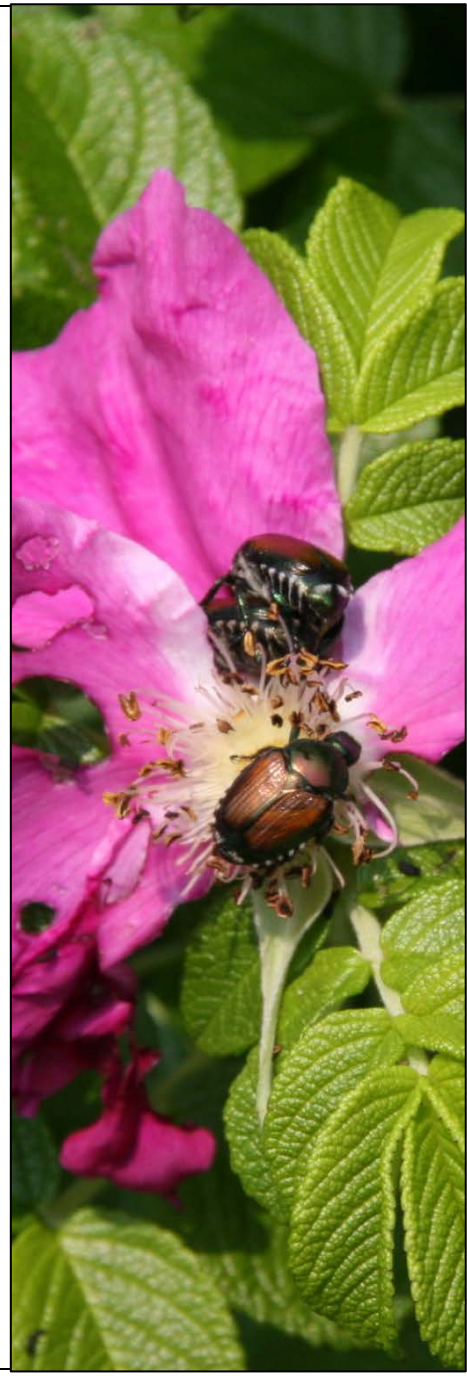


Figure 60. Survey map for *G. molesta*, British Columbia



3.3 Japanese beetle (*Popillia japonica*)

Background

The Japanese beetle has been present in Canada since 1939. This species of beetle affects more than 300 plant species, including many economically important commodity plants such as fruit trees, ornamental shrubs and roses, field crops, turf grasses, and sod. This survey was conducted to monitor changes in the distribution of Japanese beetles for regulatory purposes (CFIA Policy Directive D-96-15: "*Phytosanitary requirements to prevent the spread of Japanese beetle, Popillia japonica, in Canada and the United States*"). The main goal of this survey was pest detection in non-infested areas.

Methodology

Surveys for Japanese beetle were conducted in high risk areas such as nurseries, sod farms, golf courses, cemeteries, public parks and gardens, food terminals, truck and rail compounds/terminals, airports and border points. Emphasis was placed on sites which import soil or sod from areas known to be infested with Japanese beetle. Japanese beetle adults were surveyed in grassy areas using a specialized funnel trap, baited with a pheromone and an aromatic floral lure. Traps were placed in the field from mid-June to mid-September.

Results

This survey was conducted at 521 sites in two provinces (Table 15).

Table 15. Japanese beetle survey results for 2015–2016.

Province	Sites	Results
British Columbia	442	No detections.
Newfoundland & Labrador	79	No detections.

Maps showing surveyed sites for *Popillia japonica*:

- Survey map for *P. japonica*, British Columbia
- Survey map for *P. japonica*, Newfoundland & Labrador

Figure 61. Japanese beetle trap

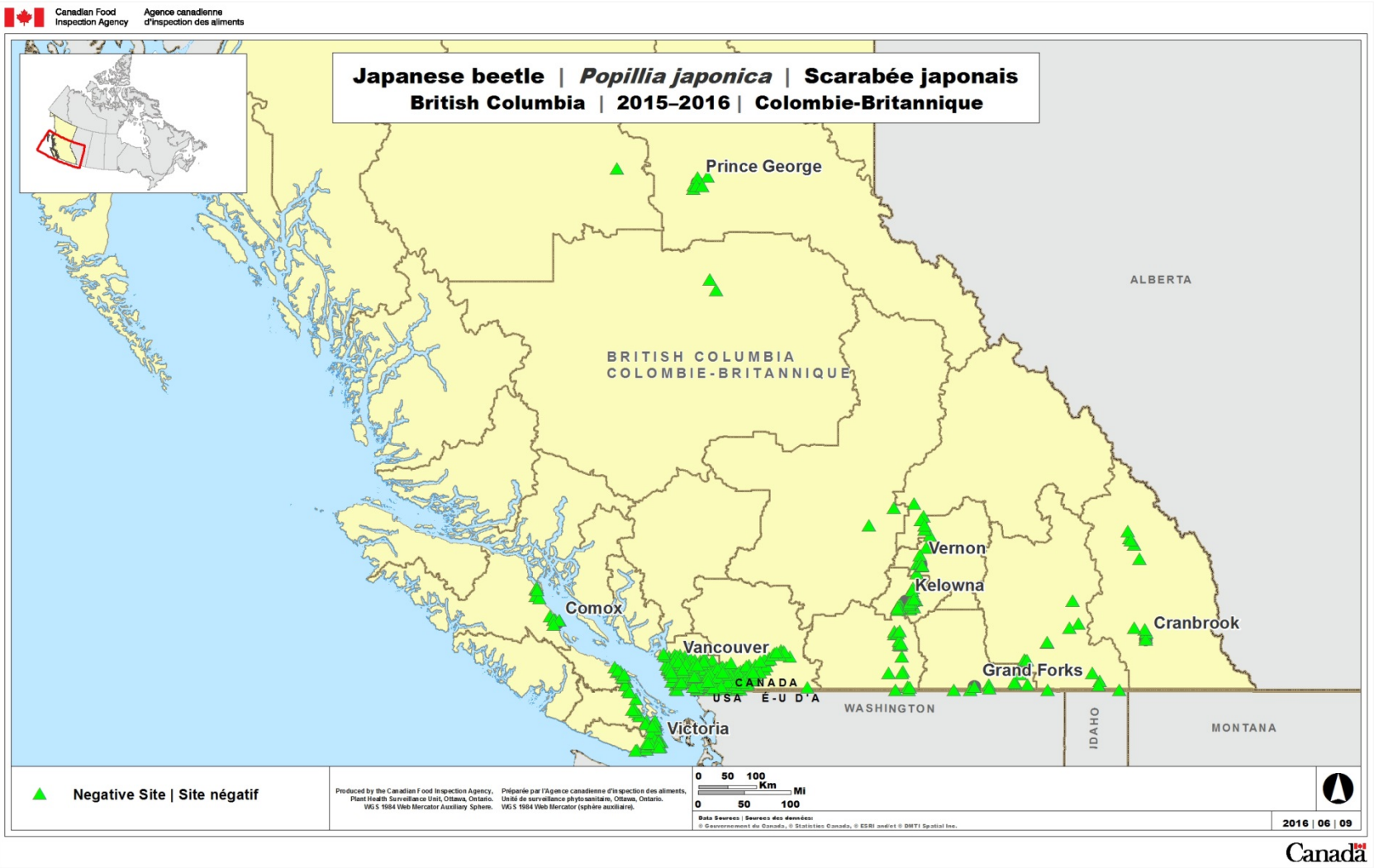


Figure 62. Survey map for *P. japonica*, British Columbia

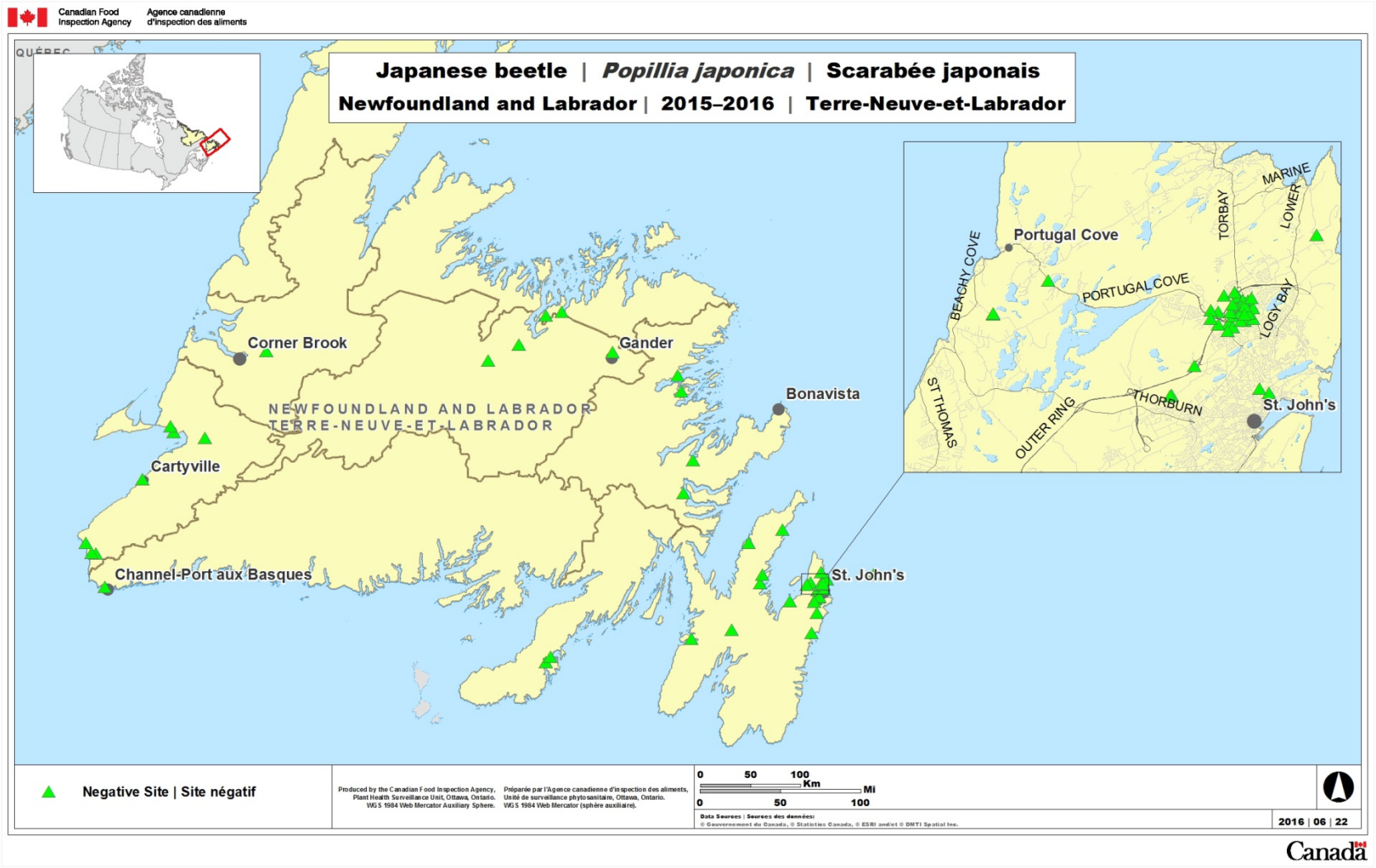


Figure 63. Survey map for *P. japonica*, Newfoundland and Labrador

3.4 Blueberry maggot (*Rhagoletis mendax*)

Background

Blueberry maggot is an indigenous pest of commercially grown lowbush and highbush blueberries in the Canadian Maritime Provinces. It is not found in Newfoundland & Labrador or in western Canada. This survey is being conducted in support of policies and programs related to CFIA Policy Directive D-02-04: "*Phytosanitary requirements for the importation from the continental united states and for domestic movement of commodities regulated for blueberry maggot*".

Methodology

Trapping surveys were conducted in areas not regulated for blueberry maggot within blueberry plantations and wild sites containing host species. Pherocon AM traps, baited with ammonium acetate, were suspended in an inverted "V" shape and placed at 10 to 15 cm above lowbush plants within wild blueberry sites or at mid-canopy height within highbush blueberry plantations. Traps were in place prior to the flight period in late-June and were collected at the end of harvest (commercial plantations) or fruit drop (wild sites) in late August or early September.

Results

This survey was conducted at 148 sites in 4 provinces (Table 16).

Table 16. Blueberry maggot survey results for 2015–2016.

Province	Sites	Results
British Columbia	84	No detections.
Newfoundland and Labrador	21	No detections.
Ontario	17	No new detections.
Québec	26	No new detections.

Maps showing surveyed sites for *Rhagoletis mendax*:

- Survey map for *R. mendax*, British Columbia
- Survey map for *R. mendax*, Newfoundland & Labrador
- Survey map for *R. mendax*, Ontario
- Survey map for *R. mendax*, Québec

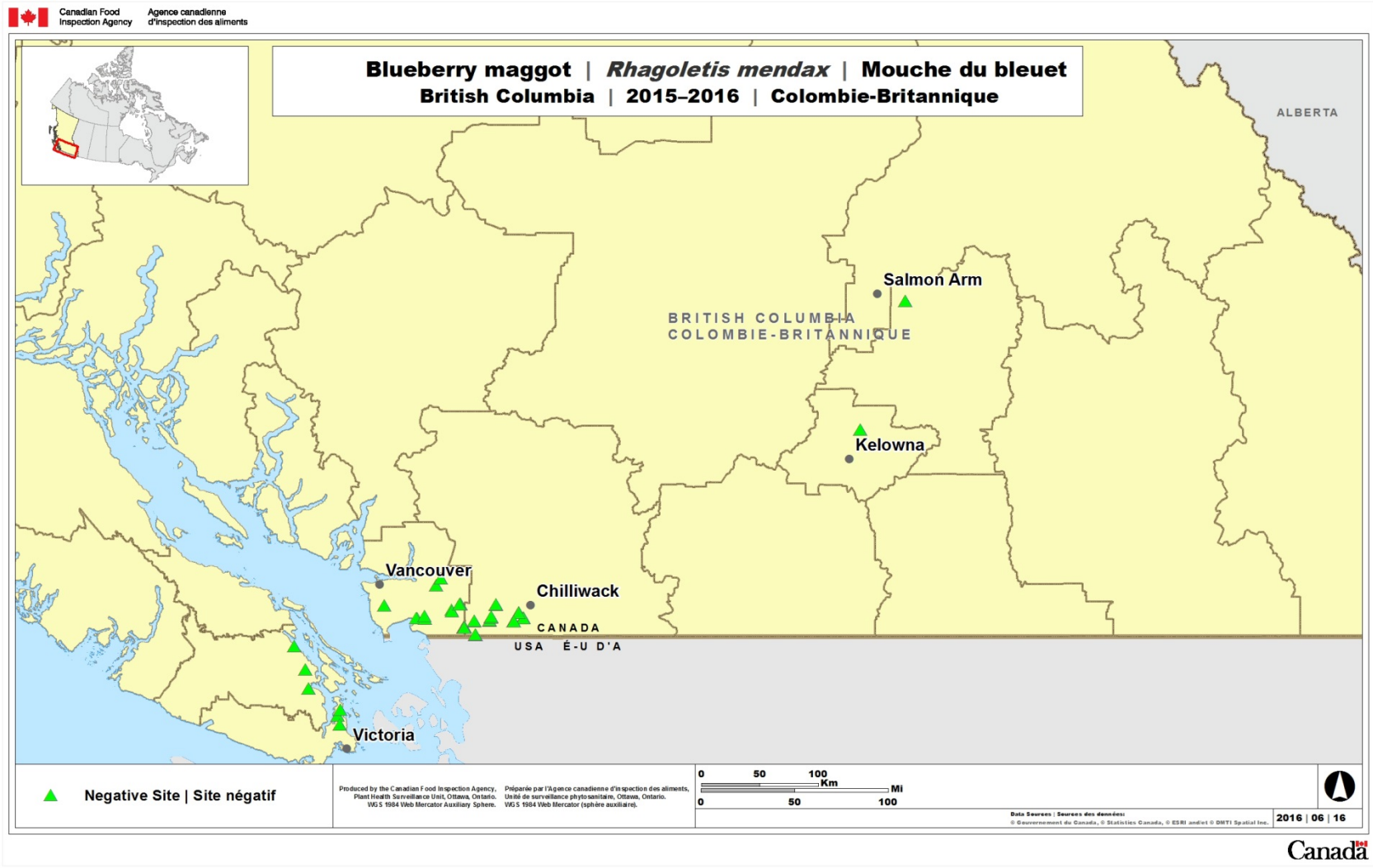


Figure 64. Survey map for *R. mendax,* British Columbia

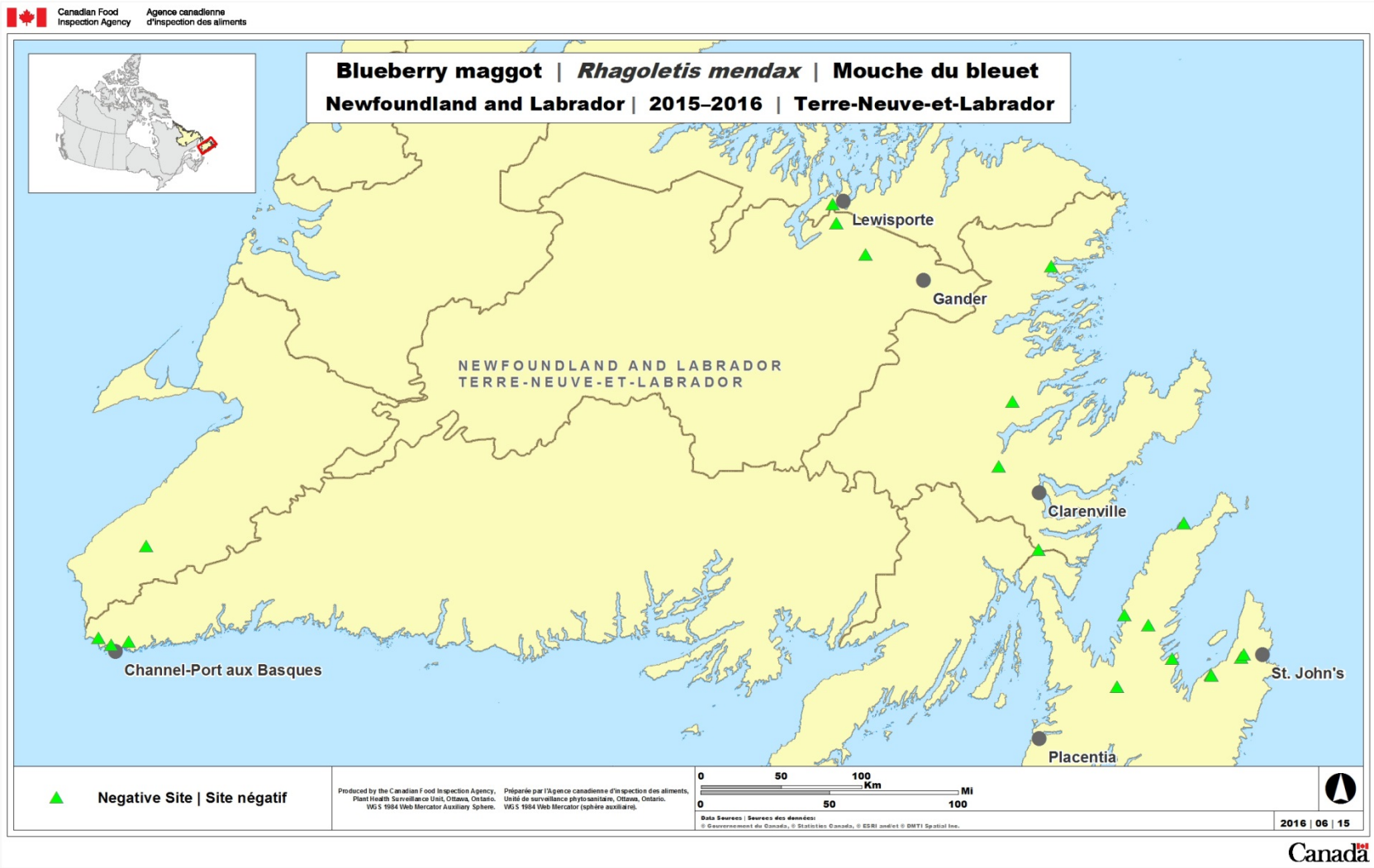


Figure 65. Survey map for *R. mendax*, Newfoundland and Labrador

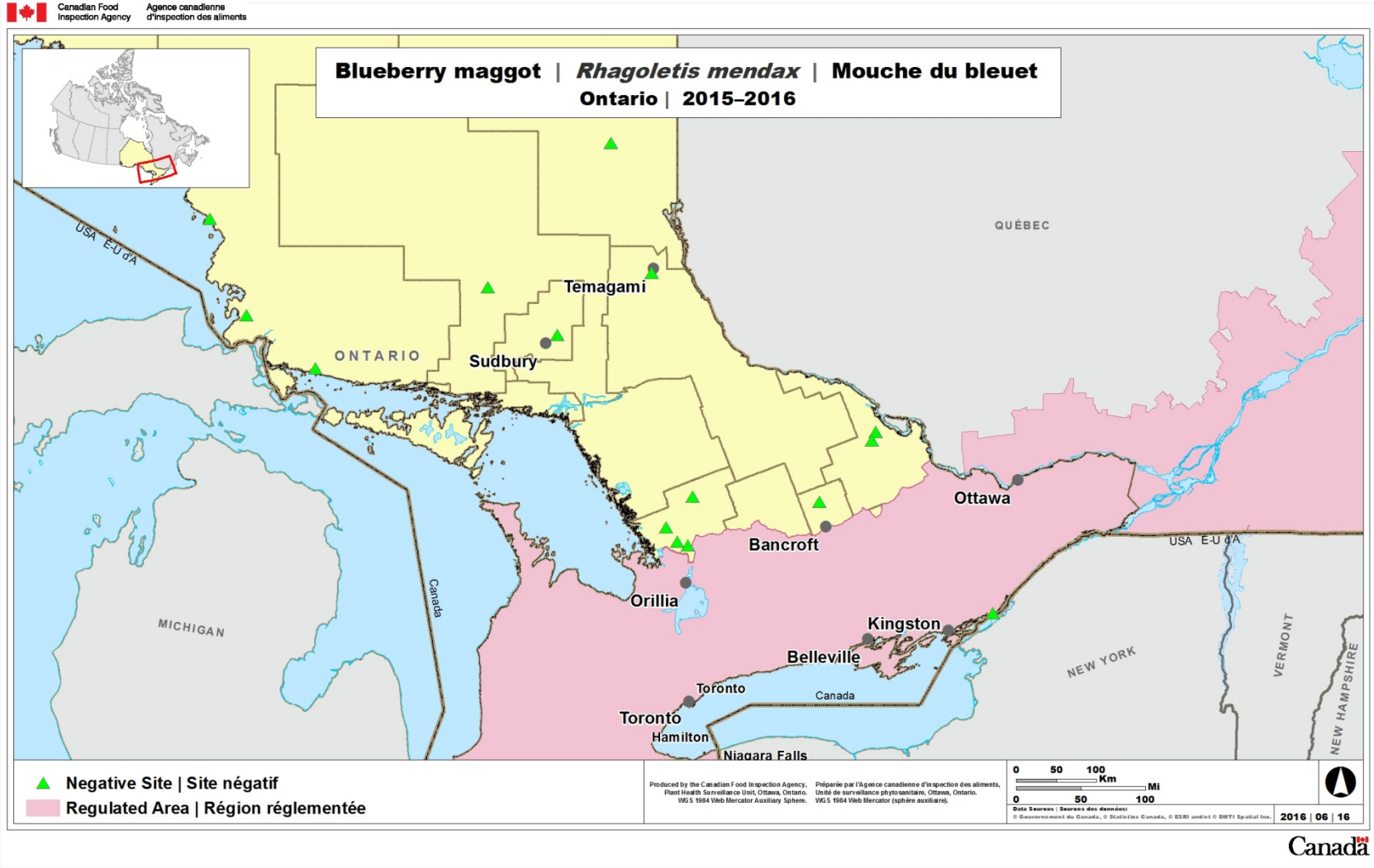


Figure 66. Survey map for *R. mendax*, Ontario

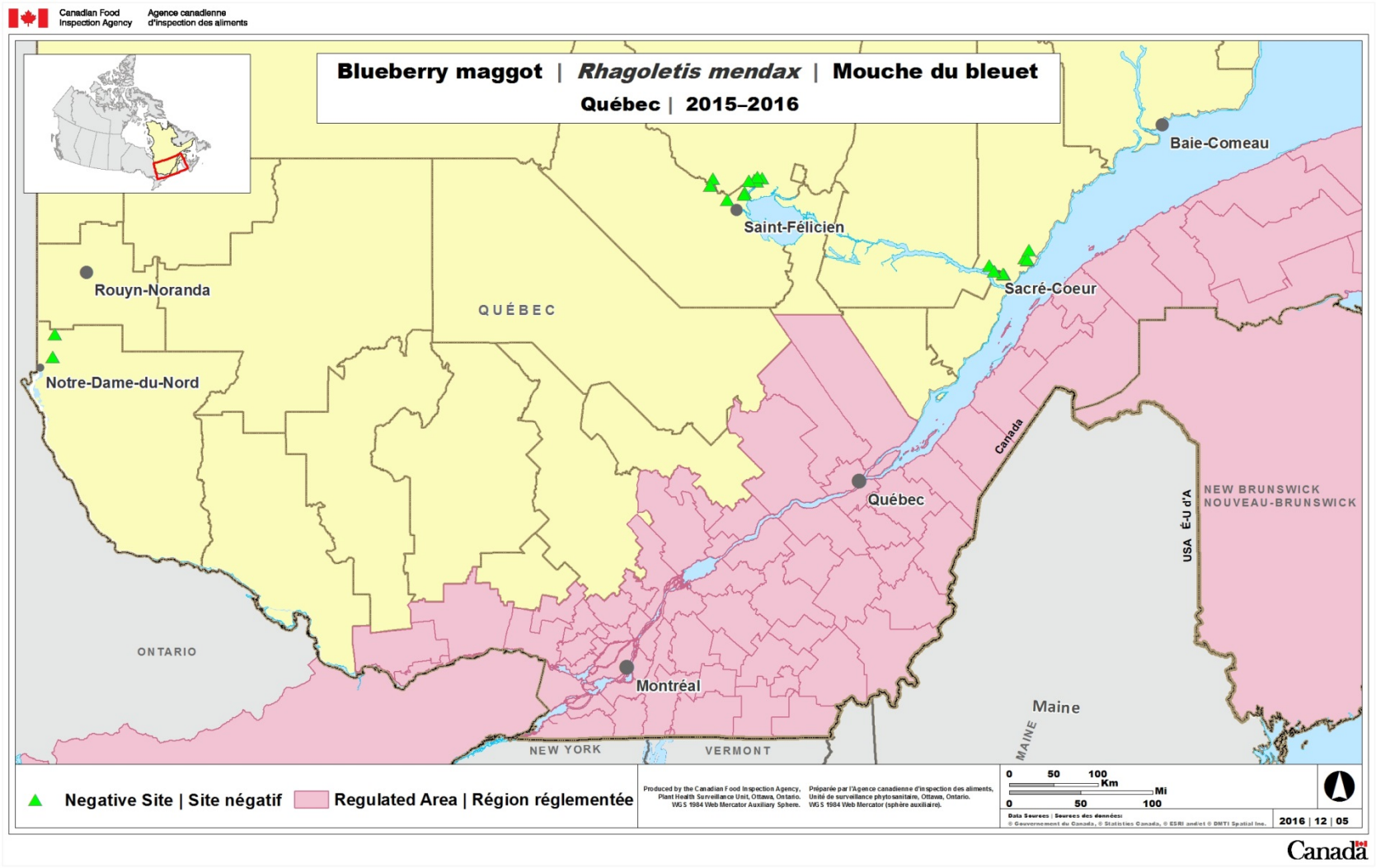


Figure 67. Survey map for *R. mendax*, Québec

3.5 Apple maggot (*Rhagoletis pomonella*)

Background

Apple maggot is an indigenous pest of apples in Canada. The British Columbia interior is the last major apple growing area of North America free of this pest. The objective of this survey is the early detection of apple maggot in the British Columbia interior and to facilitate eradication should this pest be found. This survey is being conducted in support of policies and programs related to CFIA Policy Directive D-00-07: "*Import and domestic phytosanitary requirements to prevent the introduction and spread of apple maggot (Rhagoletis pomonella spp. (Walsh*))".

Methodology

Host trees in organic orchards and on landowner property, as well as wild host trees along transportation routes, were primarily targeted for surveying since they do not receive insecticidal sprays. Trapping for adult flies was conducted with sticky red spheres baited with 10 g of ammonium carbonate crystals (an apple maggot attractant). Traps were placed in host trees from June 15th to October 3rd.

Results

Traps for apple maggot were placed at 439 sites in British Columbia. There was one specimen detected in West Kelowna.

Map showing surveyed sites for *Rhagoletis pomonella*:

- Survey map for *R. pomonella*, British Columbia

Figure 68. Apple maggot tunnels

Figure 69. Adult apple maggot flies, (Dr. Rob Smith, AAFC, Kemptville)

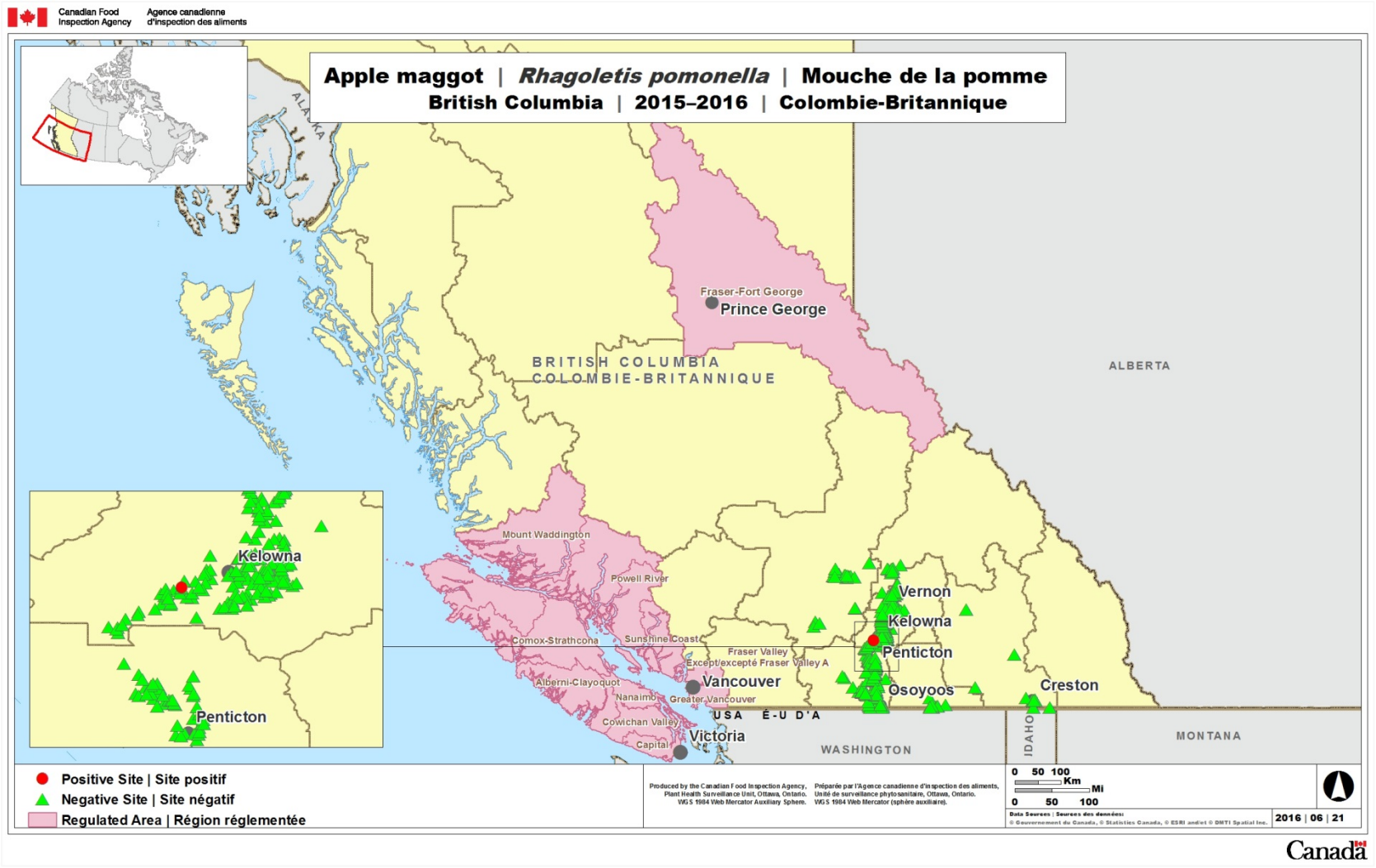


Figure 70. Survey map for *R. pomonella*, British Columbia

3.6 *Anoplophora* nursery survey

Background

The citrus longhorned beetle (CLHB, *Anoplophora chinensis* [Forster]), is a serious pest with a host range of more than 85 genera of plants. Citrus longhorned beetle is a potential threat to natural areas as well as to fruit trees and woody ornamental plants. Unlike many other native wood-boring pests that attack primarily dead trees, CLHB attacks apparently healthy trees. Once established, it can be extremely difficult and expensive to eradicate. Citrus longhorned beetle is native to east Asia and has been introduced to Europe with increasing frequency in recent years. The only North American introduction to date was at a Washington nursery in 2001. An eradication program was implemented immediately, and there have been no subsequent infestation reports. The only interception of CLHB in Canada to date was in 1996. One live CHLB was found in a warehouse in Burnaby, British Columbia after importing cable from Asia.

This survey is being conducted in support of CFIA policy directive D-11-01: *"Phytosanitary requirements for plants for planting and fresh branches to prevent the entry and spread of Anoplophora spp."*. The primary goal of this survey is to ensure that there are no CLHB infestations in proximity to nurseries that have imported host material from potentially infested areas.

Methodology

This survey involved visual inspection of host material for signs and symptoms of citrus longhorned beetle in the natural environment surrounding target nurseries. Surveys were conducted between August and December, in dry weather, primarily after leaf drop.

Results

This survey was conducted in four provinces for a total of 41 sites (Table 17).

Table 17. Survey results for 2015–2016.

Province	Sites	Results
British Columbia	10	No detections.
Nova Scotia	3	No detections.
Ontario	22	No detections.
Québec	6	No detections.

Map showing surveyed sites for *Anoplophora* nursery survey:

- Survey map for *Anoplophora* nursery survey, Canada

Figure 71. Damage from citrus longhorned beetle.

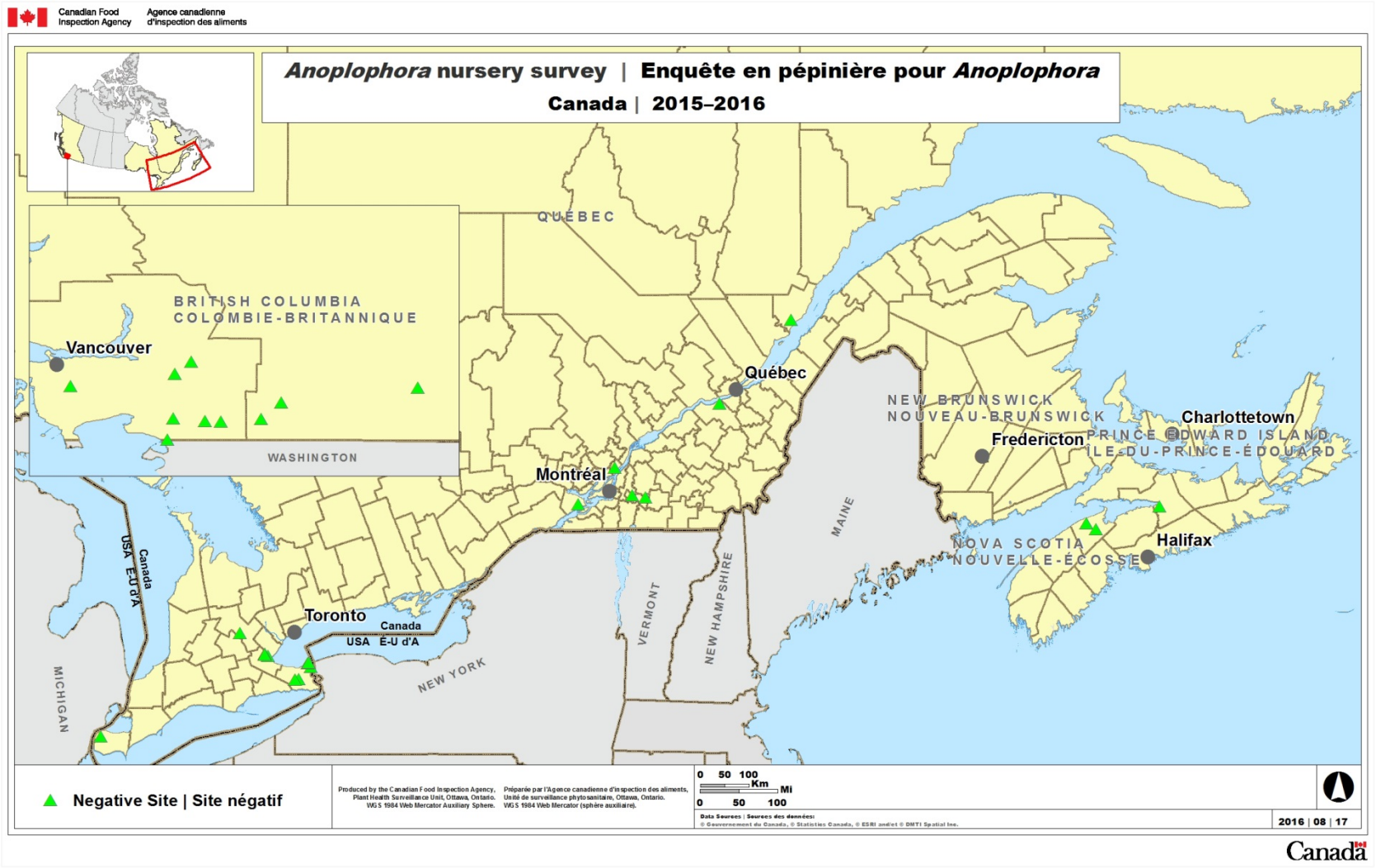


Figure 72. Map for *Anoplophora* nursery survey, Canada

3.7 European grapevine moth (*Lobesia botrana*)

Background

The preferred host of *Lobesia botrana* is *Vitis vinifera* (grape). However, it may also feed on several other plants or plant products, including *Rosmarinus officinalis* (rosemary), *Urginea maritime* (sea squill), *Prunus* spp. (stone fruit), *Punica granatum* (pomegranate), *Ribes* spp. (currant, gooseberry) and *Rubus* spp. (blackberry, raspberry).

Methodology

The priority for this survey was commercial vineyards. In areas where grapes are grown minimally or not at all, survey sites included hobbyist or backyard growers, nurseries selling grapevines and wholesale fruit handlers. Green or orange Delta traps with *Lobesia botrana* lures (Pherocon controlled-release septa) were suspended in vines or canopy of host plant material on a trellis or sturdy branch approximately 1 to 2 m above ground. Traps were place by June 15 and removed by September 20. The pheromone lure was replaced once a month (around July 15 and August 15).

Results

This survey took place at 28 sites in British Columbia and 70 sites in Ontario.

Map showing surveyed sites for *Lobesia botrana*:

- Survey map for *L. botrana*, British Columbia
- Survey map for *L. botrana*, Ontario

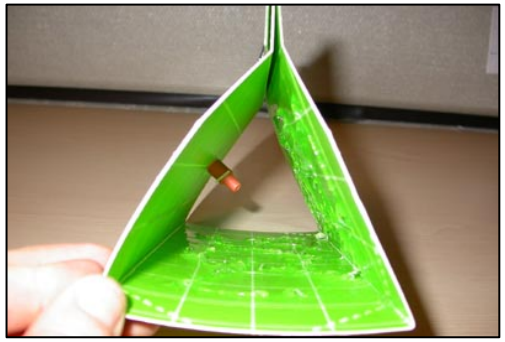


Figure 73. European grapevine moth trap

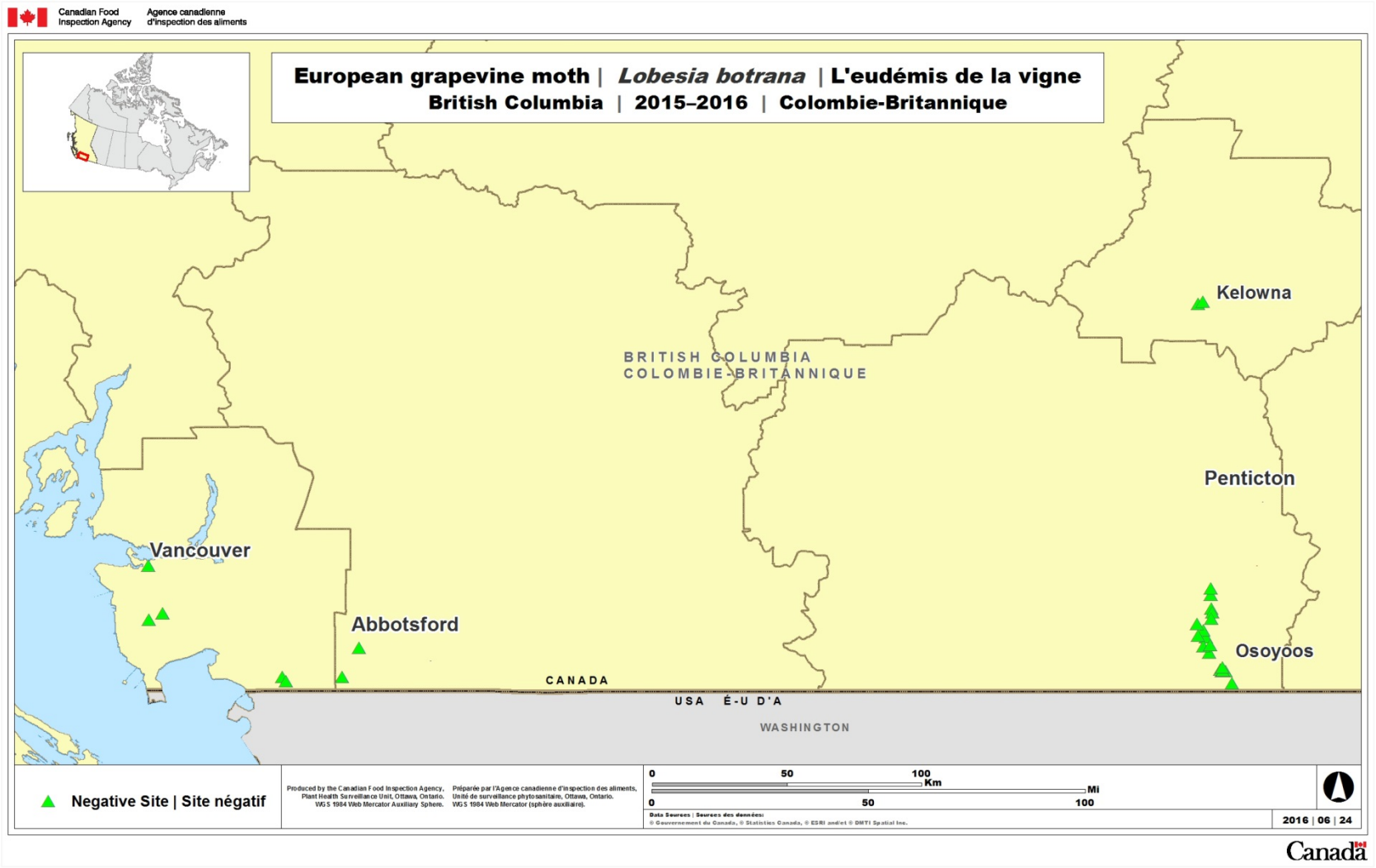


Figure 74. Survey map for *L. botrana*, British Columbia

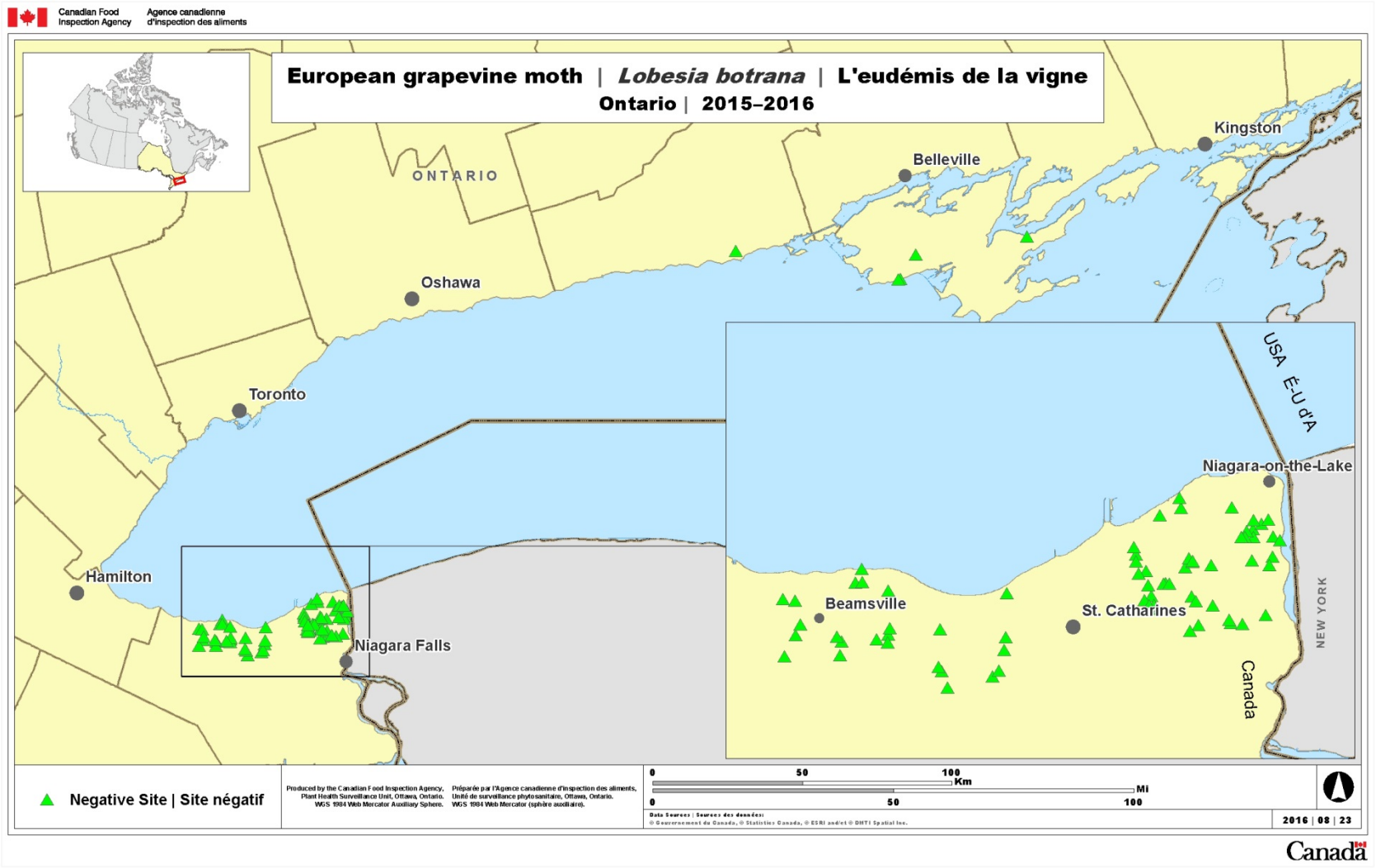


Figure 75. Survey map for *L. botrana*, Ontario

3.8 Tobacco blue mold (*Peronspora hyoscyami* f.sp. *tabacina*)

Background

Tobacco blue mold (TBM) is a serious disease of solanaceous plants including tobacco, peppers, tomato and eggplant. TBM is only reported from eastern Canada, although there was one report of the disease in Washington State in the 1950's. This pathogen is not known to overwinter in Canada but may be blown in as spores from the southeastern United States.

Methodology

This survey was conducted in cooperation with Agriculture and Agri-Food Canada (AAFC). Visual surveys were conducted on indicator plants (TBM-sensitive tobacco, *Nicotiana tabacum*) at three sites in southwestern British Columbia.

Results

This survey was conducted at 3 sites in British Columbia. There were no detections of TBM in 2015–2016.

3.9 Plum pox virus

In Ontario, samples from PPV-susceptible species were collected along the south and west edge of the plum pox quarantine area to determine if PPV is spreading. In 2015–2016, no PPV detections were identified.

Figure 76. Symptoms of plum pox virus

Chapter 4

Grain & Oilseed Surveys

4 GRAIN & OILSEED SURVEYS

The grains and oilseeds industry consists of the twenty-one crops defined under the *Canada Grain Act* (barley, oats, rye, triticale, wheat, canola, flaxseed, mustard, rapeseed, safflower seed, solin, soybeans, sunflower seed, beans, chick peas, fababeans, lentils, peas, mixed grain, buckwheat and corn), as well as unofficial grains, for example, canary seed, kamut, spelt and quinoa. In 2015, Canadian export of canola seed (low erucic acid) totalled $4.95 billion. Export of non-durum wheat (other than seed for sowing) was $5.87 billion and durum wheat (other than seed for sowing) was $2.04 billion (StatsCan, 2016c). In addition to the export market, the domestic industry processes grains and oilseeds to produce flour, vegetable oil, meal, ethanol, malt, livestock feed, and other value-added products.

In 2015–2016, the CFIA conducted two grain & oilseed surveys for a total of 1,142 sites.

Significant events in 2015–2016: Verticillium national survey, with detections in Alberta, British Columbia, Manitoba, Ontario, Québec, and Saskatchewan

Changes in regulated areas in 2015–2016: None

Table 18. Invasive pests of grains and oilseeds prioritized for surveillance in 2015–2016.

Scientific name	Common name
Trogoderma granarium	Khapra beetle
Verticillium longisporum	Verticillium wilt of canola
Ostrinia nubilalis	European corn borer

4.1 Khapra beetle (*Trogoderma granarium*)

Background

The khapra beetle (*Trogoderma granarium*) is considered one of the world's most destructive pests of grain products. At optimal temperatures, populations can grow at an extremely fast rate leading to damage rates of 30 to 70%. Infestation leads to food spoilage and the insects themselves pose a potential human health threat in contaminated food. In addition, khapra beetle affects trade due to phytosanitary restrictions and increased costs of production through additional treatment measures. Because of this, it is regulated as a quarantine pest in many countries, including Canada. The khapra beetle is native to India but has become established in many tropical and subtropical countries. It has also been reported in many countries throughout Africa, Asia, and parts of Europe and South America. The khapra beetle is not established in Canada. However, there have been several interceptions on imported products at Canada's borders. All incidents of khapra beetle infestations in North America have led to successful eradication thus far.

The objective of this survey was to obtain further surveillance data on the incidence of khapra beetle to maintain the pest-free status within Canada.

Methodology

Trapping and visual methods were used to survey for adult and larval khapra beetles. Target sites include facilities where khapra beetle was detected during import inspections or facilities known to be associated with these detections. High risk importers of rice products from India were also targeted. Storgard Beetle Traps (with food bait) were placed between June 1st and August 31st, when the temperature was above 20° C. Visual surveys were conducted at final trap pickup.

Results

Khapra beetle surveys were conducted at 33 sites in 6 provinces (Table 19). There were no detections of khapra beetle in any of the surveyed sites.

Table 19. Survey results for 2015–2016.

Province	Sites	Results
Alberta	8	No detections.
British Columbia	8	No detections.
New Brunswick	2	No detections.
Nova Scotia	2	No detections.
Ontario	6	No detections.
Québec	5	No detections.

Map showing surveyed sites for *Trogoderma granarium*:

- Survey map for *T. granarium*

Figure 77. Khapra beetle larvae

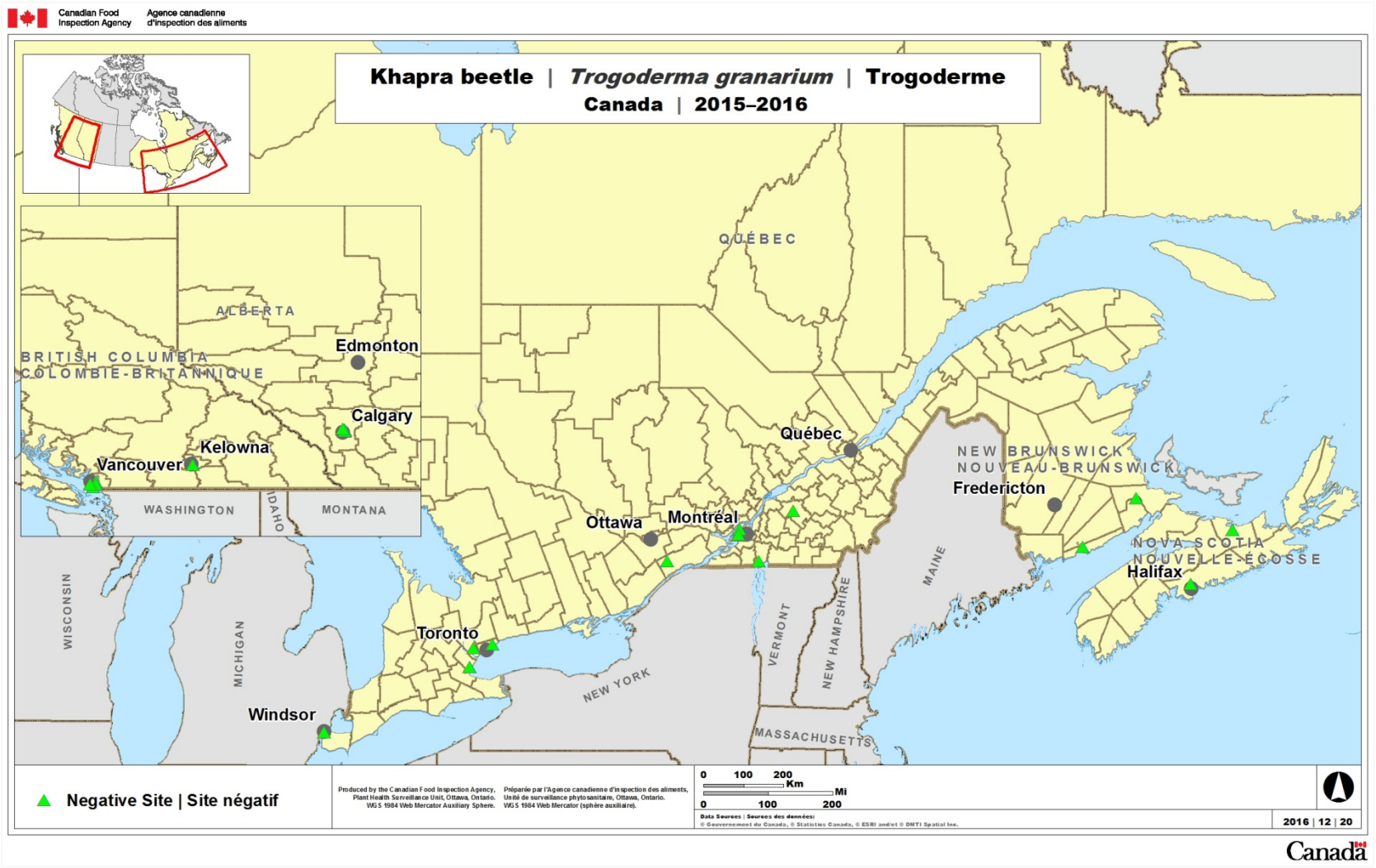


Figure 78. Survey map for khapra beetle, Canada

4.2 Verticillium wilt of canola (*Verticillium longisporum*)

Background

Verticillium longisporum, causal agent of verticillium wilt of canola, is a soil-borne fungus that causes vascular wilting in Brassica crops with symptoms similar to those caused by *Fusarium oxysporum* (Fusarium wilt). This fungus lives in roots and stems of Brassica plants and it has been reported to survive in soil as microsclerotia for up to 10–15 years. It was first confirmed on November 24, 2014 by the CFIA on a single farm location in Manitoba. This detection represents the first record of this pathogen on canola in North America although it has been reported from other cruciferous hosts in the United States.

Methodology

The microsclerotia were the primary targets for surveillance as they are long lived structures that can be present in the field throughout the year on either the plant, plant debris or in the soil. The numbers of microsclerotia usually build up to high levels just prior to harvest when affected plants are prematurely senescing.

Detection survey

This survey was completed in all canola production areas in Canada. Farms prioritized for surveillance included those considered to be higher risk (ie. canola from a large number of seed sources, import seed from off continent as well as farms where there is significant movement of agricultural machinery on and off the farm) and those with wilted fields (ie. identified as containing fusarium wilt from historical canola disease surveys or general surveillance reports). Commercial production of canola was also surveyed at randomly selected sites.

At the major field entry point, stem samples were collected from 10 plants and 1 root sample from one plant at each of the 5 points along a “W” pattern in the field, for a total of 50 plants and 5 root samples.

Delimitation survey

Survey data were used to delimit the extent of the infestation at the original detection site in Manitoba and any additional confirmed sites that were detected over the course of this survey. Site selection for delimitation can be broken down into the following four types of fields: the confirmed farm, fields adjacent to the confirmed field, contact fields (ie. those with shared equipment with the confirmed field or where the soil from the confirmed field was moved), and new positive fields (ie. fields that were confirmed to be positive based on reports from partners or from CFIA surveillance).

This survey was conducted using the methods described for the detection survey for verticillium wilt of canola. However, in fields adjacent to the confirmed field, three “W” patterns were placed over the field, for a total of 150 plants. One “W” pattern was placed over the major field entry point, one “W” pattern was placed over the most significant water channel and the final

"W" pattern was placed randomly in the field. Soil sampling was conducted in fields that were not in canola production in 2014 or 2015 if the field has had historical canola production in the last 10 years. Each field was ground truthed and uniquely identified.

Results

This survey took place in 9 provinces for a total of 1,103 sites (Table 20). There were detections in Alberta, British Columbia, Manitoba, Saskatchewan, Ontario and Québec.

Table 20. Survey results for 2015–2016.

Province	Sites	Results
Alberta	372	39 positive sites.
British Columbia	31	Detections in Charlie Lake, Clayhurst, Dawson Creek, Rolla, and Sunset Prairie, for a total of 5 positive sites.
Manitoba	318	189 positive sites.
New Brunswick	5	No detections.
Nova Scotia	1	No detections.
Ontario	29	Detections in Alliston, Elmvale, New Liskeard, for a total of 4 positive sites.
Prince Edward Island	3	No detections.
Québec	30	Two detections in La Baie.
Saskatchewan	314	34 positive sites.

Map showing surveyed sites for *Verticillium longisporum*:

- Survey map for *V. longisporum,* Alberta
- Survey map for *V. longisporum,* British Columbia
- Survey map for *V. longisporum,* Manitoba
- Survey map for *V. longisporum,* New Brunswick
- Survey map for *V. longisporum,* Nova Scotia
- Survey map for *V. longisporum,* Ontario
- Survey map for *V. longisporum,* Prince Edward Island
- Survey map for *V. longisporum,* Québec
- Survey map for *V. longisporum,* Saskatchewan

Figure 79. Symptoms of verticillium wilt of canola

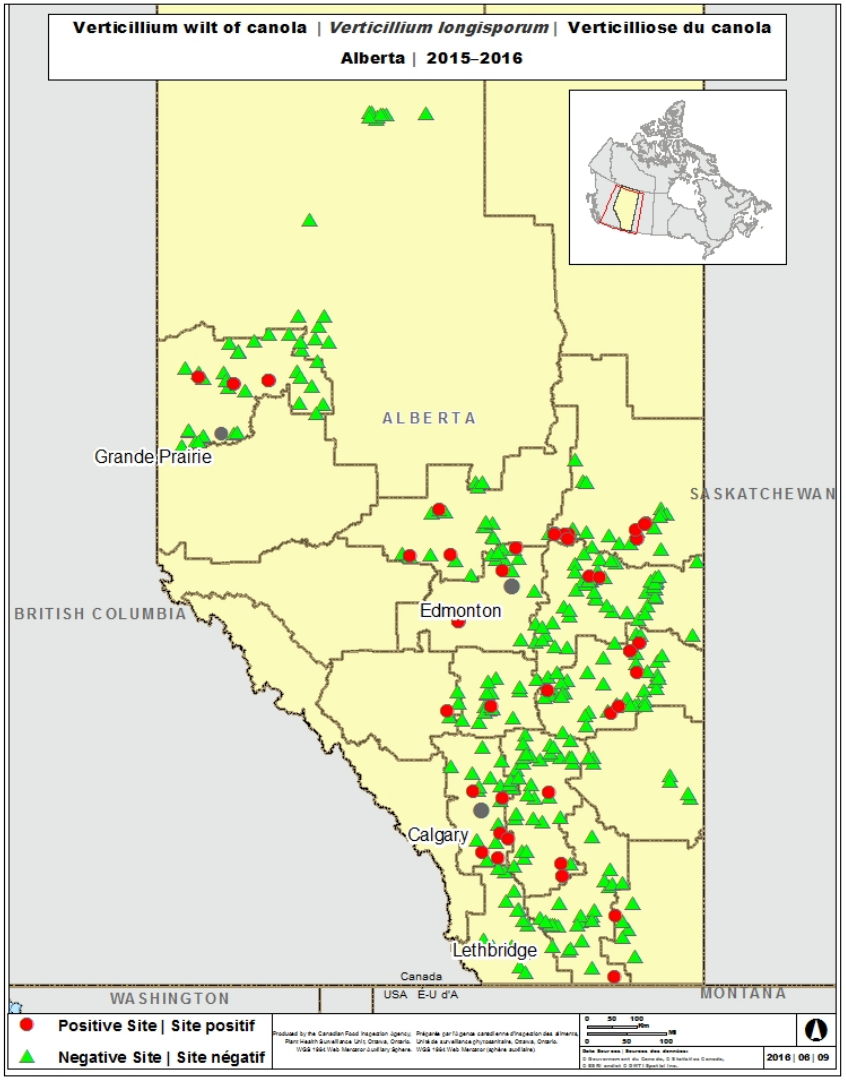


Figure 80. Survey map for *V. longisporum*, Alberta

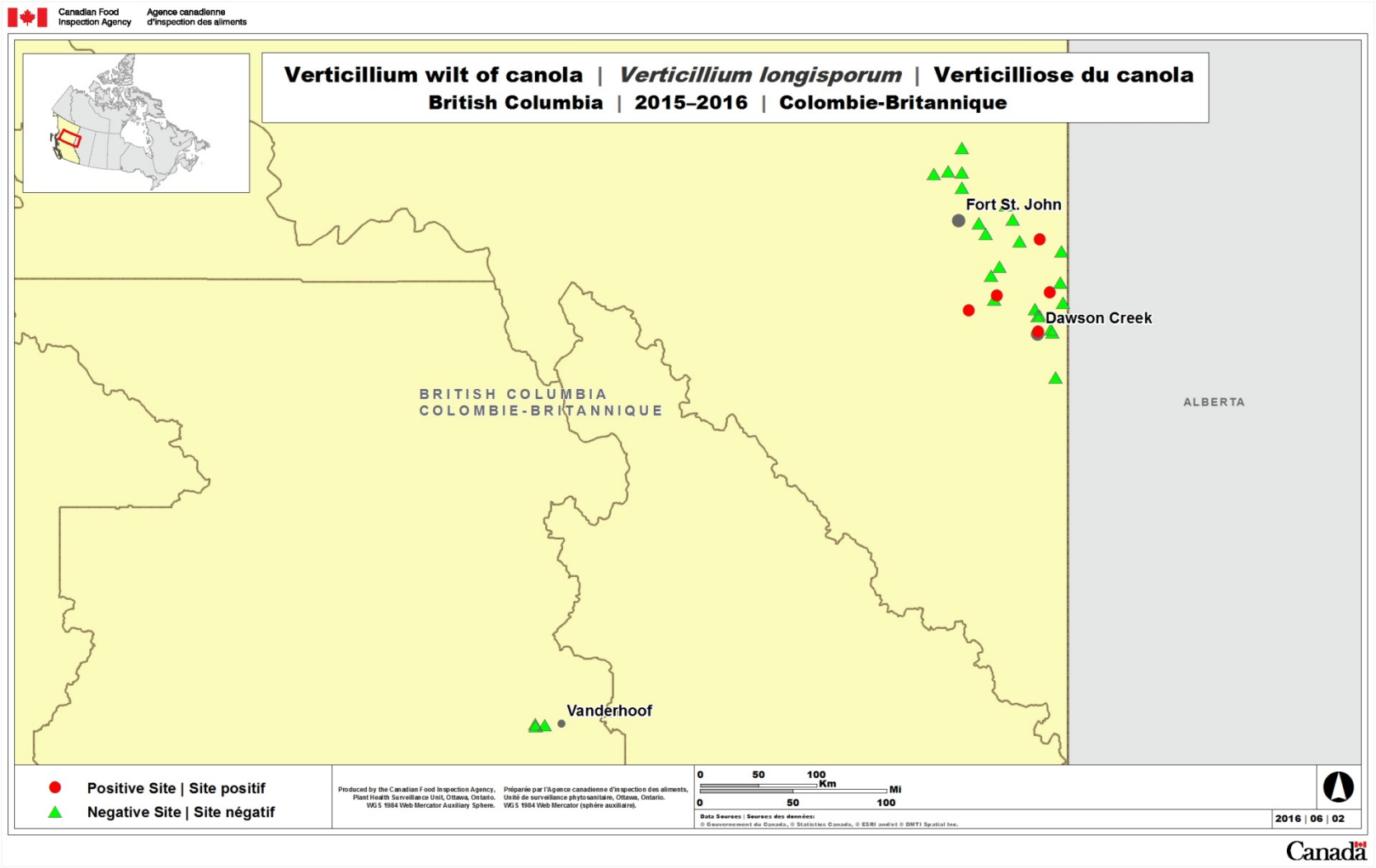


Figure 81. Survey map for *V. longisporum*, British Columbia

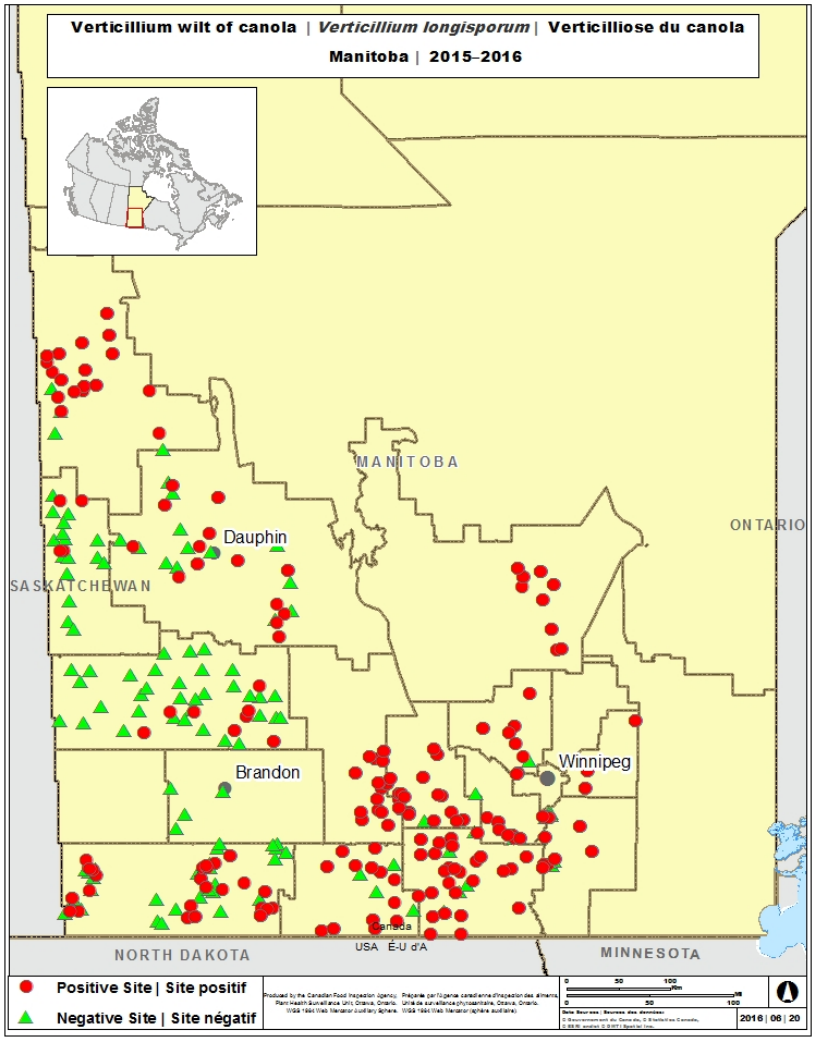


Figure 82. Survey map for *V. longisporum*, Manitoba

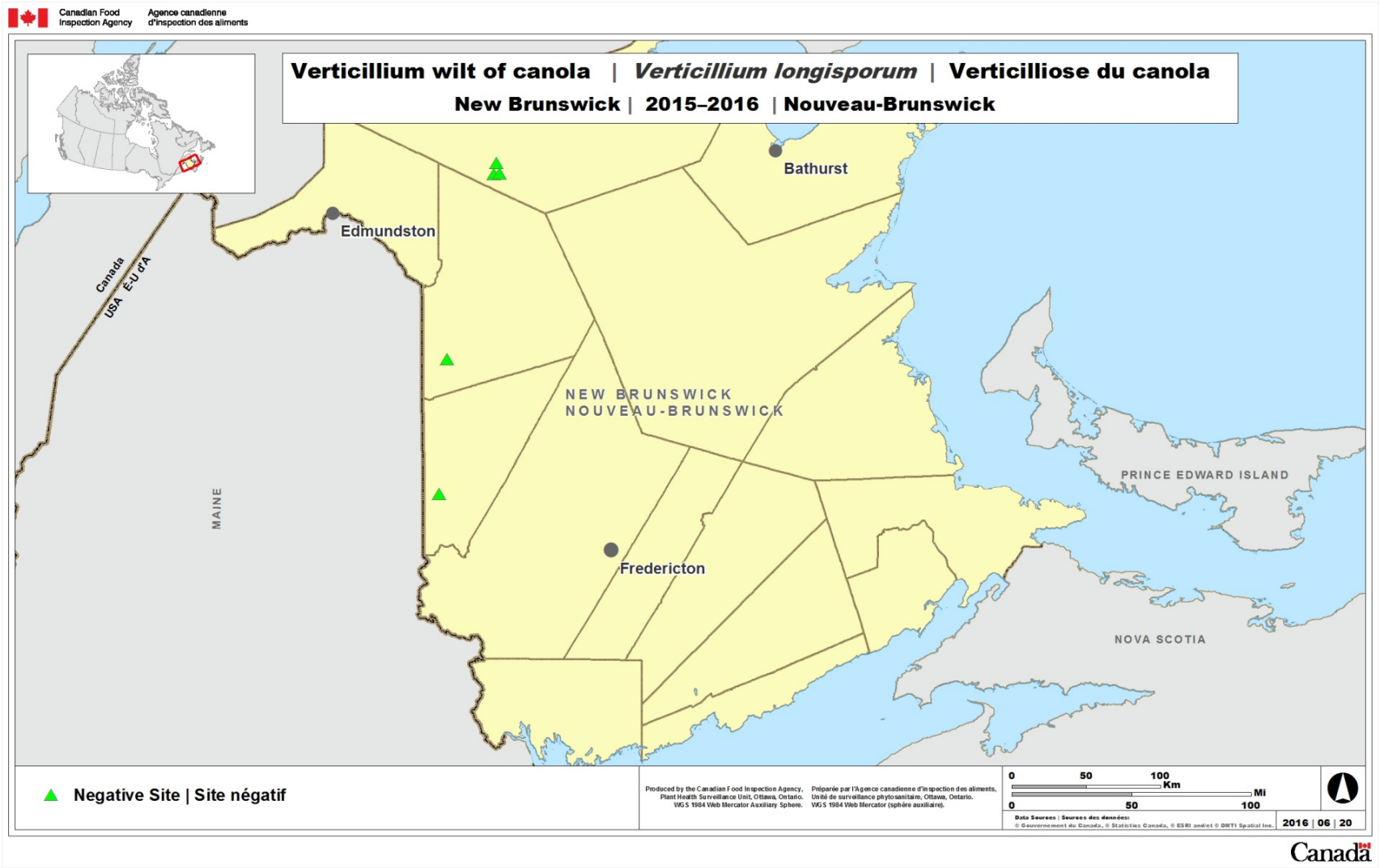


Figure 83. Survey map for *V. longisporum*, New Brunswick

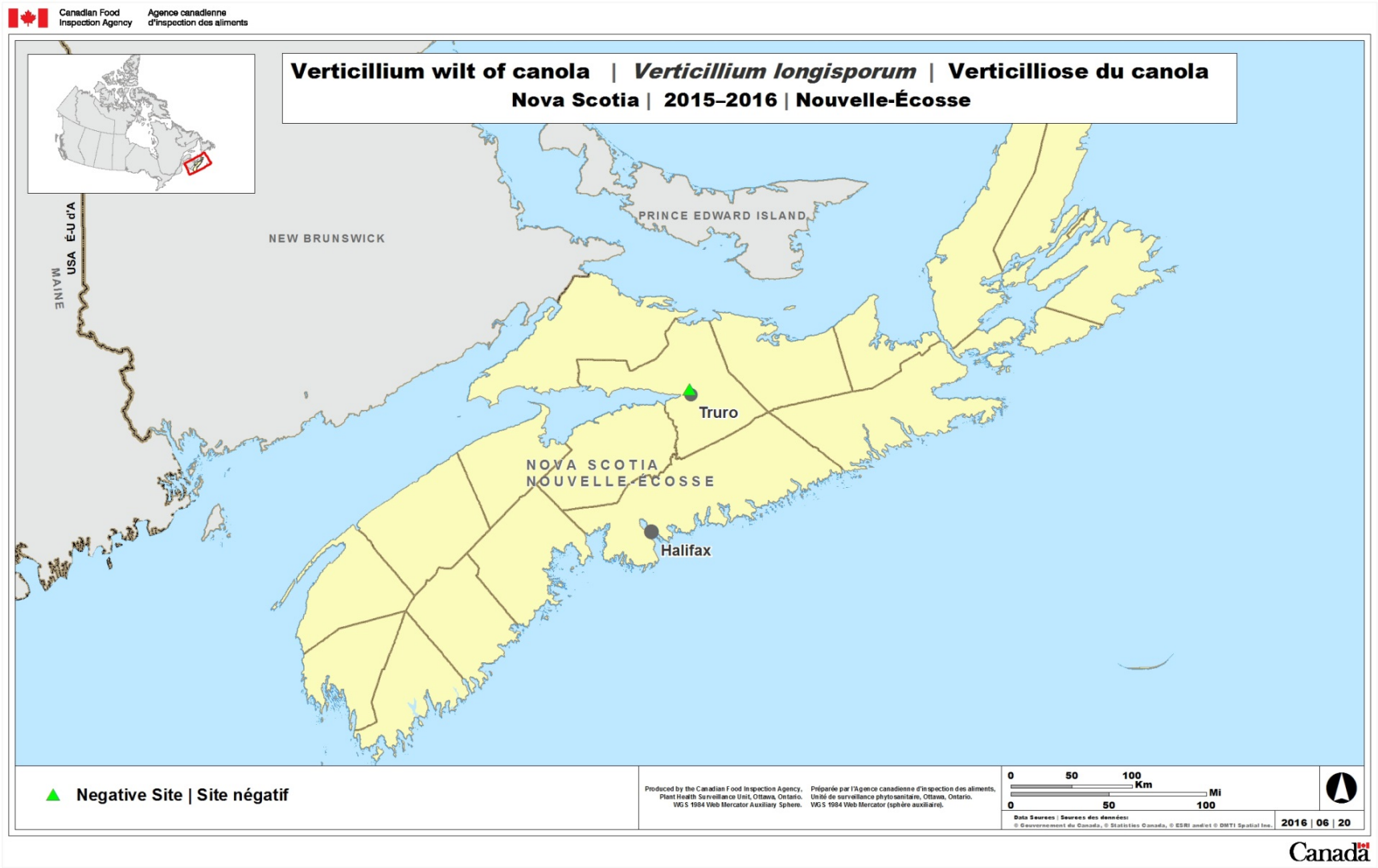


Figure 84. Survey map for *V. longisporum*, Nova Scotia

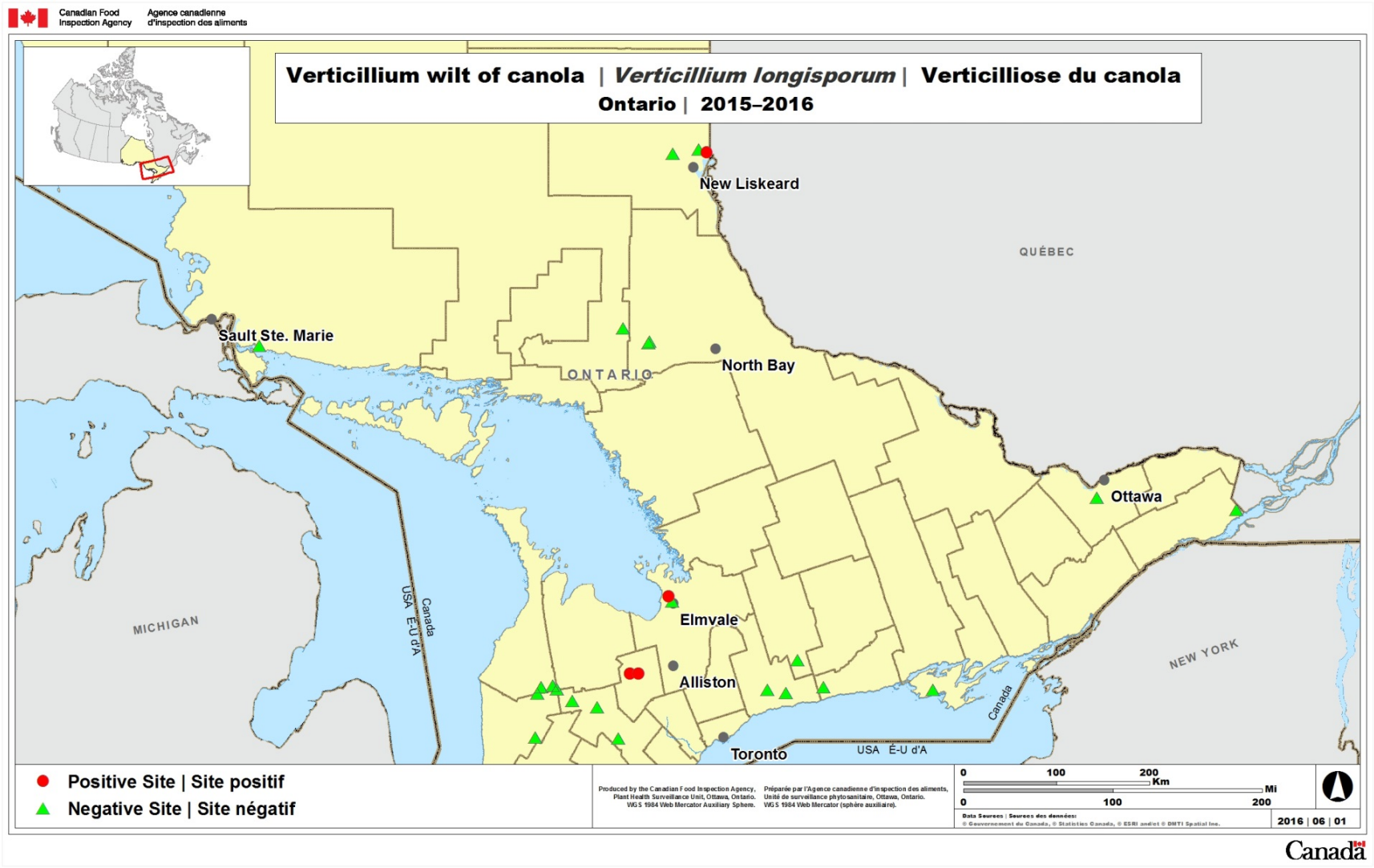


Figure 85. Survey map for *V. longisporum*, Ontario

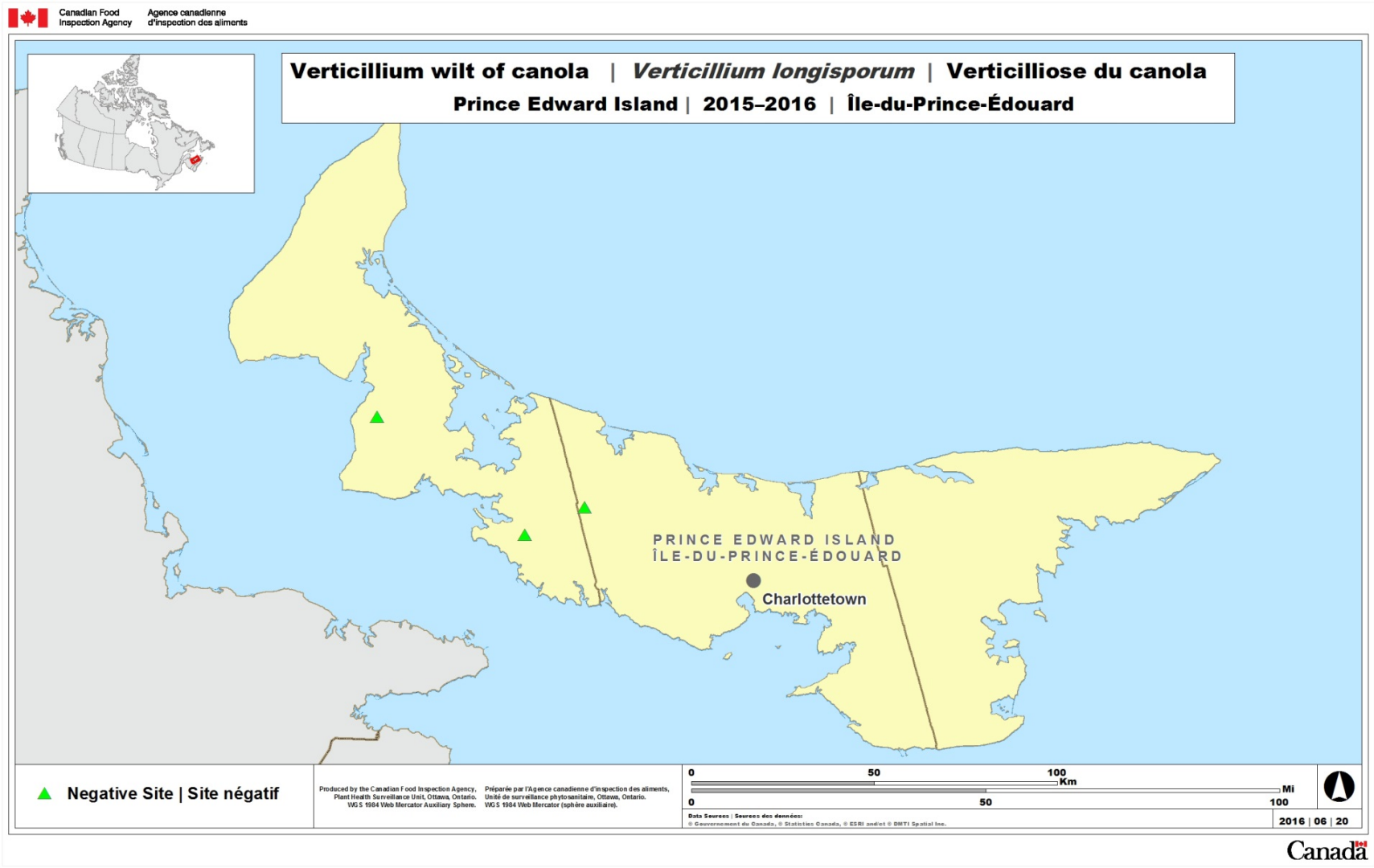


Figure 86. Survey map for *V. longisporum*, Prince Edward Island

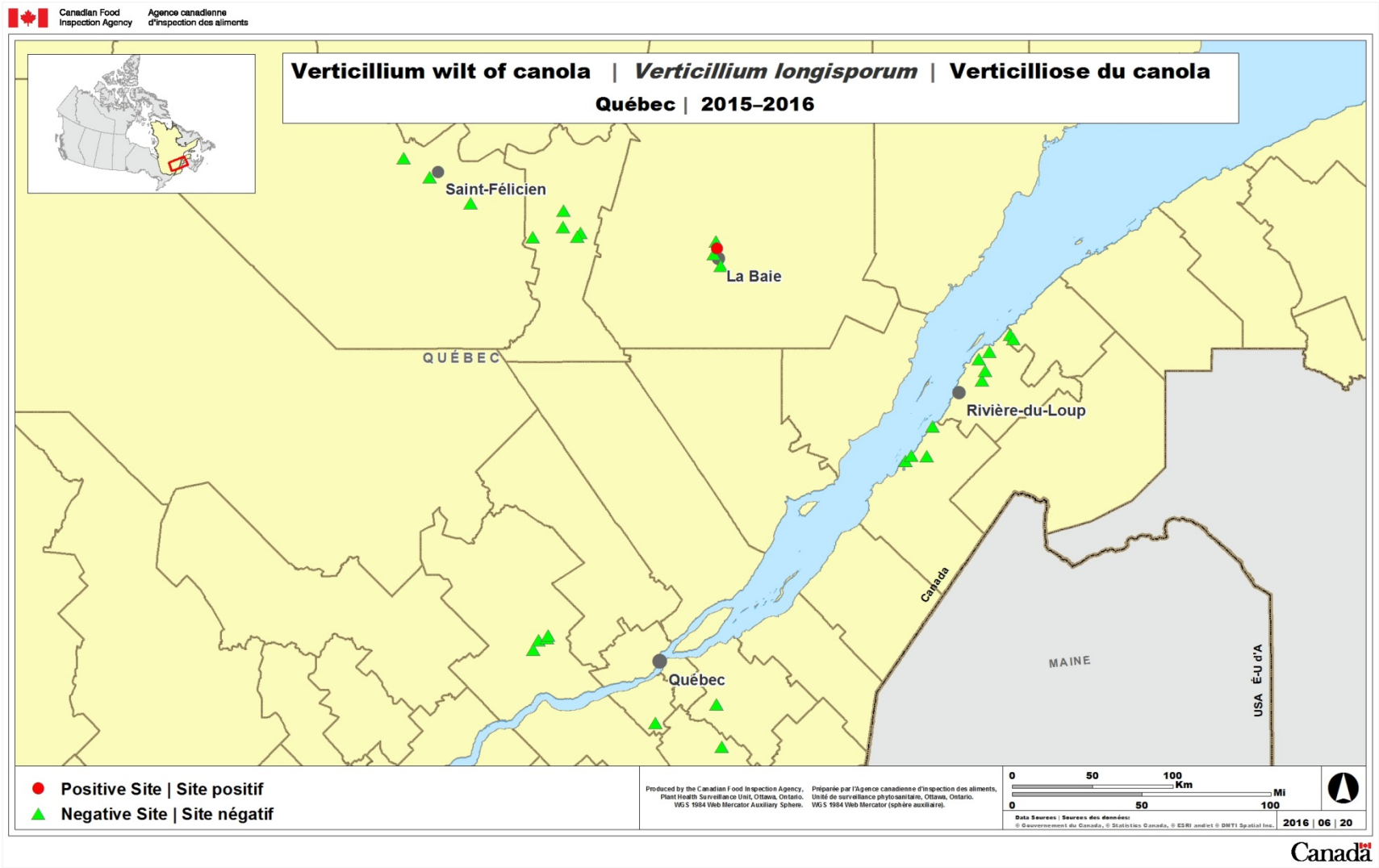


Figure 87. Survey map for *V. longisporum*, Québec

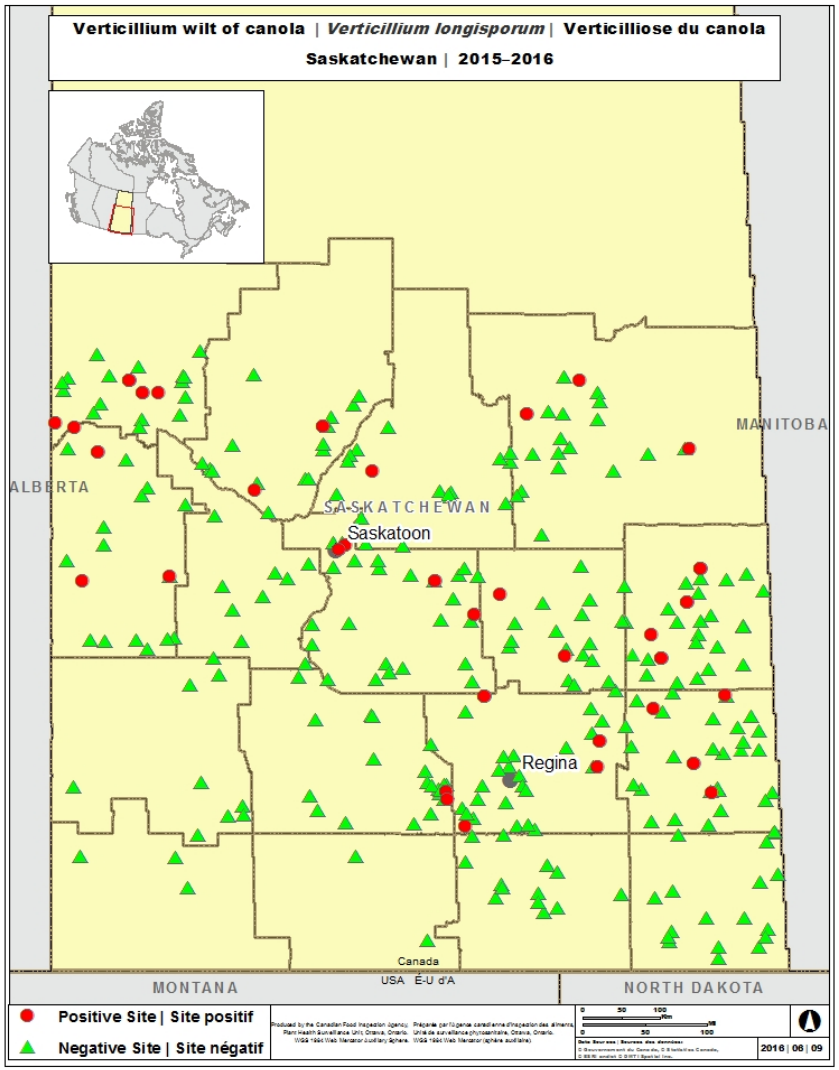


Figure 88. Survey map for *V. longisporum*, Saskatchewan

4.3 European corn borer *(Ostrinia nubilalis)*

Background

European corn borer (ECB) is an insect pest that has over 200 hosts. The primary economic damage is on corn, sorghum, soybean, millet, oat, barley, potato, and bean. ECB is found in Europe, Africa, western Asia, and North America. It is found in the United States in 42 states, including the major corn-producing states (Iowa, Illinois, Minnesota, and Nebraska). In Canada, it is found in all provinces except British Columbia. Therefore, the CFIA regulates ECB only for British Columbia.

Methodology

This survey was conducted in partnership with the British Columbia Ministry of Agriculture to determine whether ECB is present in British Columbia. Sites were selected for area-based coverage of corn production throughout British Columbia's Lower Mainland and Fraser Valley. In June, two traps were placed on the perimeter of each corn field, separated by at least 15 meters. Diamond traps were baited with lures of either the Iowa strain or New York strain of ECB. Traps were checked once in mid-season check and were taken down in late September.

Results

This survey was conducted at 39 sites in British Columbia. There were no detections of European corn borer in 2015–2016.

Map showing surveyed sites for *Ostrinia nubilalis*:

- Survey map for O. nubilalis, British Columbia

Figure 89. European corn borer

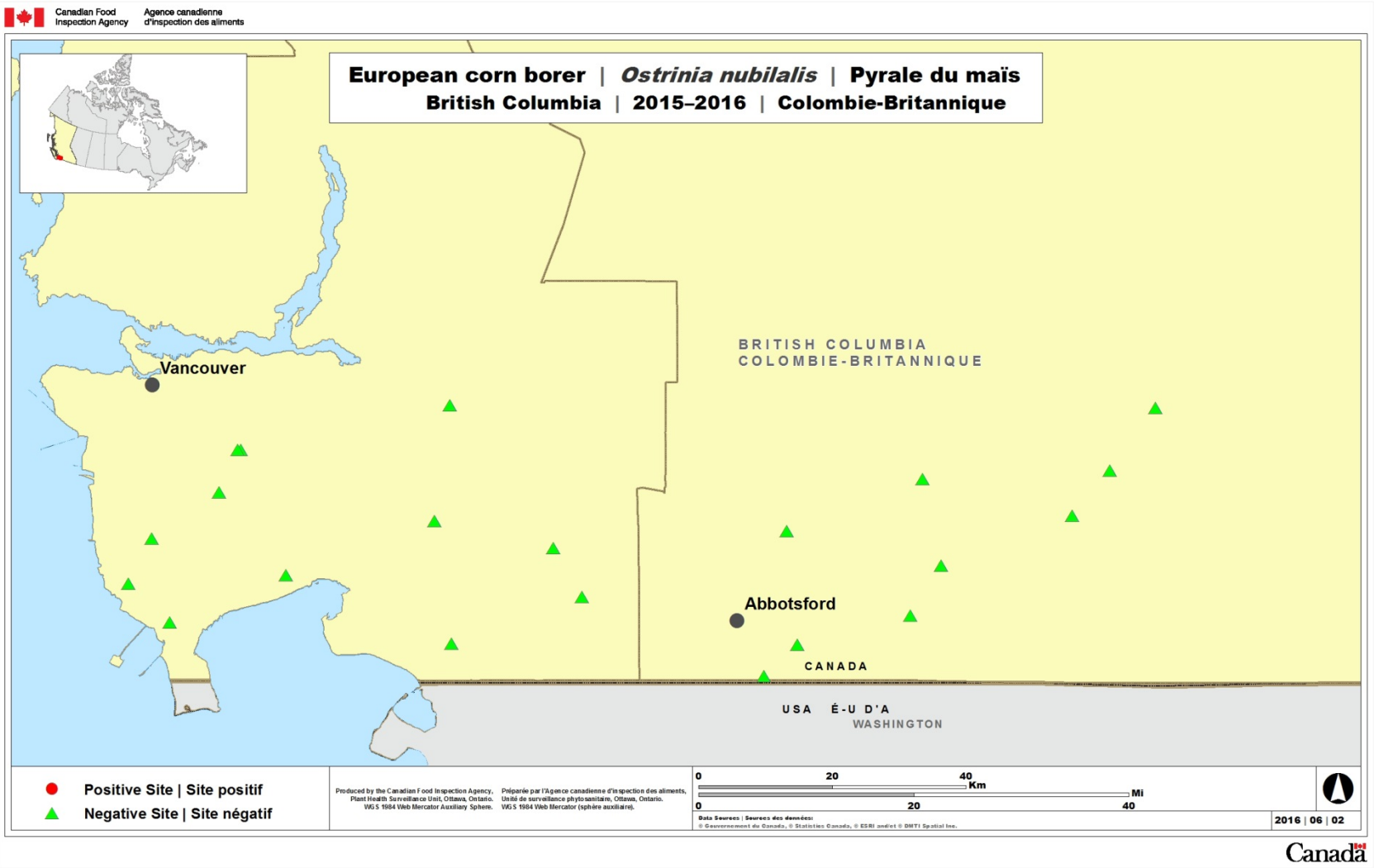
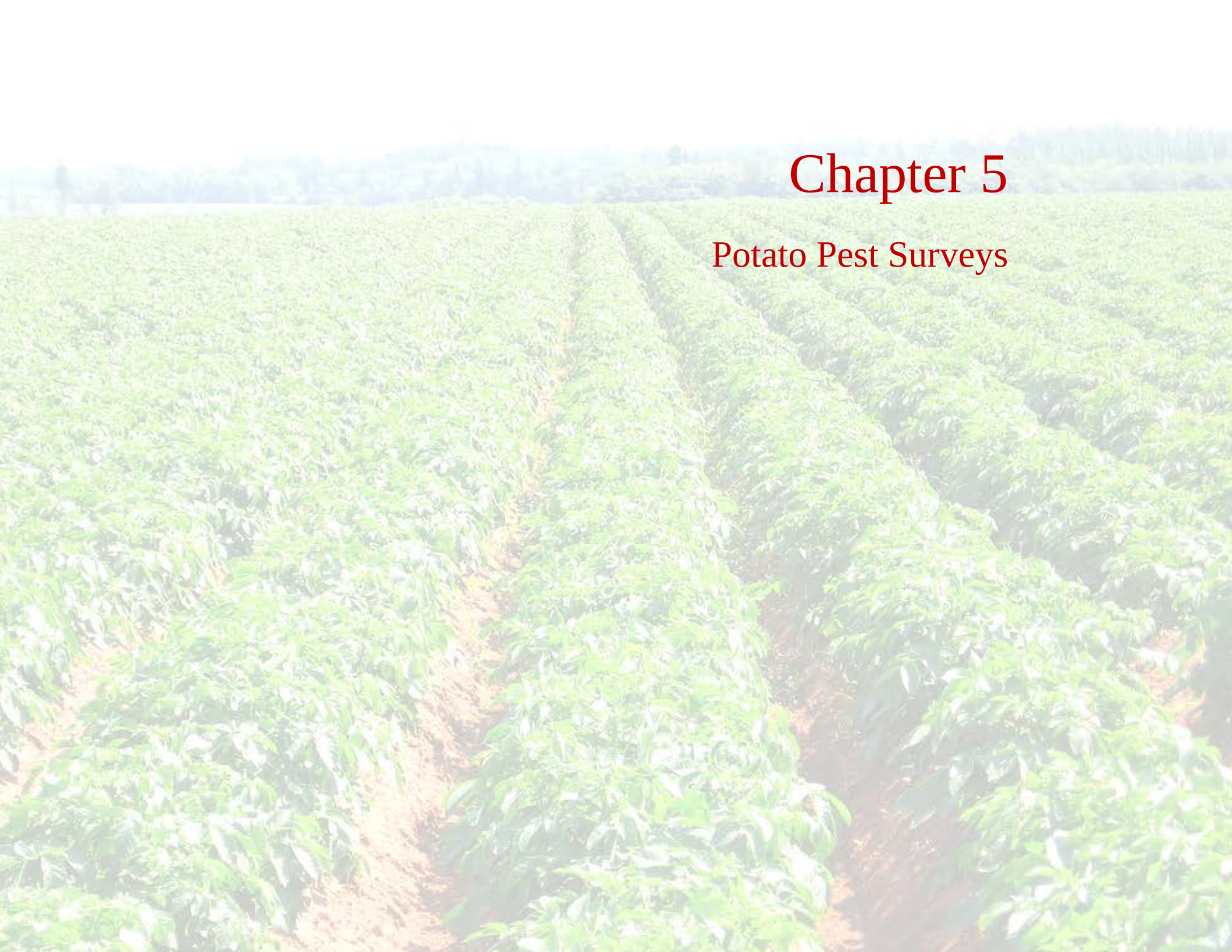


Figure 90. Survey map for *O. nubilalis*, British Columbia



Chapter 5

Potato Pest Surveys

5 POTATO PEST SURVEYS

In 2015, Canada produced 4.8 million tonnes of potatoes, a 5% increase from 2014 (StatsCan, 2016d). The top three potato-producing provinces were Prince Edward Island (24%), Manitoba (21%), and Alberta (18%). Canada is the fifth largest seed potato producer in the world. The introduction of economically important potato pests into Canada could result in substantial costs in eradication, containment or control. Pest establishment could lead to an increase in the use of chemical controls and could jeopardize export markets.

Significant events in 2015–2016: None

Changes in regulated areas in 2015–2016: None

5.1 Potato cyst nematode *(Globodera rostochiensis, G. pallida)*

Soil sampling is conducted each year across Canada to monitor this pest. For information on this pest visit the CFIA golden nematode page at the link below:
www.inspection.gc.ca/english/plaveg/pestrava/gloros/glorose.shtml

6 RESEARCH PROJECTS

The Plant Health Surveillance Unit is dedicated to preventative science and research that supports risk mitigation and early detection.

6.1 Chemical Ecology of Chinese *Agrilus* Species

The genus *Agrilus* contains more than 2,700 known species, including the devastating emerald ash borer (*A. planipennis*, EAB) which was introduced from Asia into North America via solid wood packaging material (SWPM). Even though ISPM 15 is being implemented, non-compliant SWPM is still intercepted at the border which allows non-indigenous pests an opportunity for introduction into Canada. Considering the quantity of species in the *Agrilus* genus and the increasing volume of exports from Asia, there is potential for another invasive *Agrilus* to become introduced into Canada. Prior to the discovery of EAB in North America in 2002, very little was known about the biology and chemical ecology of *Agrilus* in general. However, in order to detect non-indigenous pests at low levels, we need to determine which chemicals are attractive to these pests so that effective lures can be developed.

We are collaborating with the Institute of Chemistry at the Chinese Academy of Sciences in Beijing, China. This project uses gas-chromatograph electroantennographic detection (GC-EAD) to screen potential host tree volatiles that are attractive to various *Agrilus* species that attack temperate trees that occur in Canada (e.g. oak, poplar/aspen, maple, willow, etc.). Chemicals that elicit a strong antennal response will be candidates for further laboratory and field testing (not part of this project). Results from this project will eventually lead to the development of effective, pro-active early detection survey methods. 2015 is the 1st year of 3 for this project.

6.2 Testing Attraction of Commercially Available Traps and Lures to European *Agrilus* Species

The survey unit is collaborating with the National Forest Center (Slovakia) to the attraction of green and purple sticky prism traps and lures to European *Agrilus*. These prism traps are currently used by Canada (green) and US (purple) to detect EAB. The goal of this project is to determine if commercially available traps and lures can be used to detect other non-indigenous *Agrilus* species that attack temperate trees. 2015 is also the 1st year of 3 for this project.

6.3 Rearing Moth Eggs from International Vessels

Female Asian gypsy moths (*Lymantria dispar asiatica* and *L. dispar japonica*) are frequently attracted to lights at ports in China, Japan, Korea and the Russian Far East where they lay egg masses on the international vessels. As it is difficult to identify egg masses to the species level, unless an adult moth is associated with it, CFIA has historically only been able to identify egg masses to genus (i.e. *Lymantria*). And in instances where the egg mass does not clearly belong to a *Lymantria* species, the identity may be completely unknown. Therefore, CFIA does not have a complete risk profile of potential pests that are hitch hiking on vessels. The survey unit is collaborating with CFIA's entomology laboratory (OPL-entomology) and inspection staff as well as Canadian Forest Service and the University of British Columbia in rearing egg masses from high risk vessels at Simon Fraser University's level 2 containment facility. Reared adults are sent to OPL-entomology for identification and molecular diagnostics. This is an ongoing project.

6.4 Improving Detection Survey Methodology of Wood Boring Insects

The survey unit is supporting research by the Canadian Forest Service in examining the effect of trap colour and height on detecting European and Asian wood boring insects (e.g. bark beetles, longhorned beetles and jewel beetles). This project will determine which species from Europe and China are effectively detected in surveillance traps and which species are not, the trap color-lure-trap type combination that detects the greatest number of species, and the number of traps per site required to detect 50%, 75%, and 95% of species present. In particular, this project aims to increase our efficacy for detecting species of jewel beetles (like emerald ash borer) because the black multi-funnel traps currently used operationally detect very few jewel beetles. 2015 is the 1st year of 3 for this project.

6.5 Utilization of Unmanned Aerial Vehicles (UAV) to Detect Hemlock Woolly Adelgid

Hemlock woolly adelgid (HWA) can be distributed by birds and other animals and can occur high in the crown of very tall trees. Currently, CFIA inspectors conduct ground-based visual surveys to detect new populations of this insect. The white ovisacs produced by HWA are quite small (few millimetres) and therefore it can be difficult to detect this regulated pest if an infestation occurs high above ground level. The survey unit is supporting research by the Canadian Forest Service to test the capability of a small commercial UAV to detect the presence of HWA ovisacs. This is an ongoing project.

7 EDUCATION & OUTREACH

The Plant Health Surveillance Unit is committed to building and maintaining partnerships and networks through innovative education, outreach and awareness strategies that strengthen networks and build surveillance capacity.

7.1 Educational Materials

In 2015–2016, new pest credit cards were developed for oak wilt, kudzu, yellow starthistle, and brown spruce longhorn beetle. Pest credit cards were printed and distributed to inspection staff, partners and members of the public. Survey pest key tags were distributed to Canadian Border Services Agency (CBSA) on "what to look for" during wood packaging material inspections. New signage was designed, printed and distributed for Asian longhorned beetle, hemlock woolly adelgid, and invasive alien species trapping. New temporary tattoos were designed and printed for pink gypsy moth and spotted lanternfly. Additional temporary tattoos were printed for emerald ash borer and Asian longhorned beetle.

7.2 Events

Public outreach events attended in 2015–2016 include:

- The Entomological Society of Ontario's Bug Day at the Canadian Agriculture and Food Museum
- Ongoing establishment of ALHB outreach sites with simulated signs of infestation
- International Advanced Practitioner Workshop for Forest Health Professionals, University of Toronto
- Invasive Alien Species of Regulatory Significance: Early Detection Rapid Response Network (EDRR), attended by 50 stakeholders and interest groups
- Invasive Forest Pest Surveys: Ontario Commercial Arborists Association
- Arbour Day, City of Abbotsford, British Columbia
- Overview of ALHB (biology, impacts, survey methods) at the Invasive Species Council of BC workshop
- Overview of ALHB (biology, impacts, survey methods) at the Journées Acéricoles of the Québec Department of Agriculture, Fisheries and Food (MAPAQ) in 10 regions of Québec in collaboration with NRCan-CFS. In total, over 2,300 participants attended those sessions.

External training in 2015–2016:

- EAB and ALHB: seven workshops in Québec, attended by 1128 people

- Train the trainer sessions on EAB and ALHB with different partners in Mont St-Bruno: Société des Établissements de Plein Air du Québec (SEPAQ), Canadian Forces Base/Area Support Unit and other stakeholders, in collaboration with NRCan-CFS
- HWA Detection Workshop in York Region
- Lecture at Simon Fraser University, Masters of Pest Management program on CFIA and invasive species
- Lecture at the BC Institute of Technology, Sustainable Resource Management Department on invasive forest pests Simon Fraser University, Masters of Pest Management summer course workshop

7.3 Social Media

- Increase in followers for plant-health related information
- Twitter: @CFIA_Canada (EN), @ACIA_Canada (FR)
- Facebook: Don’t Move Firewood (DMF) campaign
- Pinterest: 13 invasive pests featured on Pinterest website
- Blog on HWA in collaboration with SEPAQ (April 2015): parcsquebec.com/blogue

8 REFERENCES

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Statistics Canada. 2016d. Table 001-0014 - Area, production and farm value of potatoes, annual, CANSIM (database). (Accessed: December 12, 2016).