

# Recovery Strategy for the Van Brunt's Jacob's-ladder (*Polemonium vanbruntiae*) in Canada

## Van Brunt's Jacob's-ladder



2012

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## PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c. 29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years.

The Minister of the Environment is the competent minister for the recovery of the Van Brunt's Jacob's-ladder and has prepared this strategy, as per section 37 of SARA. It has been prepared in cooperation with the Government of Quebec (ministère du Développement durable, de l'Environnement et des Parcs) and the Government of New Brunswick (Department of Natural Resources).

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Van Brunt's Jacob's-ladder and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment Canada and other jurisdictions and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities and budgetary constraints of the participating jurisdictions and organizations.

## ACKNOWLEDGEMENTS

Vincent Carignan and Matthew Wild (Environment Canada, Canadian Wildlife Service - Quebec region) as well as the members of the National recovery team for Van Brunt's Jacob's-ladder contributed to the development of the present recovery strategy. Simon Joly (Institut de recherche en biologie végétale), André Sabourin (consultant), Andréanne Blais (Conseil régional de l'environnement du Centre-du-Québec) and Patricia Désilets (Ministère de Développement durable, de l'Environnement et des Parcs) provided information on the Quebec occurrences and Sean Blaney and Stephen Gerriets (Atlantic Canada Conservation Data Centre) provided information on the New Brunswick occurrences. Matthieu Allard (Environment Canada, Canadian Wildlife Service - Quebec Region) produced the maps of the species' critical habitat. Marie-José Ribeyron and Ewen Eberhardt (Environment Canada, Canadian Wildlife Service - National Capital Region), Karine Picard, Alain Branchaud, Caroline Bureau and Emmanuelle Fay (Environment Canada, Canadian Wildlife Service - Quebec region) as well as Samara Eaton and Andrew Boyne (Environment Canada, Canadian Wildlife Service – Atlantic Region) provided comments on an earlier version of this document.

## EXECUTIVE SUMMARY

Van Brunt's Jacob's-ladder (*Polemonium vanbruntiae* Britt.) is a perennial herb of the family Polemoniaceae. It is endemic to the central Appalachians, in eastern North America, and is considered at risk throughout its range. Van Brunt Jacob's-ladder is found in wet, open to semi-open, rarely shaded areas that are prone to seasonal flooding (e.g. marshy alder or willow stands, riparian meadows associated with rivers or streams, wet clearings, and basins or depressions with herbaceous vegetation). The species was evaluated as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in November 2002 and was listed under the same status in Schedule 1 of the *Species at Risk Act* in January 2005.

There are an estimated 20 000 mature individuals of Van Brunt's Jacob's-ladder in Canada. However, a recent study suggests that this figure, which is based on visual estimates, could be an underestimate of the actual population. There are 14 occurrences<sup>1</sup> of Van Brunt's Jacob's-ladder in Canada, including two that are historical.

The main threat to Van Brunt's Jacob's-ladder is habitat loss through agricultural activities, forest harvesting, residential development, infrastructure construction and habitat degradation through canopy closure or activities such as the use of all-terrain vehicles.

Recovery of Van Brunt's Jacob's-ladder is considered technically and biologically feasible. The population and distribution objectives are to maintain the population size and area of occupancy of all naturally-occurring extant occurrences in Canada. The recommended recovery approaches aimed at achieving these objectives are detailed in the Broad strategies and approaches section.

The critical habitat for Van Brunt's Jacob's-ladder in Canada is identified in this recovery strategy as the suitable habitat within 30 m of each observation point<sup>2</sup> in the eleven naturally-occurring extant occurrences.

One or more action plans for Van Brunt's Jacob's-ladder will be completed within five years of the publication of this recovery strategy on the Species at Risk Public Registry.

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<sup>1</sup> An area of land and/or water in which a species or natural community is, or was, present (NatureServe, 2002).

<sup>2</sup> Each observation point represents one or several individuals in an occurrence.

## RECOVERY FEASIBILITY SUMMARY

Under section 41(1) of the *Species at Risk Act*, the competent minister must determine whether recovery of the listed wildlife species is technically and biologically feasible. On the basis of the following criteria established by Government of Canada (2009), recovery of Van Brunt's Jacob's-ladder is considered biologically and technically feasible because the answers to the following questions are "yes" or "unknown":

**1. *Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.***

Yes. Mature (flowering) individuals have been observed in all extant Canadian occurrences. In addition, Van Brunt's Jacob's-ladder can reproduce both sexually and vegetatively.

**2. *Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.***

Yes. According to COSEWIC (2002), areas of a sufficient size are available to maintain the species. Due to its ecological adaptability, it can colonize various wet habitat types, some anthropogenic, such as moist fallow fields and logging road ditches. Potential habitat is reportedly found in the valleys surrounding Quebec populations, within the current extent of occurrence of the species. Habitat does not appear limiting in New Brunswick as there is much unoccupied habitat within the southwestern New Brunswick range of the species with characteristics similar to occupied sites.

**3. *The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.***

Yes. The threats of greatest concern (agriculture, forestry, canopy closure) can be avoided or mitigated through the proposed recovery approaches.

**4. *Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.***

Yes. The necessary awareness tools could easily be developed. With respect to the conservation of occurrences appropriate effective tools already exist.

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## 1. COSEWIC\* SPECIES ASSESSMENT INFORMATION

**Date of Assessment:** November 2002

**Common Name (population):** Van Brunt's Jacob's-ladder

**Scientific Name:** *Polemonium vanbruntiae*

**COSEWIC Status:** Threatened

**Reason for Designation:** Few extant populations occupying very small habitats at risk from agricultural impacts, logging and other development pressures, and recreational activities.

**Canadian Occurrences:** QC, NB

**COSEWIC Status History:** Designated Threatened in April 1994. Status re-examined and confirmed in November 2002.

\*COSEWIC – Committee on the Status of Endangered Wildlife in Canada

## 2. SPECIES STATUS INFORMATION

Approximately 10% of Van Brunt's Jacob's-ladder global range is located in Canada. The species was listed as Threatened in Schedule 1 of the *Species at Risk Act* (SARA) (S.C. 2002, c. 29) in January 2005. It is designated Threatened in Québec under *An Act Respecting Threatened or Vulnerable Species* (R.S.Q. c. E-12.01) since 1996. The species has no official status in New Brunswick.

NatureServe (2010) gives the species a global conservation rank of G3G4 (vulnerable/apparently secure), a Canadian national rank of N1 (critically imperilled) and sub-national ranks of S1 (critically imperilled) in both Quebec and New Brunswick.

## 3. SPECIES INFORMATION

### 3.1 Species Description

Van Brunt's Jacob's-ladder is an herbaceous perennial of the family Polemoniaceae. The stems are upright, 40 to 140 cm tall. The leaves are composed of 7 to 21 ovate to oblong leaflets. The paniced<sup>3</sup> flowers, which are blue-violet in colour, are 15 to 25 mm in diameter and have 5 petals and 5 sepals; the stamens are yellow. The fruit is an ovoid capsule containing brownish-black seeds (COSEWIC, 2002). The plant often grows in dense patches due to its propagation by horizontal rhizomes.

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<sup>3</sup> A compound inflorescence formed by a cluster of clusters along a simple axis.

### 3.2 Population and Distribution

Van Brunt's Jacob's-ladder is endemic to the central Appalachians, in eastern North America (Figure 1). It ranges from West Virginia northward to the southernmost part of Quebec, New Brunswick and eastern Maine. It is sporadic throughout its entire range and more common in New York State (COSEWIC, 2002).

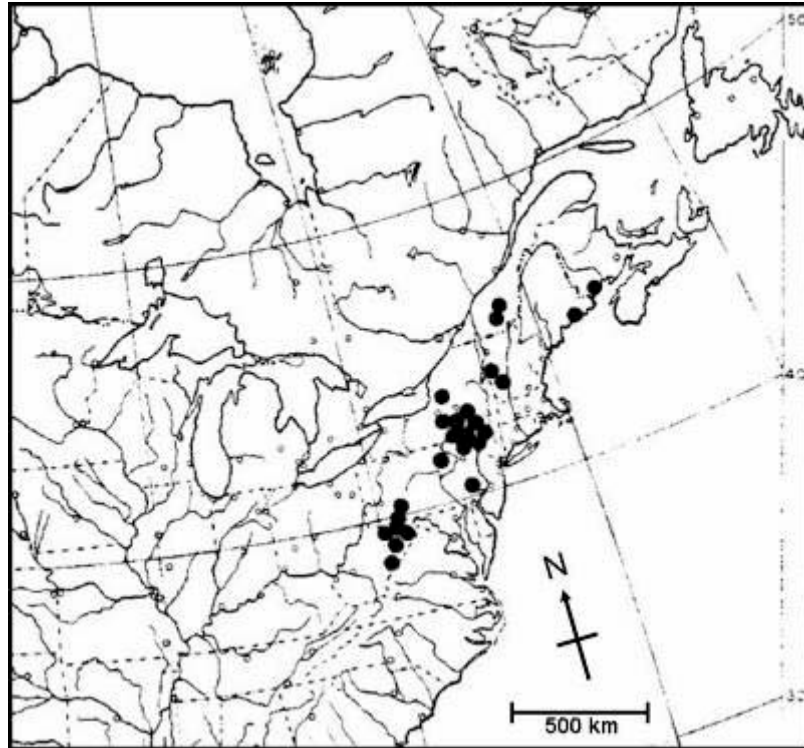


Figure 1. Distribution of Van Brunt's Jacob's-ladder in North America (adapted from COSEWIC, 2002)

The number of mature individuals of Van Brunt's Jacob's-ladder currently known in Canada is approximately 20 000. However, a recent study by researchers at Université de Montréal's Institut de recherche en biologie végétale suggests that this figure, which is based on visual estimates, could be an underestimate (Pellerin and Brouillet, 2005).

In Canada, there are 14 occurrences of Van Brunt's Jacob's-ladder, 11 in Quebec and three in New Brunswick (Table 1). In Quebec, two occurrences are historical (Saint-Christophe-d'Arthabaska and Wotton). In New Brunswick, an occurrence that had last been reported in 1885 at Trout Lake was rediscovered in 2009. The occurrence reported at Hoyt (Sunbury County) is believed to be the result of introduced specimens (Hinds, 1983).



**Table 1: Occurrences of Van Brunt's Jacob's-ladder in Canada.**

Name of Occurrence	CDPNQ/ ACCDC <sup>a</sup> ID	County	Province	Status of Occurrence	Abundance	Year Observed	Area Occupied (m <sup>2</sup> ) <sup>b</sup>
Stoke River	5610	Le Val-Saint-François	QC	Extant	2300 300 1000-5000	1994 2001-2 2009	5 300
Ham-Nord – Développement-Boisvert-West	5606	Arthabaska	QC	Extant	300 330 1075	1994 2001-2 2010	5 600
Ham-Nord – Développement-Boisvert-East and South	5608 <sup>c</sup>	Arthabaska	QC	Extant	3300 13 000 3000 3000	1994 2001-2 2009 2010	4 500
	South sector				Arthabaska	QC	
Ham-Nord-Domaine des Sept-Chutes	19767	Arthabaska	QC	Extant	112	2010	1 400
Saints-Martyrs-Canadiens	5609	Arthabaska	QC	Extant	1000 900 300 330	1994 2001-2 2009 2010	830
Saint-Camille <sup>d</sup>	10807	Les Sources	QC	Extant	2000 114 660 134 299 128 419 53 390	2001-2 2005 2007 2008 2009	2 600
Saint-Joseph-de-Ham-Sud	10808	Les Sources	QC	Extant	300 0 300	2001-2 2009 2010	1 700
Mont-Carrier-Sud	5601	Le Val-Saint-François	QC	Extant	100 70 200	1994 2001-2 2009	200
Saint-Adrien	5605	Les Sources	QC	Extant	30	2002	Unknown
Saint-Christophe-d'Arthabaska	5603	Arthabaska	QC	Historical	Unknown	1943	Unknown
Wotton	5604	Les Sources	QC	Historical	0	2001	Unknown
Dipper Harbour Creek	1048748/ 1048749 <sup>e</sup>	Saint John	NB	Extant	500-1000 250-1000	2005 2009	13 100
Trout Lake	1048735	Charlotte	NB	Extant	Unknown 100	1885 2009	Unknown
Hoyt	-	Sunbury	NB	Introduced	Unknown	1983	Unknown

Sources: Hinds (1983), COSEWIC (2002), Gouge (2003), Brouillet and Pellerin (2005), Jean (2007), S. Clayden (2007, ACCDC pers. comm), CDPNQ (2008, 2011), Joly (2009), Leclerc (2009), Sabourin (2010)

<sup>a</sup> Centre de données sur le patrimoine naturel du Québec; Atlantic Canada Conservation Data Center

<sup>b</sup> This area was measured during the 2009 or 2010 field seasons.

<sup>c</sup> Since the East and South sectors are less than 1 km apart (< 800 m), they were recently (2011) merged into a single occurrence (ID 5608) according to the NatureServe (2010) methodology. However, these sectors have been monitored as two distinct units since 1994 and the data is reported accordingly.

<sup>d</sup> This occurrence has been the object of a study to develop a more accurate counting method for the species. This results in relatively high fluctuations in the reported number of individuals at the site. For example, Jean (2007) reports 114 660 individuals for 2005 whereas Pellerin and Brouillet (2005) report 72 000 plants.

<sup>e</sup> Since these two occurrences are less than 1 km apart (< 400 m), they are merged into a single occurrence (ID 1048748/1048749) (CDPNQ, 2011).

### 3.3 Needs of the Van Brunt's Jacob's-ladder

In Canada, Van Brunt's Jacob's-ladder occurs in wet, open to semi-open, rarely shaded habitats that are prone to seasonal flooding (e.g. marshy alder or willow stands, riparian meadows associated with rivers or streams, wet clearings, and basins or depressions with herbaceous vegetation) (COSEWIC, 2002; Comité FloraQuebeca, 2009). Although the species is presumed to have low dispersal capabilities, as observed through its absence in suitable habitat next to extant occurrences (Désilets et al., 2011), it has been known to occupy transitional zones, such as wet uncultivated or abandoned fields, or logging road ditches (COSEWIC, 2002). The maintenance of some degree of open canopy appears to be important to the survival and growth of individuals.

Van Brunt's Jacob's-ladder often occurs near the foot of slopes and seepage areas submitted to spring or seasonal flooding, but not to permanent flooding or flooding that persists during the entire growing season. This water regime is an important element of the species' habitat. The flat or gently sloping terrain on which the species occurs promotes sediment accumulation, which enriches the soils. The foot of slopes and other sites where lateral drainage or runoff occurs are favourable to the formation of rich, deep, moist soils. This substrate generally contains few or no stones (COSEWIC, 2002).

The plant species most commonly associated with Van Brunt's Jacob's-ladder are Speckled Alder (*Alnus incana* subsp. *rugosa*), Canada Bluejoint (*Calamagrostis canadensis*), Virgin's Bower (*Clematis virginiana*), sedges (*Carex* spp.), Flattop White Aster (*Doellingeria umbellata*), Joe-pye Weed (*Eupatorium maculatum*), willows (*Salix* spp.), Broad-leaved Meadowsweet (*Spiraea latifolia*) and Tall Meadow-rue (*Thalictrum pubescens*) (COSEWIC, 2002).

## 4. THREATS

### 4.1 Threat Assessment

Table 2. Threat Assessment Table.

Threat	Level of Concern <sup>1</sup>	Extent	Occurrence	Frequency	Severity <sup>2</sup>	Causal Certainty <sup>3</sup>
<b>Habitat loss or degradation</b>						
<b>Agricultural activities</b>	High	Localized	Current	Continuous	High	Moderate
<b>Residential development</b>	Moderate	Localized	Anticipated	Continuous	High	Moderate
<b>Forest harvesting</b>	Moderate	Localized	Current	Unknown	Moderate	Moderate
<b>Infrastructure construction</b>	Low	Localized	Current	One-time	Moderate	Moderate
<b>All-terrain vehicles</b>	Low	Localized	Current	Unknown	Low	Low
<b>Activities or natural processes</b>						
<b>Canopy closure</b>	Low	Widespread	Current	Continuous	Unknown	Low

<sup>1</sup> *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the species, consistent with the population and distribution objectives. This criterion considers the assessment of all the information in the table.*

<sup>2</sup> *Severity: reflects the population-level effect (High: very large population-level effect, Moderate, Low, Unknown).*

<sup>3</sup> *Causal certainty: reflects the degree of evidence that is known for the threat (High: available evidence strongly links the threat to stresses on population viability; Medium: there is a correlation between the threat and population viability e.g. expert opinion; Low: the threat is assumed or plausible).*

### 4.2 Description of Threats

Threats are listed in order of decreasing level of concern. Most of the information in this section relates to the Quebec occurrences since, at the time of writing the COSEWIC report, they were the only extant occurrences for which information was available. Many of these occurrences have been monitored since 1994. The extent to which these threats apply to New Brunswick occurrences has not been determined.

#### Agricultural activities

Agricultural activities such as mowing, ploughing, drainage and the cultivation of Christmas trees are particularly harmful in wet or riparian meadows. They can affect the drainage conditions to which Van Brunt's Jacob's-ladder are associated thereby reducing the vigour of plants. More directly, these activities can lead to some individuals being cut before they produce seeds and to the loss of suitable habitat. The Wotton occurrence was extirpated between 1991 and 2000 following the establishment of a Christmas tree-growing operation, and part of the

Stoke River occurrence was affected following ploughing and mowing of a nearby field (COSEWIC, 2002). The expansion of agricultural activities also poses a threat to the Saint-Camille and Mont-Carrier-Sud occurrences.

#### Forest harvesting

Timber harvest, for reasons mentioned above, is also harmful to the species. This activity has caused the disappearance of part of the Saints-Martyrs-Canadiens occurrence (Blais, 2011) and may have affected one of the occurrences in the New Brunswick range (S. Clayden, personal communication).

#### Residential development

Home or cottage construction could harm part of the Ham-Nord Développement-Boisvert-West occurrence in the medium term by removing suitable habitat (Blais, 2011).

#### Infrastructure construction

Road infrastructure pose another threat to the species by altering drainage. It can also lead to the physical separation of once-connected occurrences (e.g. Saint-Adrien) (A. Sabourin, personal communication). Dam construction could also pose a problem although no projects are currently planned near Van Brunt Jacob's-ladder occurrences (COSEWIC, 2002).

#### All-terrain vehicles

Trails for all-terrain vehicles can lead to trampling of individuals and disturbance of habitat which has been observed in the Développement-Boisvert-East occurrence (COSEWIC, 2002).

#### Canopy closure

The natural process of plant succession could result in a decline in Van Brunt's Jacob's-ladder habitat quality by causing canopy closure and reducing the amount of available light. Although plant succession is a natural process, the lack of habitat available combined to the limited dispersal capabilities of the species in the context of a fragmented landscape is such that natural succession would be a threat. This threat could be aggravated by land management practices aimed at managing other natural processes that prevent plant succession (control of beaver populations, bank stabilization, etc.).

## **5. POPULATION AND DISTRIBUTION OBJECTIVES**

The potential for finding additional sites and the number of viable occurrences required to ensure the survival of the species in Canada has not been determined. In the absence of greater certainty, the population and distribution objectives for Van Brunt's Jacob's-ladder are to maintain the population size and area of occupancy of all naturally-occurring extant occurrences in Canada. The Hoyt occurrence was excluded because it is believed to be the result of introduced specimens.

## 6. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES

### 6.1 Actions Already Completed or Underway

#### Conservation and stewardship

The Ministère du Développement durable, de l'Environnement et des Parcs du Québec is in the process of developing a conservation plan for the recovery of Quebec occurrences of Van Brunt's Jacob's-ladder (Désilets et al., 2011) although no final plan is currently available. Through land acquisition and conservation easements, the Société de conservation des milieux humides du Québec has been able to establish two nature reserves on private property and to protect all or part of the habitat of some of the occurrences identified as priorities (Développement Boisvert East and South; Saint-Martyrs-Canadiens). No steps have yet been taken for the recently (re)discovered occurrence in New Brunswick.

In 2010, the Conseil régional de l'environnement du Centre-du-Québec (CRECQ) initiated a habitat stewardship project for Van Brunt's Jacob's-ladder in the Centre-du-Québec region. Activities included inventories in certain occurrences and surveys in other suitable habitats in order to suggest conservation measures to concerned land-owners. This non-governmental organization recently published a conservation plan for the Quebec occurrences of Van Brunt's Jacob's-ladder (Blais, 2011)

The Jardin Botanique de Montréal is involved in *ex situ* conservation measures of the Saint-Camille and Stoke River occurrences as well as being involved with public awareness of the species. Meetings have been held with the landowners on whose property these occurrences are found to increase their awareness of the species.

#### Monitoring and research

A five-year demographic study was initiated in 2005 by the Institut de recherche en biologie végétale for the Saint-Camille occurrence (Brouillet and Pellerin, 2005; Boisjoly, 2007; Jean, 2007; Leclerc, 2009). As part of this project, Brouillet and Pellerin (2005) also characterized the soil conditions and species associated with this occurrence and implemented a new monitoring protocol during 2005 only.

## 6.2 Strategic Direction for Recovery

**Table 3. Recovery planning table**

<b>Threat or Limitation</b>	<b>Priority</b>	<b>Broad Strategy to Recovery</b>	<b>General Description of Research and Management Approaches</b>
All	High	Conservation and stewardship of the species and its suitable habitat	- Develop a conservation strategy that includes: a) protection using legal tools (e.g. land acquisition and stewardship agreements, etc.) b) the identification and mitigation of threats through best management practices for landowners and land managers
Knowledge gaps	Medium	Survey and monitoring	- Adopt a standardized methodology for conducting inventories (accurate counts) and monitoring extant and historic occurrences - Specify the limits for the critical habitat at the Trout Lake and Dipper Harbour Creek occurrences - Survey for new sites in appropriate habitats
Knowledge gaps	Medium	Research	- Establish what constitutes a viable population size - Examine the genetic diversity of the Quebec occurrences
All	Medium	Communication and outreach	Proceed with the development and implementation of a communication strategy with partner agencies, interest groups, private landowners and the general public.

## 7. CRITICAL HABITAT

### 7.1 Identification of the Species' Critical Habitat

The Van Brunt's Jacob's-ladder colonizes a variety of open or semi-open wetlands. The biophysical attributes of suitable habitat for Van Brunt's Jacob's-ladder include:

- 1) marshy alder or willow stands, riparian meadows associated with rivers or streams, wet clearings, and basins or depressions with herbaceous vegetation;
- 2) foot of slopes and seepage areas where lateral drainage or runoff are favourable to the formation of rich, deep, moist soils;
- 3) soils subjected to seasonal flooding (no permanent flooding)
- 4) exposure to sunlight through a relatively open canopy;
- 5) most commonly associated species are Speckled Alder, Canada Bluejoint, Virgin's Bower, sedges, Flattop White Aster, Joe-pye Weed, willows, Broad-leaved Meadowsweet and Tall Meadow-rue.

Critical habitat for Van Brunt's Jacob's-ladder in Canada is identified in this recovery strategy as the suitable habitat within 30 m of each observation point in the eleven naturally-occurring extant occurrences (Appendix A). This distance was selected on the basis of study results that examined the edge effects of land-use activities that may affect the availability of resources and population growth of many plant species (see Henderson, 2010). When the 30 m surrounding adjacent observation points overlapped, they were merged into a single polygon containing critical habitat. Any element contained within the polygon that does not correspond to the attributes of suitable habitat (ex. house, road, mature forest) is not considered critical habitat.

In Quebec, the data used to map critical habitat was collected in 2009 and 2010 by taking GPS coordinates (observation points) along the outer limits of patches of Van Brunt's Jacob's-ladder. The only exception was the Saint-Adrien occurrence that was not visited and for which the 2002 data available in the CDPNQ was used. The Dipper Harbour Creek data (New Brunswick) was collected in a similar fashion to the Quebec data during the 2009 field season; however the area between the two observations at this occurrence has not been surveyed. The Trout Lake data corresponds to a single observation point (unknown number of individuals) and further field work will be necessary to draw more specific critical habitat limits.

## 7.2 Activities Likely to Result in Destruction of Critical Habitat

Destruction is determined on a case by case basis. Destruction would result if part of the critical habitat was degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from a single activity or multiple activities at one point in time or from the cumulative effects of one or more activities over time (Government of Canada, 2009).

The critical habitat of Van Brunt's Jacob's-ladder may be destroyed through multiple anthropogenic activities:

- *Habitat conversion (direct loss)*. The exploitation/conversion of fallow fields or forests harvesting, road infrastructure projects, and cottage or residential development all result in direct habitat loss (critical habitat destruction). The mowing of fallow fields can also damage plants and prevent seed production.
- *Alteration of the water regime (prolonged drought or flooding)*. Because Van Brunt's Jacob's-ladder is a species living in wet but not aquatic habitats, critical habitat of the species can be degraded by any activity that affects the water regime, by either prolonged flooding or drying of the substrate such as agricultural and forestry drainage. Activities that modify the dynamics of the water regime, such as dam construction, can destroy critical habitat, even when such activities occur at a distance from it.
- *Land management*. By controlling certain natural processes that prevent vegetation succession (beaver dams, shoreline erosion, etc.), land management practices could result in the destruction of critical habitat by degrading the conditions necessary for the plants to grow (e.g. competition with shrubs).
- *Soil compaction*. Activities that cause soil compaction, such as ATV traffic, also contribute to the decline in critical habitat quality by affecting the drainage conditions.

These examples do not represent an exhaustive list of the activities likely to destroy the critical habitat of Van Brunt's Jacob's-ladder.

## **8. MEASURING PROGRESS**

The performance indicators presented below propose a means of determining and measuring the progress made towards the achievement of the population and distribution objectives. The specific progress made towards the implementation of the recovery strategy will be measured every five years against the following performance indicator:

- the population size and area of occupancy are maintained at each of the naturally-occurring extant occurrences of Van Brunt's Jacob's-ladder in the species' Canadian range.

## **9. STATEMENT ON ACTION PLANS**

One or more action plans for Van Brunt's Jacob's-ladder will be completed within five years of the publication of this recovery strategy on the Species at Risk Public Registry.



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## APPENDIX A: VAN BRUNT'S JACOB'S-LADDER CRITICAL HABITAT

Table A-1. Information concerning Van Brunt's Jacob's-ladder critical habitat.

Occurrence name	Province	Centroid		Area (m <sup>2</sup> )	Land tenure
		Latitude	Longitude		
Stoke River	QC	45,55501	-71,88317	17 850	Non federal
Ham-Nord – Développement-Boisvert West	QC	45,83015	-71,64851	5 999	Non federal
Ham-Nord – Développement-Boisvert East and South	QC	45,82682 (East sector)	-71,62905 (East sector)	29 265 (19412 in East sector; 9853 in South sector)	Non federal
		45,81910 (South sector)	-71,63191 (South sector)		
Ham-Nord-Domaine des Sept-Chutes	QC	45,83786	-71,66273	3 639	Non federal
Saints-Martyrs-Canadiens	QC	45,86860	-71,55588	7 915	Non federal
Saint-Camille	QC	45,74134	-71,68061	11 113	Non federal
Saint-Joseph-de-Ham-Sud	QC	45,72690	-71,64084	10 888	Non federal
Mont-Carrier Sud	QC	45,53383	-71,89291	4 600	Non federal
Saint-Adrien	QC	45,82700	-71,73600	2 800	Non federal
Dipper Harbour Creek	NB	45,11632 (North sector)	-66,45653 (North sector)	15 600 (4700 in North sector; 10 900 in South sector)	Non federal
		45,11247 (South sector)	-66,45380 (South sector)		
Trout Lake	NB	45,17616	-66,76458	2 815	Non federal

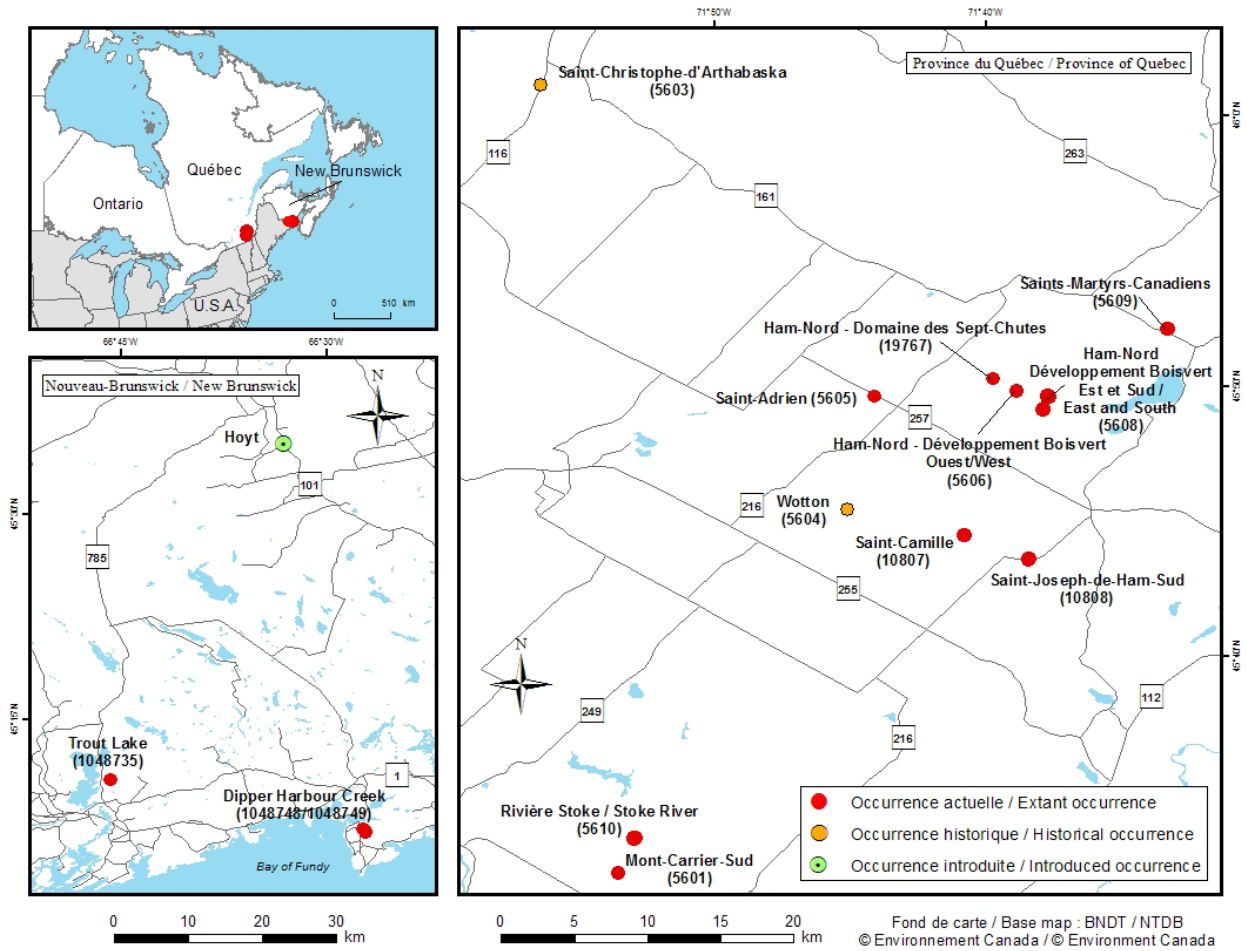


Figure A-1: Location of Van Brunt's Jacob's-ladder occurrences in Canada.

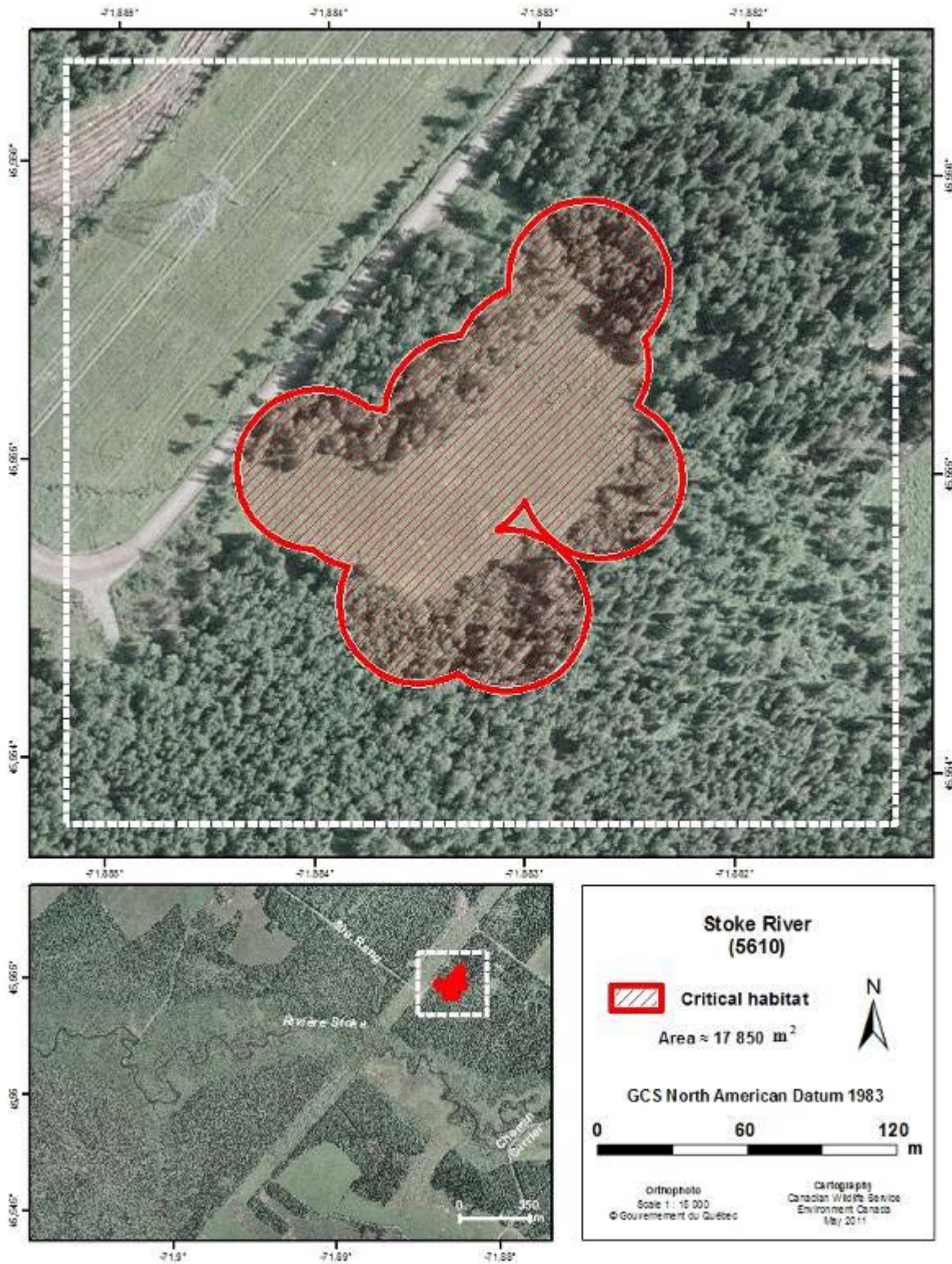


Figure A-2: Polygon containing critical habitat at Stoke River.



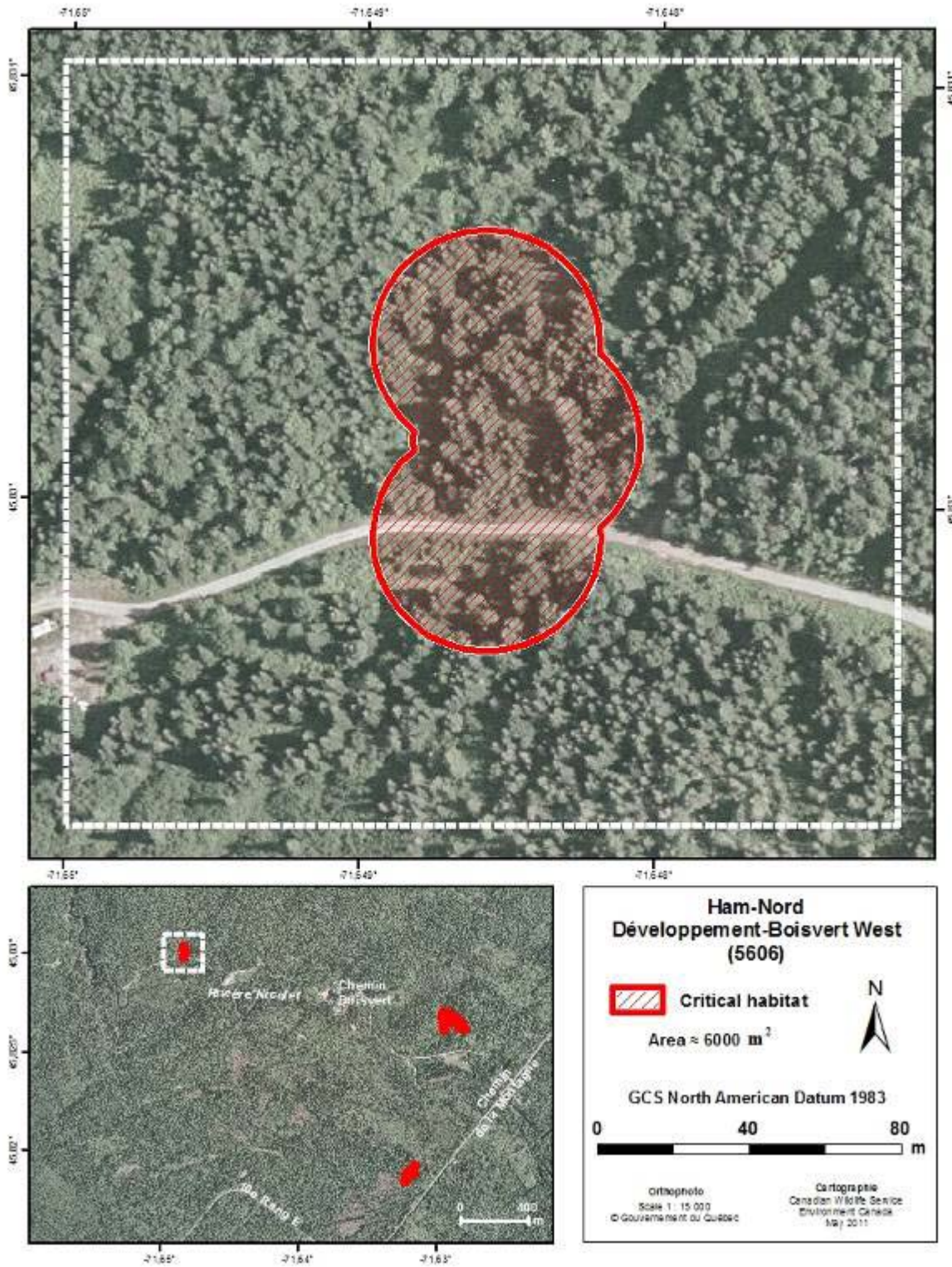


Figure A-3: Polygon containing critical habitat at Ham-Nord-Développement-Boisvert West.



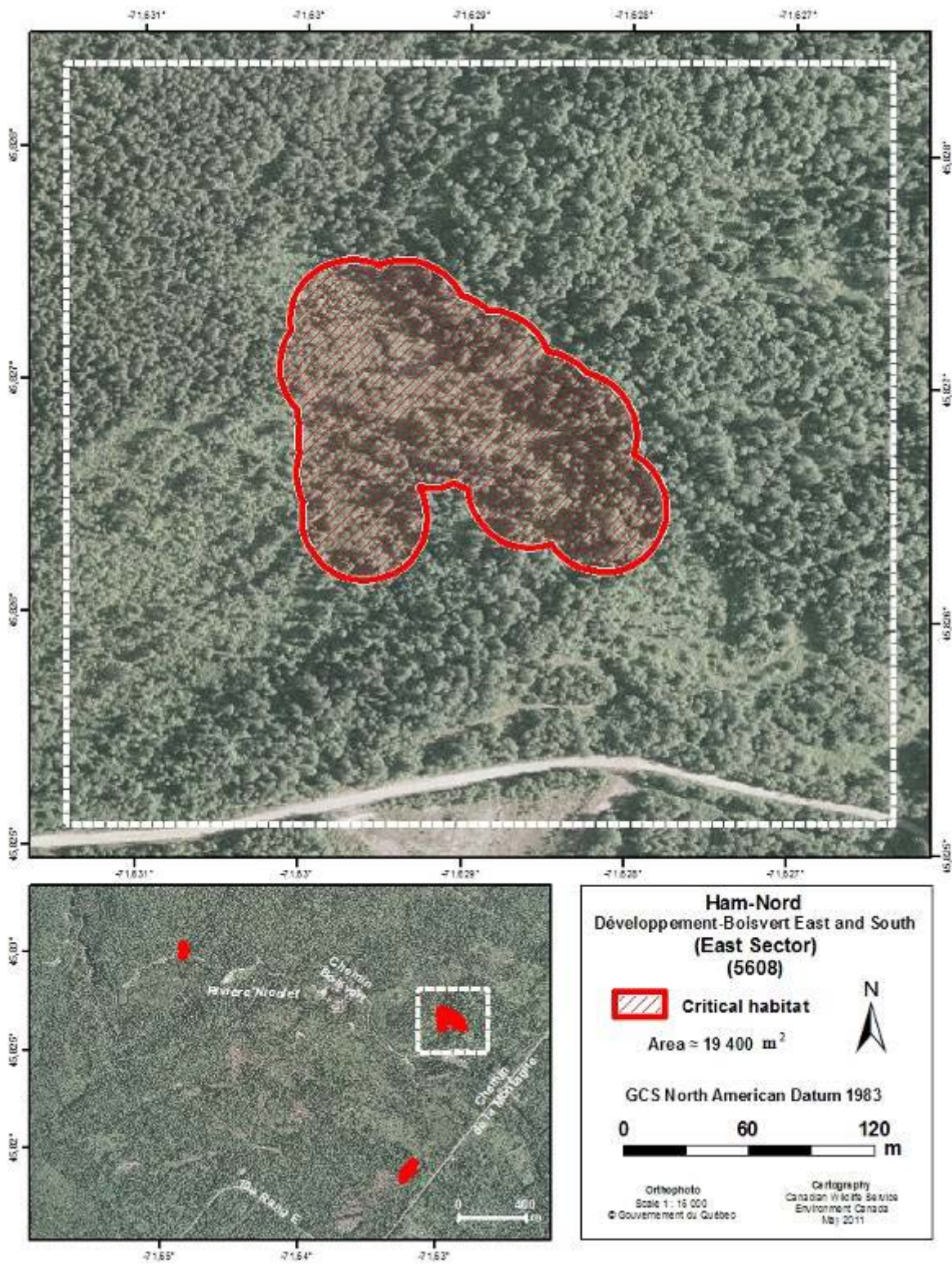


Figure A-4: Polygon containing critical habitat at Ham-Nord-Développement-Boisvert East and South (East sector)



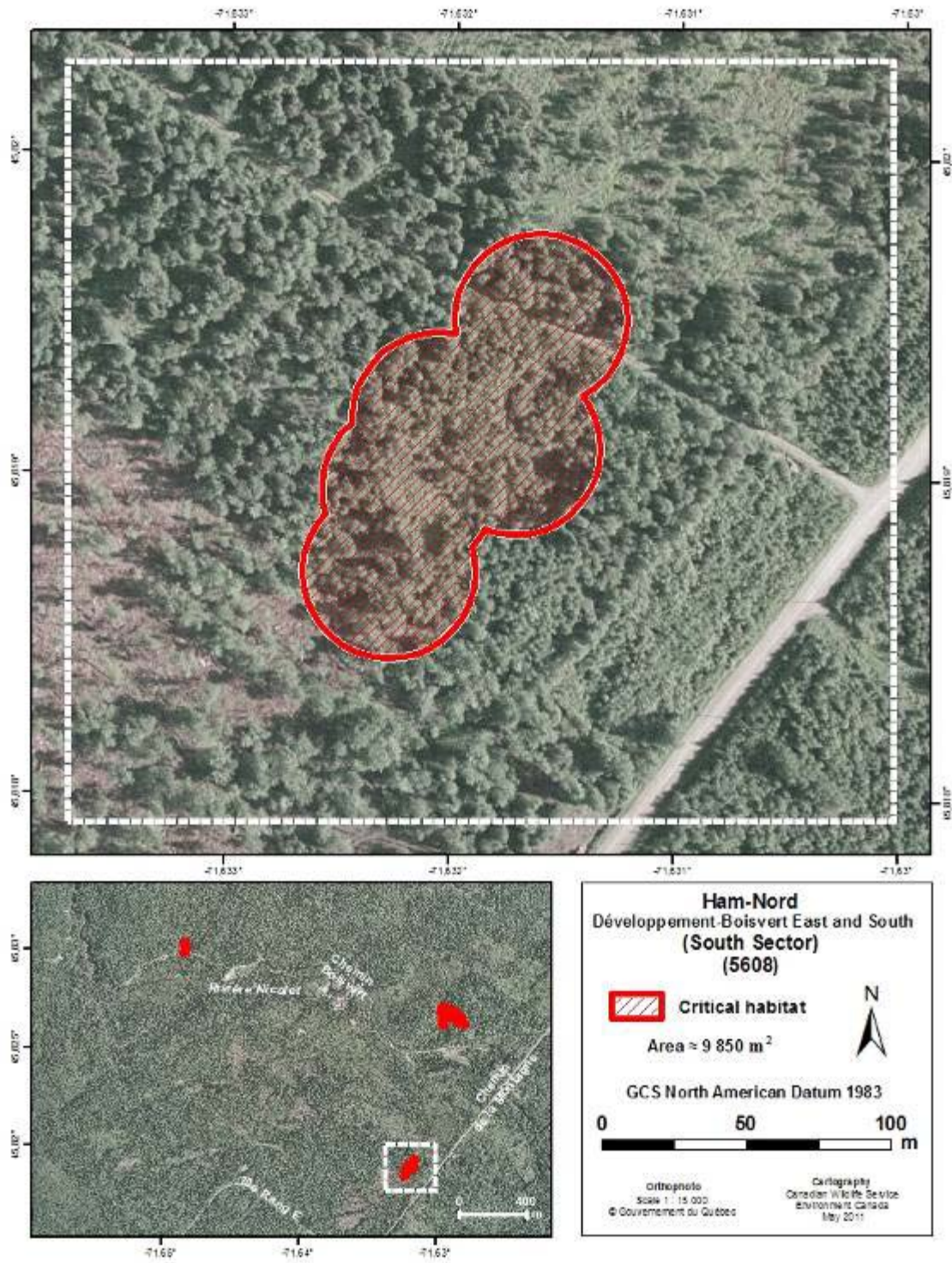


Figure A-5: Polygon containing critical habitat at Ham-Nord-Développement-Boisvert East and South (South sector).



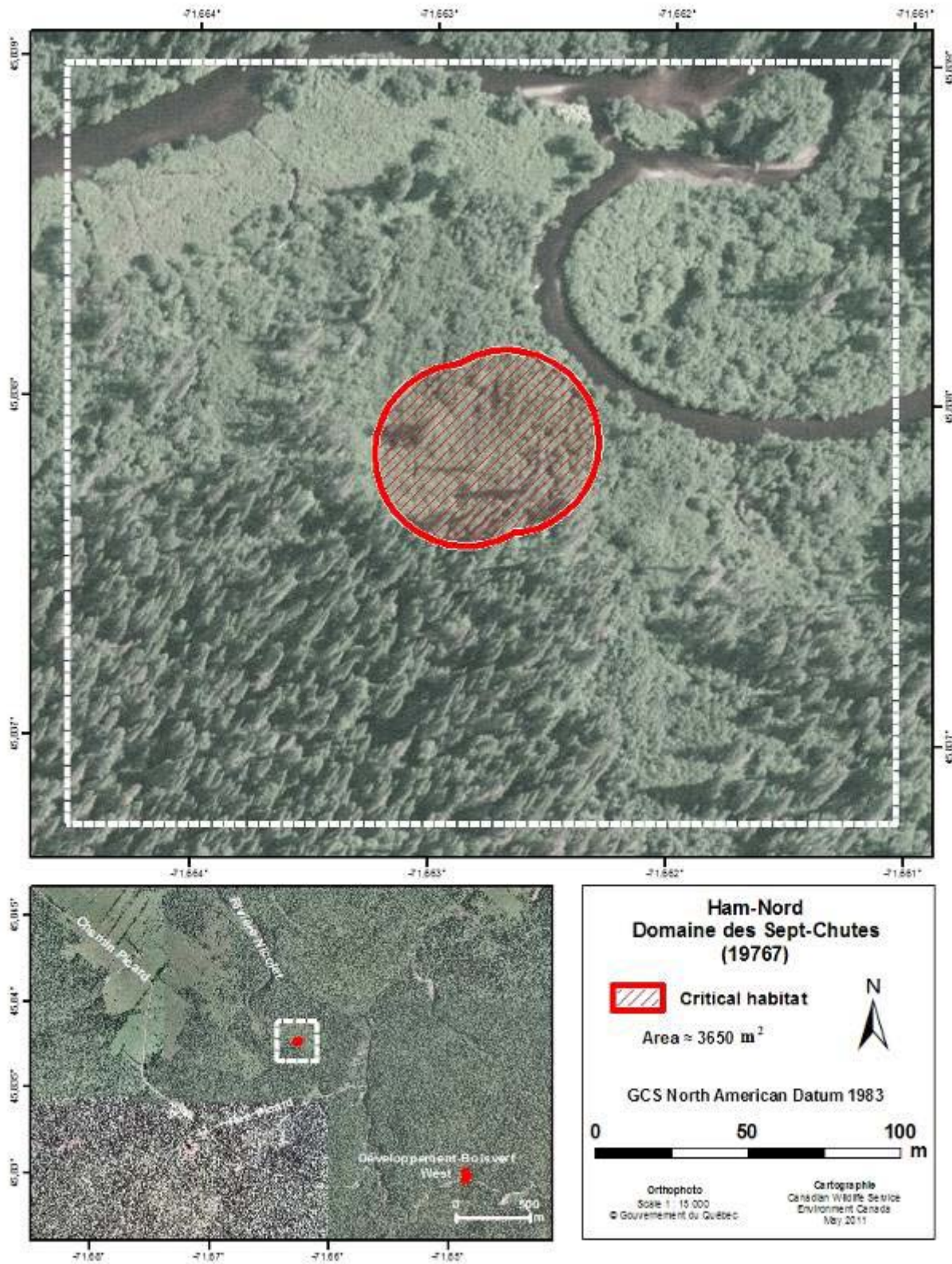


Figure A-6: Polygon containing critical habitat at Ham-Nord-Domaine des Sept-Chutes.



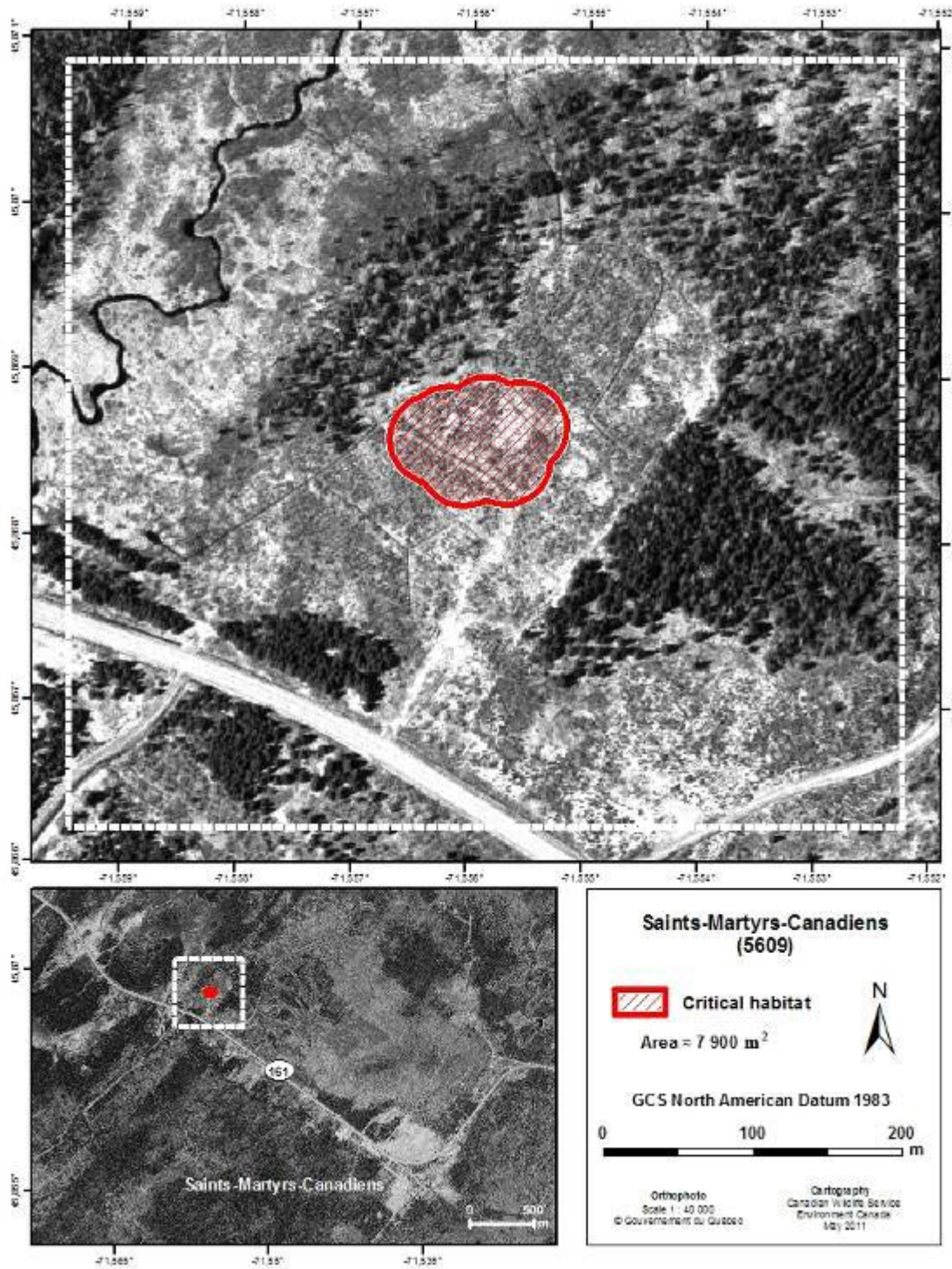


Figure A-7: Polygon containing critical habitat at Saints-Martyrs-Canadiens.

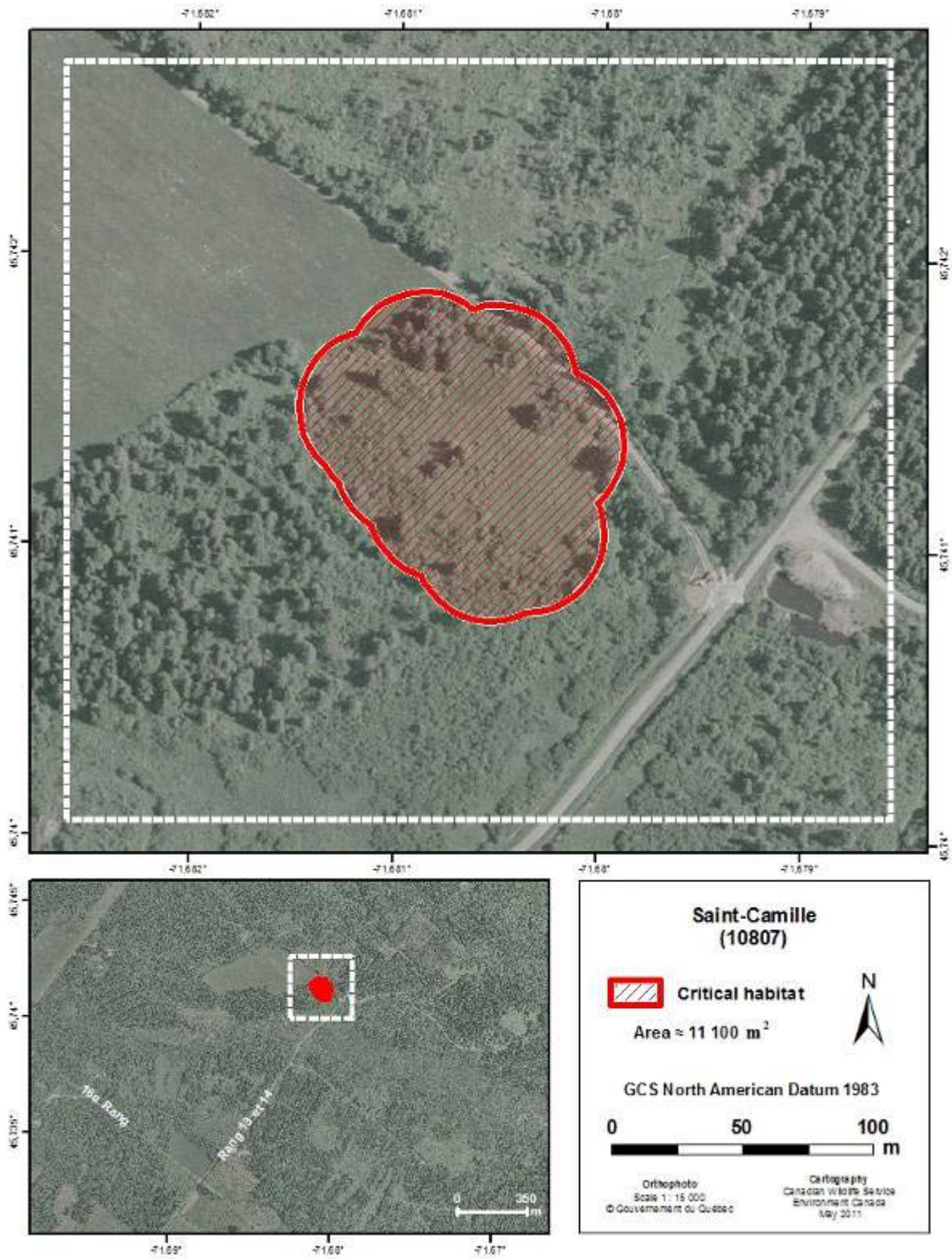


Figure A-8: Polygon containing critical habitat at Saint-Camille.



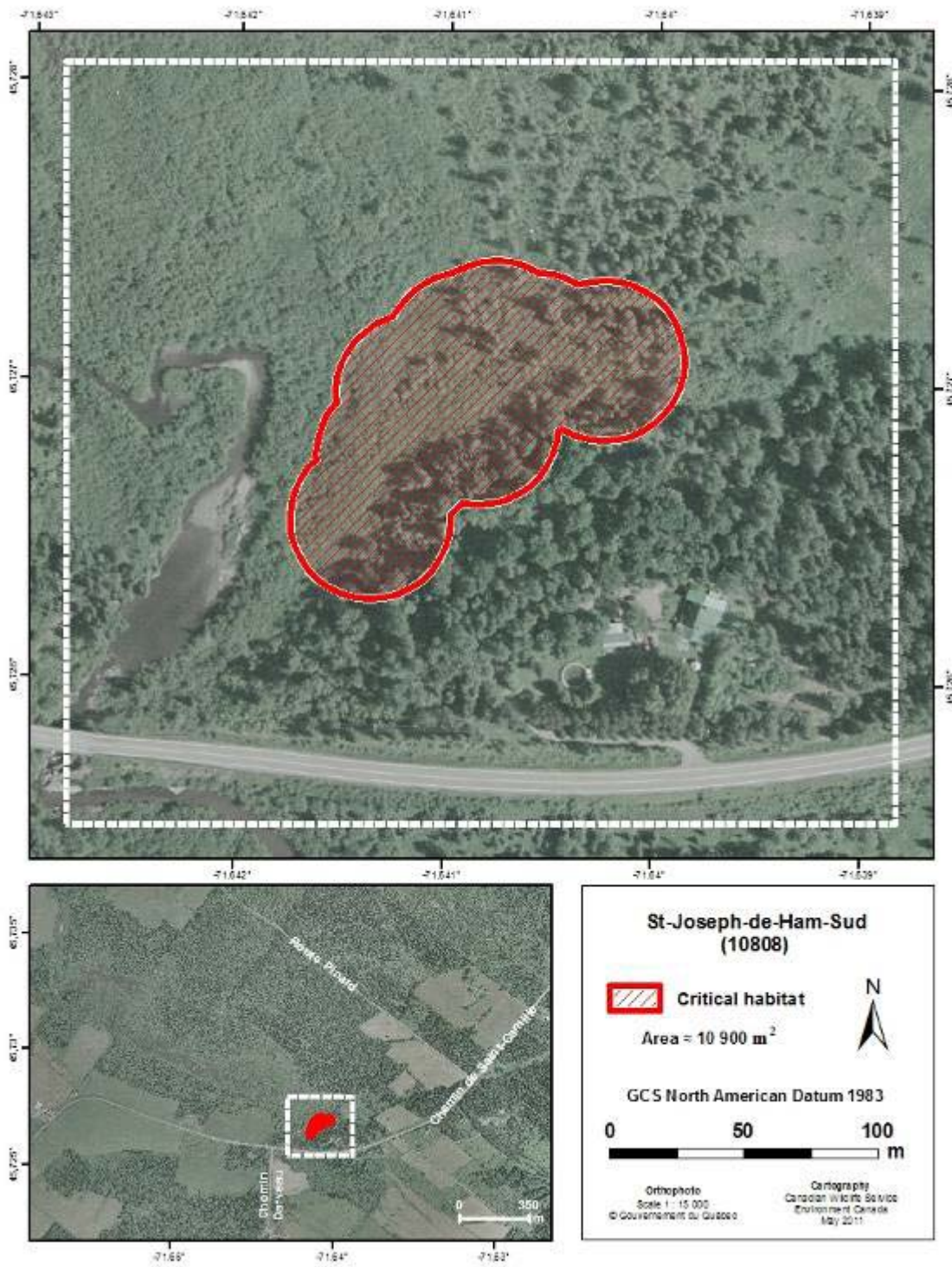


Figure A-9: Polygon containing critical habitat at St-Joseph-de-Ham-Sud.

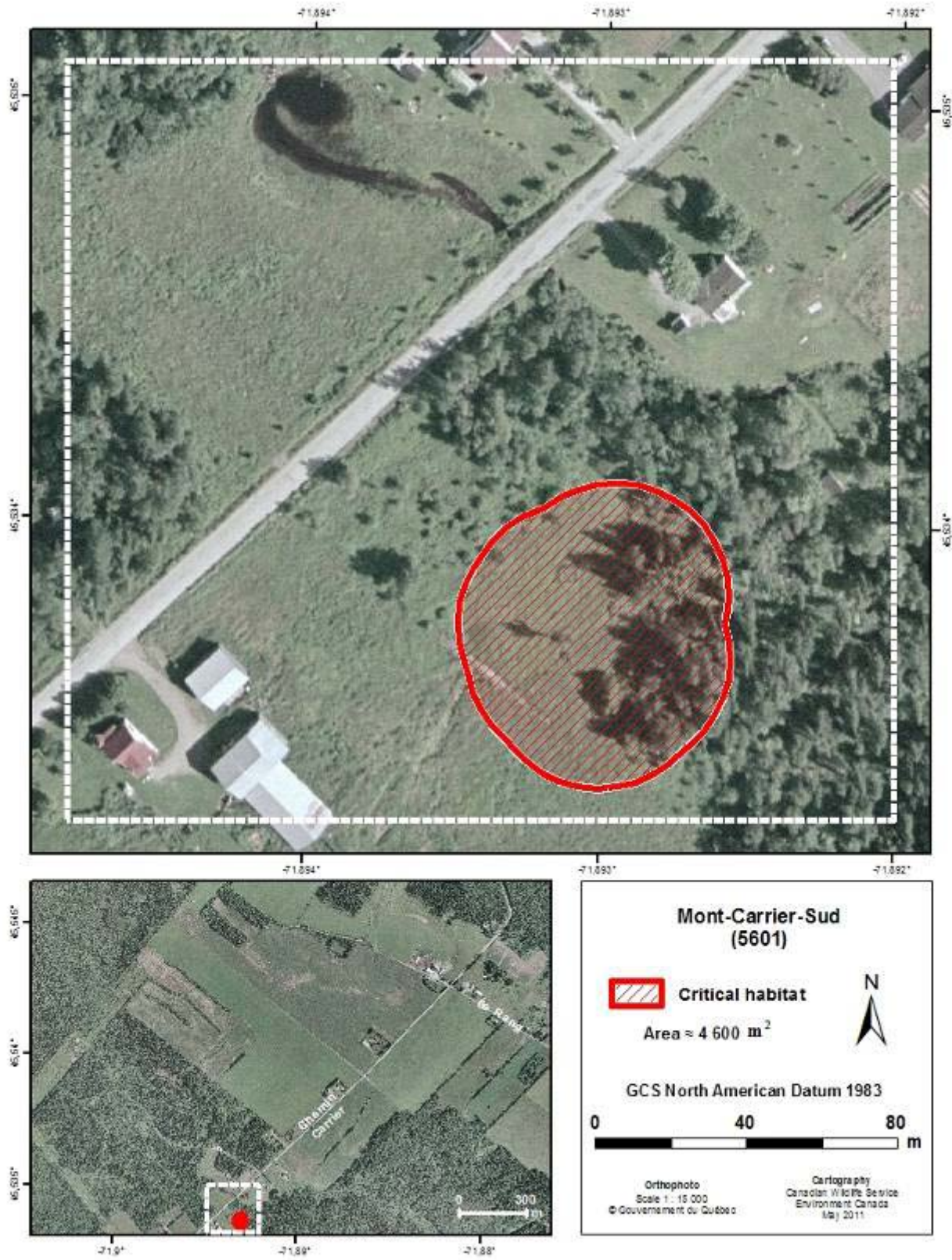


Figure A-10: Polygon containing critical habitat at Mont-Carrier Sud.



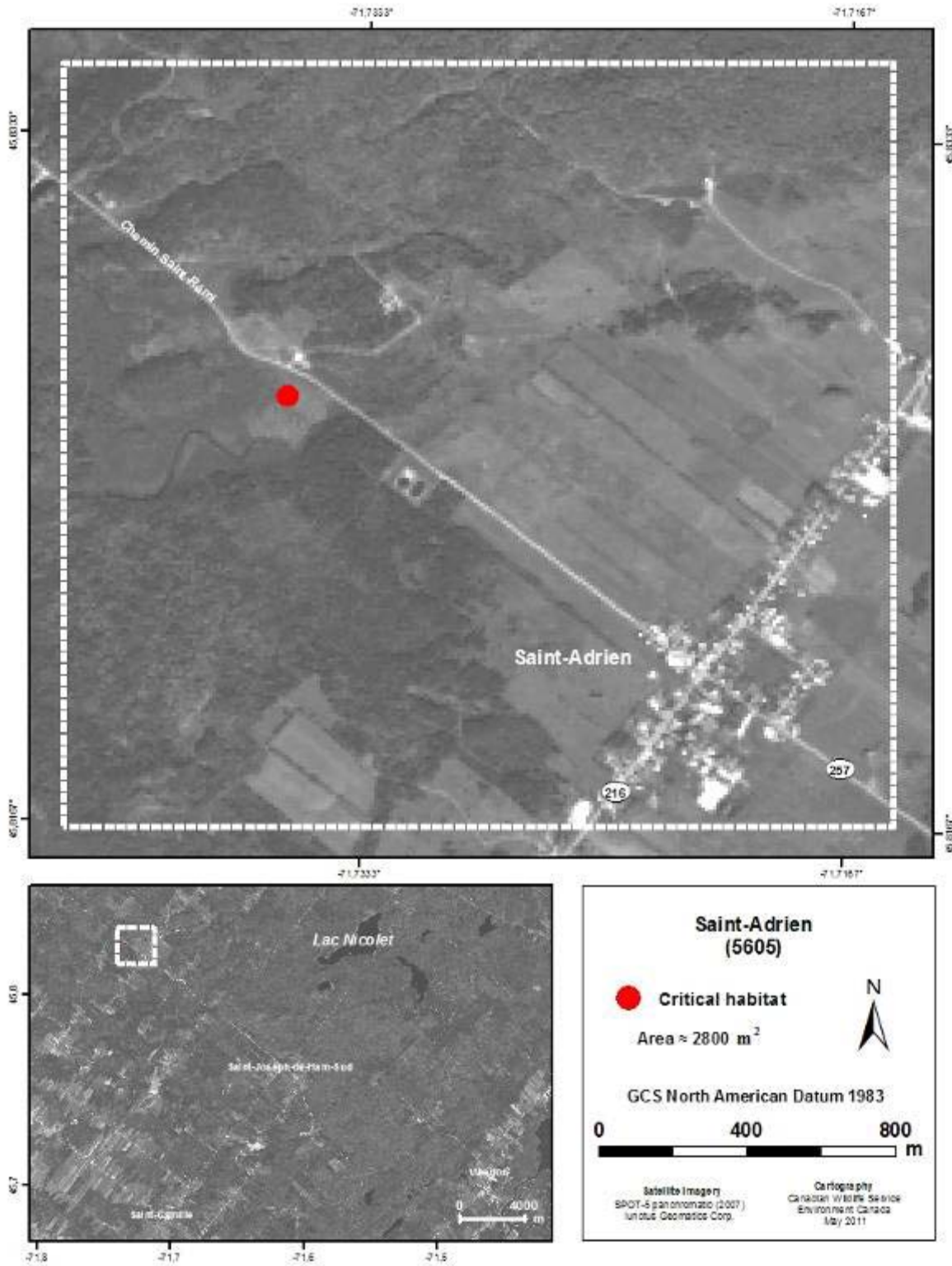


Figure A-11: Polygon containing critical habitat at Saint-Adrien.

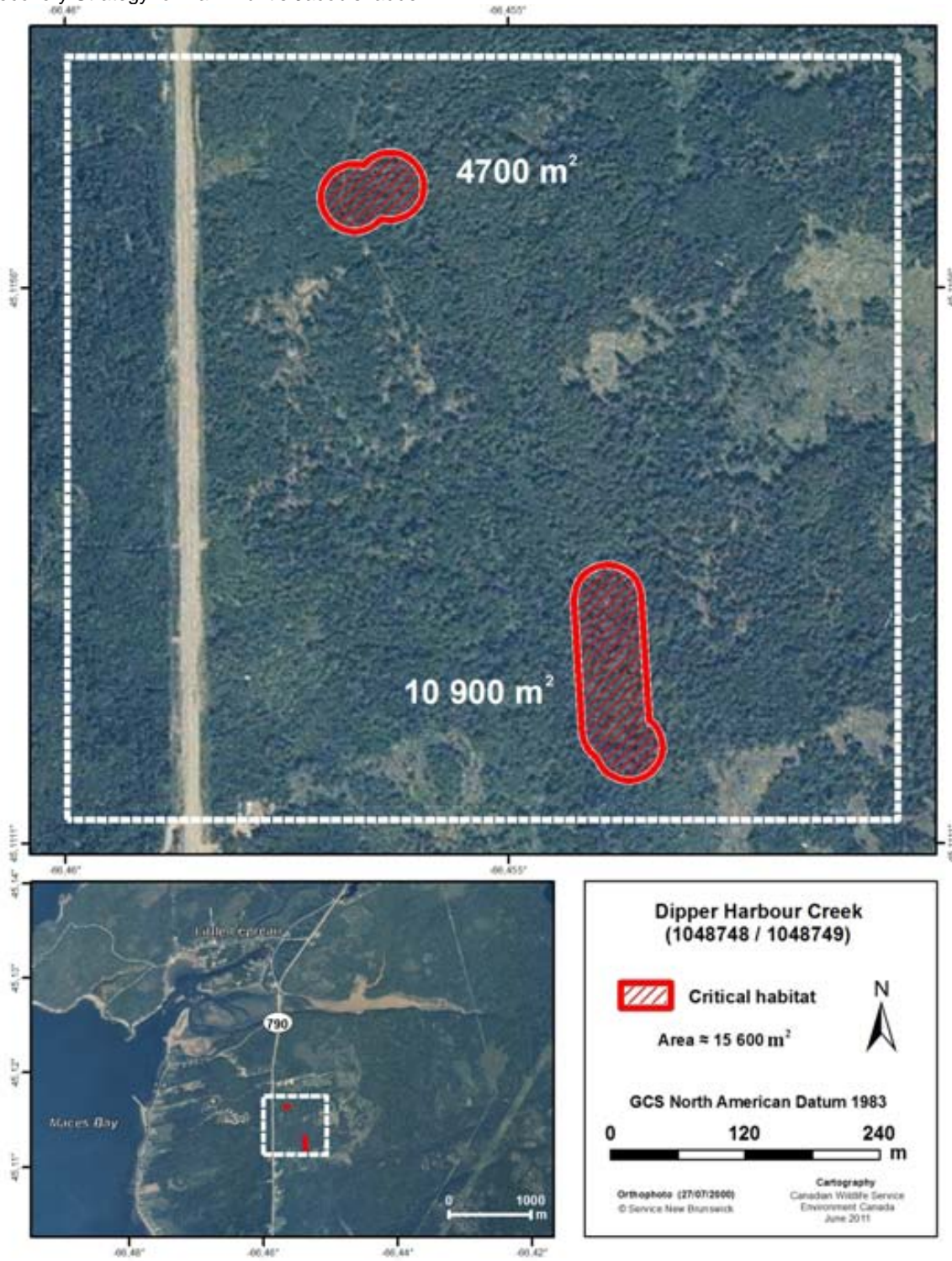


Figure A-12: Polygon containing critical habitat at Dipper Harbour Creek.



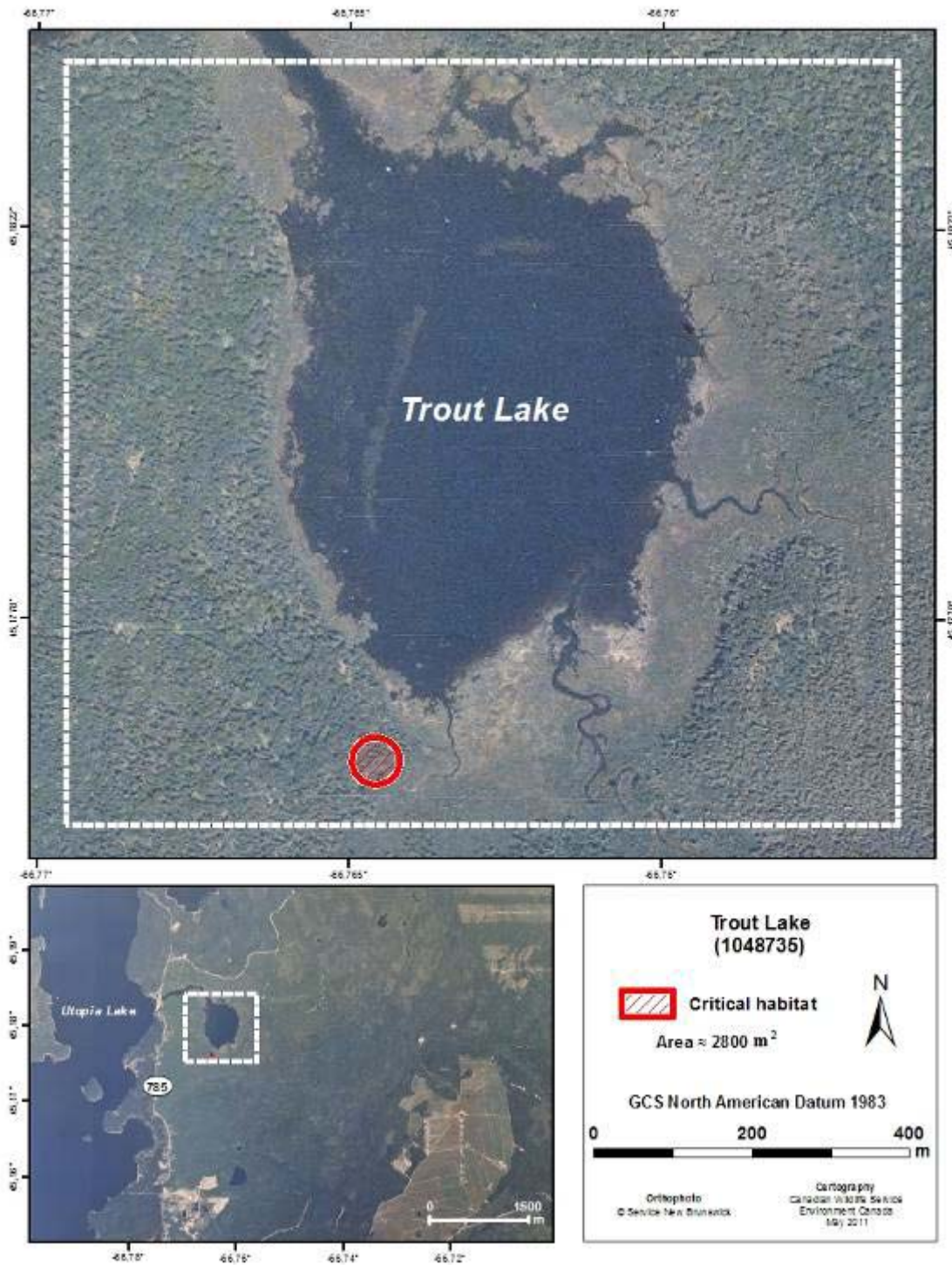


Figure A-13: Polygon containing critical habitat at Trout Lake.



## **APPENDIX B: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES**

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

The potential for this recovery strategy to inadvertently lead to adverse effects on the environment and other species was considered. Given that the recommended activities are limited to non-intrusive activities, such as population surveys and monitoring, it may be concluded that this strategy will not entail any significant adverse effects.