



White Wood Aster

(Eurybia divaricata) in Ontario

Ontario Recovery Strategy Series

Draft

2019

About the Ontario Recovery Strategy Series

This series presents the collection of recovery strategies that are prepared or adopted as advice to the Province of Ontario on the recommended approach to recover species at risk. The Province ensures the preparation of recovery strategies to meet its commitments to recover species at risk under the *Endangered Species Act 2007* (ESA) and the Accord for the Protection of Species at Risk in Canada.

What is recovery?

Recovery of species at risk is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

What is a recovery strategy?

Under the ESA a recovery strategy provides the best available scientific knowledge on what is required to achieve recovery of a species. A recovery strategy outlines the habitat needs and the threats to the survival and recovery of the species. It also makes recommendations on the objectives for protection and recovery, the approaches to achieve those objectives, and the area that should be considered in the development of a habitat regulation. Sections 11 to 15 of the ESA outline the required content and timelines for developing recovery strategies published in this series.

Recovery strategies are required to be prepared for endangered and threatened species within one or two years respectively of the species being added to the Species at Risk in Ontario list. Recovery strategies are required to be prepared for extirpated species only if reintroduction is considered feasible.

What's next?

Nine months after the completion of a recovery strategy a government response statement will be published which summarizes the actions that the Government of Ontario intends to take in response to the strategy. The implementation of recovery strategies depends on the continued cooperation and actions of government agencies, individuals, communities, land users, and conservationists.

For more information

To learn more about species at risk recovery in Ontario, please visit the Ministry of Environment, Conservation and Parks Species at Risk webpage at: www.ontario.ca/speciesatrisk

1 **Recommended citation**

2 Ministry of the Environment, Conservation and Parks. 2019. DRAFT Recovery Strategy
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4 Series. Prepared by the Ministry of the Environment, Conservation and Parks,
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11 Content (excluding illustrations) may be used without permission with appropriate credit
12 to the source, except where use of an image or other item is prohibited in the content
13 use statement of the adopted federal recovery strategy.

14 Cette publication hautement spécialisée « Recovery strategies prepared under the
15 *Endangered Species Act, 2007* », n'est disponible qu'en anglais en vertu du Règlement
16 411/97 qui en exempte l'application de la [Loi sur les services en français](#). Pour obtenir
17 de l'aide en français, veuillez communiquer avec recovery.planning@ontario.ca.

18 **Acknowledgments**

19 The Ministry gratefully acknowledges Paul O'Hara (field botanist and native plant
20 cultivation specialist, Blue Oak Native Landscapes) for information and insights
21 regarding the recovery of White Wood Aster in Ontario.

22 **Declaration**

23 The recovery strategy for the White Wood Aster (*Eurybia divaricata*) was developed in
24 accordance with the requirements of the *Endangered Species Act, 2007* (ESA). This
25 recovery strategy has been prepared as advice to the Government of Ontario, other
26 responsible jurisdictions and the many different constituencies that may be involved in
27 recovering the species.

28 The recovery strategy does not necessarily represent the views of all individuals who
29 provided advice or contributed to its preparation, or the official positions of the
30 organizations with which the individuals are associated.

31 The recommended goals, objectives and recovery approaches identified in the strategy
32 are based on the best available knowledge and are subject to revision as new
33 information becomes available. Implementation of this strategy is subject to
34 appropriations, priorities and budgetary constraints of the participating jurisdictions and
35 organizations.

36 Success in the recovery of this species depends on the commitment and cooperation of
37 many different constituencies that will be involved in implementing the advice set out in
38 this strategy.

39 **Responsible jurisdictions**

40 Ministry of the Environment, Conservation and Parks
41 Environment and Climate Change Canada – Canadian Wildlife Service, Ontario
42 Parks Canada Agency
43

44 **Executive summary**

45 The *Endangered Species Act, 2007* (ESA) requires the Minister of the Environment,
46 Conservation and Parks to ensure recovery strategies are prepared for all species listed
47 as endangered or threatened on the Species at Risk in Ontario (SARO) List. Under the
48 ESA, a recovery strategy may incorporate all or part of an existing plan that relates to
49 the species.

50 The White Wood Aster (*Eurybia divaricata*) is listed as threatened on the SARO List.
51 The species is listed as threatened under the federal *Species at Risk Act* (SARA).
52 Environment and Climate Change Canada prepared the Recovery Strategy for the
53 White Wood Aster (*Eurybia divaricata*) in Canada in 2018 to meet its requirements
54 under the SARA. This recovery strategy is hereby adopted under the ESA. With the
55 additions indicated below, the enclosed strategy meets all of the content requirements
56 outlined in the ESA.

57 Additional information is included on the distribution and abundance of White Wood
58 Aster and survey activities that were completed during the 2018 field season.

59 The Critical Habitat section of the federal recovery strategy provides an identification of
60 critical habitat (as defined under the SARA). Identification of critical habitat is not a
61 component of a recovery strategy prepared under the ESA. However, it is
62 recommended that the approach used to identify critical habitat in the federal recovery
63 strategy, along with any new scientific information pertaining to the White Wood Aster
64 and the areas it occupies, be considered when developing a habitat regulation under
65 the ESA.

66

67 **Table of contents**

68 Recommended citation i
69 Acknowledgments..... i
70 Declaration ii
71 Responsible jurisdictions ii
72 Executive summary iii
73 1.0 Adoption of federal recovery strategy 1
74 1.1 Species assessment and classification..... 1
75 1.2 Distribution, abundance and population trends..... 1
76 1.3 Recovery actions completed or underway 3
77 1.4 Area for consideration in developing a habitat regulation 3
78 Glossary 4
79 List of abbreviations..... 4
80 References 6
81 Personal communications..... 6
82 Appendix 1. Recovery strategy for the White Wood Aster (*Eurybia divaricata*) in
83 Canada..... 7
84

85 **1.0 Adoption of federal recovery strategy**

86 The *Endangered Species Act, 2007* (ESA) requires the Minister of the Environment,
87 Conservation and Parks to ensure recovery strategies are prepared for all species listed
88 as endangered or threatened on the Species at Risk in Ontario (SARO) List. Under the
89 ESA, a recovery strategy may incorporate all or part of an existing plan that relates to
90 the species.

91 The White Wood Aster (*Eurybia divaricata*) is listed as threatened on the SARO List.
92 The species is listed as threatened under the federal *Species at Risk Act* (SARA).
93 Environment and Climate Change Canada prepared the Recovery Strategy for the
94 White Wood Aster (*Eurybia divaricata*) in Canada in 2018 to meet its requirements
95 under the SARA. This recovery strategy is hereby adopted under the ESA. With the
96 additions indicated below, the enclosed strategy meets all of the content requirements
97 outlined in the ESA.

98 **1.1 Species assessment and classification**

99 The following list is assessment and classification information for the White Wood Aster
100 (*Eurybia divaricata*). Note: The glossary provides definitions for the abbreviations and
101 technical terms in this document.

- 102 • SARO List Classification: Threatened
- 103 • SARO List History: Threatened (2008, 2002, 2000)
- 104 • COSEWIC Assessment History: Threatened (2002, 1995)
- 105 • SARA Schedule 1: Threatened (2005)
- 106 • Conservation Status Rankings: G-rank: G5; N-rank: N2N3; S-rank: S2S3

107 **1.2 Distribution, abundance and population trends**

108 During field investigations in the summer and autumn of 2018, nine populations or
109 subpopulations of White Wood Aster were reconfirmed, and five new locations of
110 populations or subpopulations were identified.¹ New information was obtained on the
111 respective sizes of these populations or subpopulations. This information is summarized
112 in Table 1, based on O'Hara (2018) and O'Hara (pers. comm. 2019).

¹ Further updates based on these investigations are expected once all field data have been compiled (O'Hara, pers. comm. 2019).

113 Table 1. New and updated information on local populations and subpopulations of White
 114 Wood Aster in Ontario.

Local population / subpopulation location name	Local population / subpopulation status	Year last observed	Stem count when last observed
Culp's Woods	Extant; previously reported	2018	>3500
Two Mile – Four Mile Creek ANSI / Four Mile Creek	Extant; previously reported	2018	50
Two Mile – Four Mile Creek ANSI / Two Mile Creek	Extant; previously reported	2018	110
Paradise Grove	Extant; previously reported	2018	>250
Lancaster Park	Extant; previously reported	2018	>1300
Woodlawn Park	Extant; previously reported	2018	8000-9000
Woodland Elementary School Grove	Extant; previously reported	2018	>650
Fonthill-Sandhill Valley ANSI	Extant; previously reported	2018	1000s
Hillcrest Park, Pelham	Extant; previously reported	2018	>750
Newark Park, Niagara-on-the-Lake	Extant; newly reported	2018	>6000
Garner Trail Woods, west of St. Michael's Avenue, Niagara Falls	Extant; newly reported	2018	230
Aqueduct Park, Welland	Extant; newly reported	2018	15
Ricelawn Park, Welland	Extant; newly reported	2018	1000
Lathrop Woods Nature Preserve, Fonthill	Extant; newly reported	2018	30

115 White Wood Aster was not detected in 2018 at four sites where it was last detected in
 116 2008. These are (1) Dufferin Island, (2) Beamsville Escarpment Life Science ANSI, (3)
 117 Along Bruce Trail North of Queenston Quarry and (4) North Pelham Valley ANSI
 118 (O'Hara 2018).

119 **1.3 Recovery actions completed or underway**

120 Surveys have been completed within the northern half of the Regional Municipality of
121 Niagara to re-confirm the presence of White Wood Aster at several locations and
122 determine whether or not it is present at other locations with suitable site conditions.
123 These surveys occurred during the summer and fall of 2018.

124 **1.4 Area for consideration in developing a habitat regulation**

125 Under the ESA, a recovery strategy must include a recommendation to the Minister of
126 the Environment, Conservation and Parks on the area that should be considered in
127 developing a habitat regulation. A habitat regulation is a legal instrument that prescribes
128 an area that will be protected as the habitat of the species. The recommendation
129 provided below will be one of many sources considered by the Minister, including
130 information that may become newly available following completion of the recovery
131 strategy, when developing the habitat regulation for this species.

132 The Critical Habitat section of the federal recovery strategy provides an identification of
133 critical habitat (as defined under the SARA). Identification of critical habitat is not a
134 component of a recovery strategy prepared under the ESA. However, it is
135 recommended that the approach used to identify critical habitat in the federal recovery
136 strategy, along with any new scientific information on White Wood Aster and the areas it
137 occupies, be considered when developing a habitat regulation under the ESA.

138 Glossary

139 Committee on the Status of Endangered Wildlife in Canada (COSEWIC): The
140 committee established under section 14 of the Species at Risk Act that is
141 responsible for assessing and classifying species at risk in Canada.

142 Committee on the Status of Species at Risk in Ontario (COSSARO): The committee
143 established under section 3 of the *Endangered Species Act, 2007* that is
144 responsible for assessing and classifying species at risk in Ontario.

145 Conservation status rank: A rank assigned to a species or ecological community that
146 primarily conveys the degree of rarity of the species or community at the global
147 (G), national (N) or subnational (S) level. These ranks, termed G-rank, N-rank
148 and S-rank, are not legal designations. Ranks are determined by NatureServe
149 and, in the case of Ontario's S-rank, by Ontario's Natural Heritage Information
150 Centre. The conservation status of a species or ecosystem is designated by a
151 number from 1 to 5, preceded by the letter G, N or S reflecting the appropriate
152 geographic scale of the assessment. The numbers mean the following:

153 1 = critically imperilled
154 2 = imperilled
155 3 = vulnerable
156 4 = apparently secure
157 5 = secure
158 NR = not yet ranked

159 *Endangered Species Act, 2007* (ESA): The provincial legislation that provides protection
160 to species at risk in Ontario.

161 *Species at Risk Act* (SARA): The federal legislation that provides protection to species
162 at risk in Canada. This Act establishes Schedule 1 as the legal list of wildlife
163 species at risk. Schedules 2 and 3 contain lists of species that at the time the Act
164 came into force needed to be reassessed. After species on Schedule 2 and 3 are
165 reassessed and found to be at risk, they undergo the SARA listing process to be
166 included in Schedule 1.

167 Species at Risk in Ontario (SARO) List: The regulation made under section 7 of the
168 *Endangered Species Act, 2007* that provides the official status classification of
169 species at risk in Ontario. This list was first published in 2004 as a policy and
170 became a regulation in 2008.

171 List of abbreviations

172 ANSI: Area of Natural and Scientific Interest
173 COSEWIC: Committee on the Status of Endangered Wildlife in Canada
174 COSSARO: Committee on the Status of Species at Risk in Ontario

- 175 ESA: Ontario's *Endangered Species Act, 2007*
- 176 ISBN: International Standard Book Number
- 177 SARA: Canada's *Species at Risk Act*
- 178 SARO List: Species at Risk in Ontario List
- 179

180 **References**

181 O'Hara, P. 2018. 2018 White Wood Aster (*Eurybia divaricata*) Survey. Interim Report
182 completed for Ontario Species at Risk Stewardship Fund. Blue Oak Native
183 Landscapes, Hamilton.

184 **Personal communications**

185 O'Hara, P. 2019. Email correspondence to E. Snyder. January 2019. Field Botanist and
186 Native Plant Cultivation Specialist, Blue Oak Native Landscapes. Hamilton,
187 Ontario.

188

189

**Appendix 1. Recovery strategy for the
White Wood Aster (*Eurybia divaricata*) in Canada**

Recovery Strategy for the White Wood Aster (*Eurybia divaricata*) in Canada

White Wood Aster



2018



Government
of Canada

Gouvernement
du Canada

Canada

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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](#)¹.

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¹ <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>.

1 Preface

2
3 The federal, provincial, and territorial government signatories under the [Accord for the](#)
4 [Protection of Species at Risk \(1996\)](#)² agreed to establish complementary legislation and
5 programs that provide for effective protection of species at risk throughout Canada.
6 Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent
7 ministers are responsible for the preparation of recovery strategies for listed Extirpated,
8 Endangered, and Threatened species and are required to report on progress within
9 five years after the publication of the final document on the SAR Public Registry.

10
11 The Minister of Environment and Climate Change is the competent minister under
12 SARA for the White Wood Aster and has prepared this recovery strategy, as per
13 section 37 of SARA. To the extent possible, it has been prepared in cooperation with
14 the governments of Ontario and Quebec, as per section 39(1) of SARA.

15
16 Success in the recovery of this species depends on the commitment and cooperation of
17 many different constituencies that will be involved in implementing the directions set out
18 in this strategy and will not be achieved by Environment and Climate Change Canada or
19 any other jurisdiction alone. All Canadians are invited to join in supporting and
20 implementing this strategy for the benefit of the White Wood Aster and Canadian
21 society as a whole.

22
23 This recovery strategy will be followed by one or more action plans that will provide
24 information on recovery measures to be taken by Environment and Climate Change
25 Canada and other jurisdictions and/or organizations involved in the conservation of the
26 species. Implementation of this strategy is subject to appropriations, priorities, and
27 budgetary constraints of the participating jurisdictions and organizations.

28
29 The recovery strategy sets the strategic direction to arrest or reverse the decline of the
30 species, including identification of critical habitat to the extent possible. It provides all
31 Canadians with information to help take action on species conservation. When critical
32 habitat is identified, either in a recovery strategy or an action plan, SARA requires that
33 critical habitat then be protected.

34
35 In the case of critical habitat identified for terrestrial species including migratory birds
36 SARA requires that critical habitat identified in a federally protected area³ be described
37 in the *Canada Gazette* within 90 days after the recovery strategy or action plan that
38 identified the critical habitat is included in the public registry. A prohibition against
39 destruction of critical habitat under ss. 58(1) will apply 90 days after the description of
40 the critical habitat is published in the *Canada Gazette*.

41
² <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>.

³ These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Birds Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

42 For critical habitat located on other federal lands, the competent minister must either
43 make a statement on existing legal protection or make an order so that the prohibition
44 against destruction of critical habitat applies.

45
46 If the critical habitat for a migratory bird is not within a federal protected area and is not
47 on federal land, within the exclusive economic zone or on the continental shelf of
48 Canada, the prohibition against destruction can only apply to those portions of the
49 critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies
50 as per SARA ss. 58(5.1) and ss. 58(5.2).

51
52 For any part of critical habitat located on non-federal lands, if the competent minister
53 forms the opinion that any portion of critical habitat is not protected by provisions in or
54 measures under SARA or other Acts of Parliament, or the laws of the province or
55 territory, SARA requires that the Minister recommend that the Governor in Council make
56 an order to prohibit destruction of critical habitat. The discretion to protect critical habitat
57 on non-federal lands that is not otherwise protected rests with the Governor in Council.
58

59

60 Acknowledgments

61

62 Development of this recovery strategy was facilitated by Allison Foran and
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75

76 **Executive Summary**

77

78 In Canada, the White Wood Aster (*Eurybia divaricata*) occurs in southern Ontario and in
79 southwestern Quebec. The species is listed as Threatened under Schedule 1 of the
80 *Species at Risk Act* (SARA). The species is ranked as Imperilled to Vulnerable in
81 Canada (N2N3) and Ontario (S2S3) and Imperilled in Quebec (S2). The global range of
82 the White Wood Aster is restricted to eastern North America, and it reaches its southern
83 limit in the U.S. states of Georgia and Alabama. The species' northern limit is in Canada
84 where there are a total of 56 known extant⁴ local populations⁵; 12 in southwestern
85 Quebec and 44 in southern Ontario.

86

87 The White Wood Aster is an herbaceous late summer-to-fall-flowering perennial. The
88 flower heads consist of petal-like white rays surrounding small yellow and purple disc
89 florets. The upper leaves are deeply serrated, and the lower ones are heart-shaped.
90 The species occurs in open deciduous and mixed forests. Owing to its preference for
91 open sun-exposed areas, the species is sometimes found in disturbed areas, including
92 woodlots disturbed by small-scale forest harvesting and the edges of recreational trails.

93

94 The primary threat to the White Wood Aster is habitat loss due to urban and agricultural
95 development. Other threats include forest harvesting, alteration of the natural
96 disturbance regime, invasive species, grazing by deer, and off-trail recreational
97 activities.

98

99 The recovery of the White Wood Aster is considered feasible; therefore, this recovery
100 strategy has been prepared as per section 41(1) of SARA. The population and
101 distribution objectives for the White Wood Aster are: maintain the current distribution
102 and abundance (i.e., total number of stems) of the White Wood Aster in Canada; and
103 where necessary and technically and biologically feasible, support natural increases of
104 abundance (i.e., total number of stems) of extant local populations. The broad strategies
105 to be taken to address the threats to the survival and recovery of the species are
106 presented in the section on Strategic Direction for Recovery (Section 6.2). They include
107 surveys and monitoring, research, habitat management and conservation, landuse
108 policy and planning, and communication, outreach and education.

109

110 Critical habitat for the White Wood Aster is partially identified in this recovery strategy,
111 based on the best available data. Where detailed surveys have been conducted and
112 White Wood Aster plant locations are known, critical habitat is identified as the extent of
113 biophysical attributes (7.1.1) up to 80 m (radial distance) around existing mapped
114 observations of the White Wood Aster (7.1.2). In cases where little or no mapping
115 and/or documentation of plant locations or habitat features exists, but the approximate
116 location of the local population has been verified, the area containing critical habitat is
117 identified as the ecological or landscape feature containing the local population (7.1.2),
118 and critical habitat for White Wood Aster is identified as the extent of biophysical

⁴ Population which is considered to be still in existence, i.e., not destroyed or lost (extirpated).

⁵ Plants contained in a discrete area, typically corresponding to a population or metapopulation, often equivalent to an element occurrence as defined by NatureServe (2002).

119 attributes (7.1.1) up to 80 m (radial distance) from any single plant wherever they occur
120 within the areas containing critical habitat (7.1.2). In addition, in cases where the
121 suitable habitat extends for less than 50 m around a White Wood Aster, a critical
122 function zone capturing an area within a radial distance of 50 m is also included as
123 critical habitat. A schedule of studies is included to obtain the information needed to
124 complete the identification of critical habitat. As more information becomes available,
125 additional critical habitat may be identified where critical habitat criteria are met. One or
126 more actions plans for the White Wood Aster will be posted on the Species at Risk
127 Public Registry by December 31, 2024.

128

129 Recovery Feasibility Summary

130

131 Based on the following four criteria that Environment and Climate Change Canada uses
132 to establish recovery feasibility, recovery of the White Wood Aster has been deemed
133 technically and biologically feasible.

134

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

137

138 **Yes.** The presence of viable local populations⁶ and subpopulations⁷ that contain
139 mature plants capable of reproduction are confirmed in both Ontario and Quebec
140 (COSEWIC 2002; Boisjoli 2010). Recent survey efforts by local naturalist organizations
141 have resulted in the discovery of many new local populations. Since 2002, the total
142 number of known extant local populations has increased from 10 to 12 in Quebec and
143 from 15 to 44 in Ontario (COSEWIC 2002; Appendix B). For most local populations the
144 number of stems is estimated (Appendix B); however, it is unknown how many
145 individual plants this represents because the species can reproduce by cloning. The
146 presence of more than one clone (i.e., more than one genetically distinct individual) has
147 only been confirmed in a few local populations (COSEWIC 2002). These populations
148 are therefore capable of sexual reproduction, whereas it is unclear whether the
149 remaining local populations are capable of sexual reproduction or are restricted to
150 vegetative reproduction.

151

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

154

155 **Yes.** Located at the northernmost extent of its North American range, the White Wood
156 Aster has a limited distribution in Canada. The existing forest habitat within its range is
157 geographically restricted and highly fragmented due to deforestation, which has
158 occurred since European settlement (largely for agricultural purposes (Larson et al
159 1999)). However, forest stands remain at most local populations, maintaining functional
160 habitats for individual plants and potentially providing suitable areas adjacent to where
161 the White Wood Aster occurs for population expansion. The species is rarely found in
162 regenerated forests that were previously cleared for agriculture (Singleton et al. 2001);
163 therefore, recovery will largely depend on the protection of remaining old-growth
164 woodlots and on-going habitat management, such as forest canopy thinning. It is
165 possible that through these techniques, sufficient suitable habitat could be made
166 available to enhance the population and improve its abundance.

167

⁶ Plants contained in a discrete area, typically corresponding to a population or metapopulation, often equivalent to an element occurrence as defined by NatureServe (2002).

⁷ Individual plants or groups of plants, generally found within one km of each other and not separated by unsuitable habitat. Local populations may comprise several subpopulations.

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

170

171 **Yes.** The primary threats to the White Wood Aster are habitat loss due to urban and
172 agricultural development, tree canopy closure due to incompatible forest management
173 practises and natural succession, and invasive plants. Suitable habitat can be
174 conserved through land planning policies that mandate the retention or proper
175 management of woodland habitat. Where appropriate, suitable habitat can be
176 rehabilitated or restored through habitat stewardship (e.g., tree canopy thinning) and
177 management measures that include forest best management practices. Wood
178 harvesting on a small scale and using techniques that minimize the creation of
179 even-aged stands can support the creation of natural forest gaps and encourage
180 growth of the species. Best management practices can be used to manage invasive
181 plants when necessary. Other threats such as grazing by deer, invasive invertebrates,
182 consumption by weevils, and off-trail recreation can be mitigated through management
183 measures that include sustainable deer management and best management practises
184 reduce the spread of weevils. In addition outreach and education may promote the
185 protection of local populations on private lands and may also reduce threats such as
186 trampling and the intentional collection of individuals.

187

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

190

191 **Yes.** Based on the best available information and the nature of the primary threats, the
192 development of new recovery techniques is not needed to achieve the population and
193 distribution objectives at this time. White Wood Aster habitat may be conserved through
194 land acquisition, conservation agreements or stewardship programs as well as
195 promotion of forest best management practises into local land use policy. Habitat
196 restoration methods, such as tree canopy thinning to maintain suitable open habitat,
197 could also be used to promote the species' recovery. Propagation techniques have
198 been developed for the White Wood Aster (Kujawski and Davis 2001), and may be
199 considered to support the persistence of self-sustaining populations in the future.

200

201	Table of Contents	
202		
203	Preface.....	i
204	Acknowledgments.....	iii
205	Executive Summary.....	iv
206	Recovery Feasibility Summary.....	vi
207	1. COSEWIC Species Assessment Information.....	1
208	2. Species Status Information.....	1
209	3. Species Information.....	2
210	3.1 Species Description.....	2
211	3.2 Species Population and Distribution.....	2
212	3.3 Needs of the White Wood Aster.....	6
213	4. Threats.....	8
214	4.1 Threat Assessment.....	8
215	4.2 Description of Threats.....	9
216	5. Population and Distribution Objectives.....	12
217	6. Broad Strategies and General Approaches to Meet Objectives.....	13
218	6.1 Actions Already Completed or Currently Underway.....	13
219	6.2 Strategic Direction for Recovery.....	15
220	6.3 Narrative to Support the Recovery Planning Table.....	17
221	7. Critical Habitat.....	17
222	7.1 Identification of the Species' Critical Habitat.....	17
223	7.2 Schedule of Studies to Identify Critical Habitat.....	20
224	7.3 Activities Likely to Result in the Destruction of Critical Habitat.....	20
225	8. Measuring Progress.....	22
226	9. Statement on Action Plans.....	22
227	10. References.....	23
228	Appendix A: Conservation Ranks of the White Wood Aster in Canada and the	
229	United States.....	29
230	Appendix B: Local populations and subpopulations of the White Wood Aster, with	
231	estimated abundance, last observed date and population status.....	30
232	Appendix C: Critical Habitat for the White Wood Aster in Canada.....	34
233	Appendix D: Effects on the Environment and Other Species.....	67
234		

235
236

1. COSEWIC* Species Assessment Information

Date of Assessment: November 2002

Common Name: White Wood Aster

Scientific Name: *Eurybia divaricata*

COSEWIC Status: Threatened

Reason for Designation: Geographically restricted and fragmented populations at risk from continued habitat loss, invasive species, deer browsing and recreational activities impacting populations along trails.

Canadian Occurrence: Ontario and Quebec

COSEWIC Status History: Designated Threatened in April 1995. Status re-examined and confirmed in November 2002.

237
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241

*COSEWIC (Committee on the Status of Endangered Wildlife in Canada).

Former scientific name was *Aster divaricatus*, in 1994 the taxonomy of the genus *Aster* was revised (Nesom 1994), the species is now classified in the genus *Eurybia* (COSEWIC 2002).

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243

2. Species Status Information

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In Canada, the White Wood Aster occurs in southern Ontario and southwestern Quebec. The species was listed as Threatened under Schedule 1 of the *Species at Risk Act* (SARA) (S.C. 2002, c.29) in 2005. In Quebec, the White Wood Aster has been listed as Threatened under the *Act Respecting Threatened or Vulnerable species* (R.S.Q., c. E-12.01) since 2005. In Ontario, it has been listed as Threatened under the *Endangered Species Act, 2007* (ESA)(S.O. 2007, c. 6) since 2008, and receives general habitat protection under the ESA.

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Globally, this species is listed as Secure (G5) (CESCC 2016). In Canada, the White Wood Aster is ranked as nationally Imperilled to Vulnerable (N2N3), Imperilled to Vulnerable in Ontario (S2S3), and Imperilled in Quebec (S2) (CESCC 2016). In the U.S., it is listed as nationally Secure (N5) and occurs in 21 states throughout the eastern part of the country. Appendix A provides additional ranks and definitions of the NatureServe rankings. It is estimated that less than 5% of the species' global range occurs in Canada.

260 3. Species Information

261 3.1 Species Description

262 The White Wood Aster is a late summer-to-fall-flowering herbaceous perennial. The
263 upper leaves are deeply serrated and the lower leaves are cordate (i.e., heart-shaped).
264 This species grows 30-90 cm tall and is recognized by small florets (small individual
265 flowers) that are joined together in heads that form flat topped clusters. The seeds are
266 2.6-3.8 mm long (Brouillet 2006) and are wind dispersed. The seeds have very low
267 migration rates, which range from 0.25-0.31 m/yr (Matlack 1994; Singleton et al. 2001).
268 This may explain why the species has been observed to have a limited distribution at
269 some sites in Canada despite the availability of nearby suitable habitat (COSEWIC
270 2002). The flower heads consist of five to ten petal-like white rays surrounding yellow
271 florets that turn purple once pollinated (Britton and Brown 1970; COSEWIC 2002).
272 Flowering occurs in early August to September and fruiting occurs in mid- to late-
273 September (COSEWIC 2002). The White Wood Aster is insect-pollinated. Common
274 pollinator species include hoverflies (especially *Syrphus spp.* and *Toxomerus*
275 *geminatus*), ants (Superfamily Formicoidea), Common Eastern Bumble Bee (*Bombus*
276 *impatiens*), and sweat bees (*Lasioglossum (Dialictus) sp.* and *Augochlora pura* or
277 *Augochlorella aurata*) (MacPhail 2013). The White Wood Aster can also spread via
278 clonal reproduction⁸ and thus form colonies (COSEWIC 2002).
279
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281

282 3.2 Species Population and Distribution

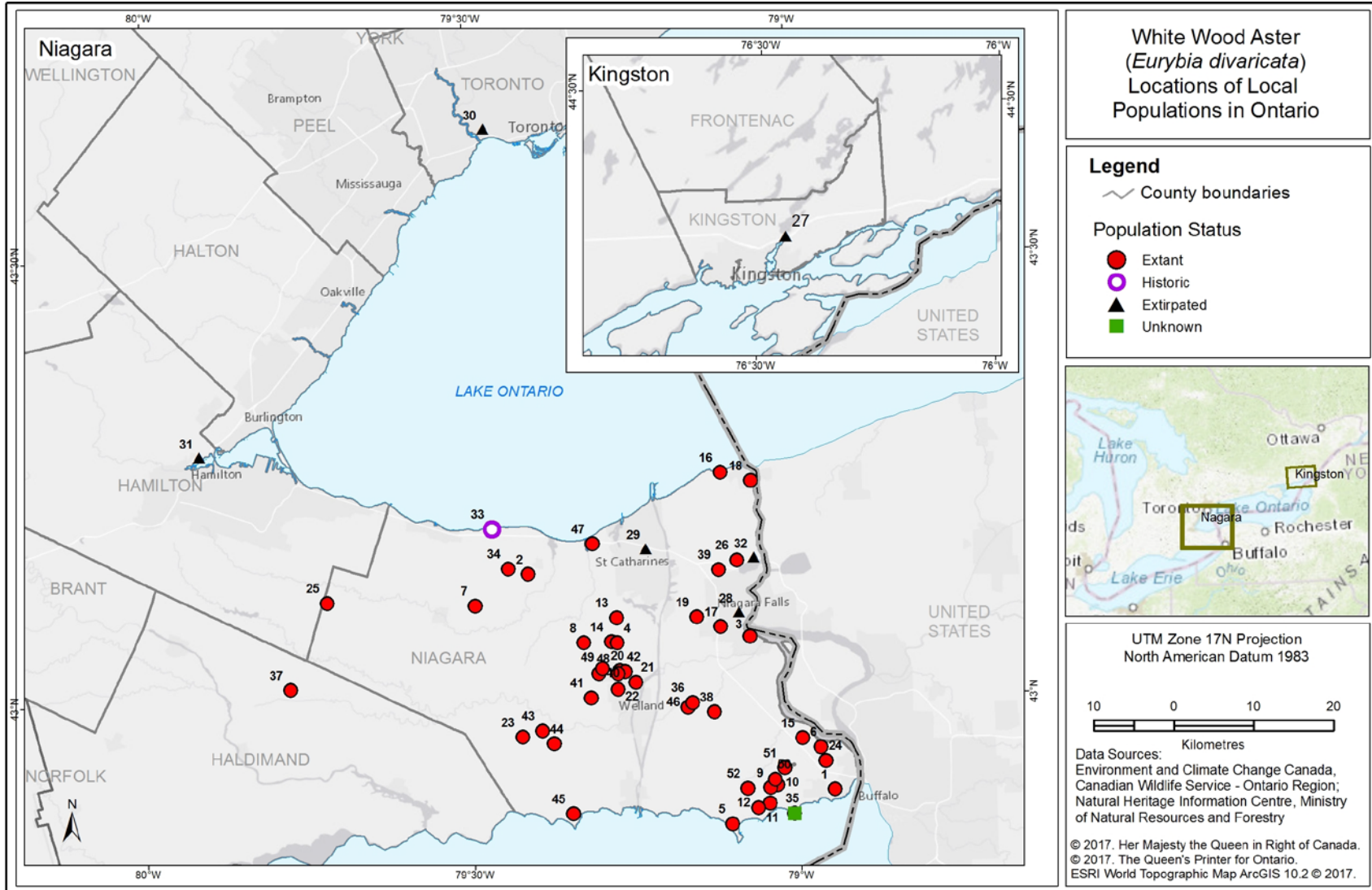
283 The White Wood Aster is endemic to North America and is generally common
284 throughout the eastern United States. It ranges from the Appalachian Mountains and
285 New England south to Georgia and Alabama. In Canada, the species is found in the
286 Niagara region of southern Ontario as well as in the Montérégie and Estrie regions of
287 southwestern Quebec (Figures 1 and 2).
288
289

290 The COSEWIC status report (2002) reported 16 local populations of the White Wood
291 Aster in Ontario and 10 in Quebec. Recent surveys have led to the discovery of new
292 local populations within the previously known range for the species (i.e., the Niagara
293 region of Ontario and the Montérégie and Estrie regions in Quebec). This does not
294 imply a population or range increase, but rather an increase in survey effort. As of 2016,
295 there are a total of 65 known local populations of the White Wood Aster in Canada:
296 13 in Quebec where 12 are extant (i.e., recorded between 1997-2016 and assumed to
297 be still in existence), and one is extirpated (i.e., confirmed to no longer exist), and 52 in
298 Ontario where 44 are extant, 6 are extirpated, one is historic (i.e., record predates 1997,
299 but habitat remains suitable) and one is unknown (i.e., likely extirpated, but
300 unconfirmed). A total of 56 local populations are extant in Canada, however, there is
301 uncertainty regarding the number of individuals and the spatial distribution of local
302 populations due to the lack of consistent monitoring and reporting. Details of the known

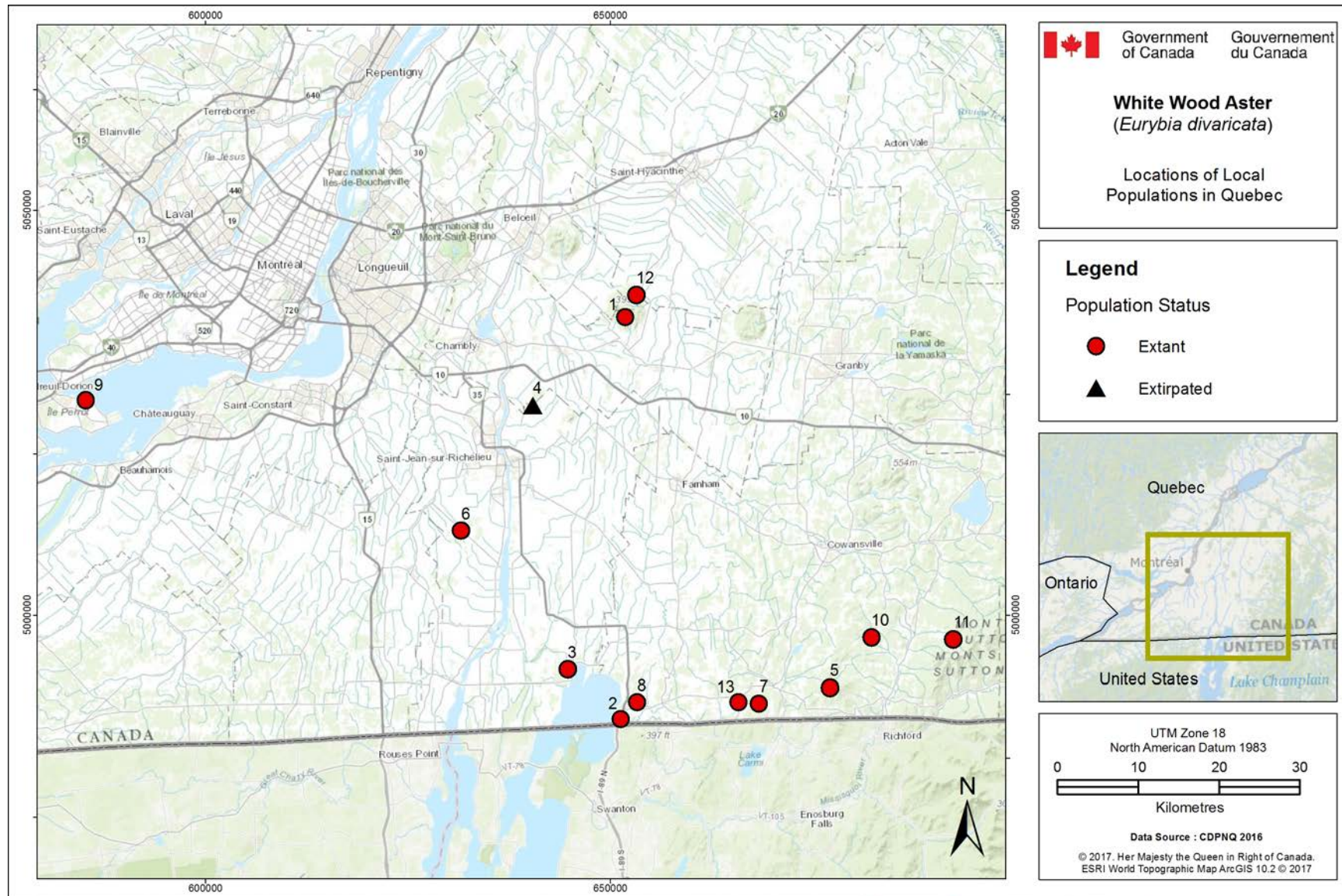
⁸ Asexual reproduction by underground rhizomes (root stalks). Above ground, these plants appear to be distinct individuals, but underground they remain interconnected and are all clones of the same plant.

303 local populations and associated subpopulations in each province are presented in
304 Appendix B.

305



306 **Figure 1. Locations of local populations of the White Wood Aster in Ontario and population status information. Local population**
 307 **numbers correspond to descriptions in Appendix B.**
 308



309 Figure 2. Locations of local populations of the White Wood Aster in Quebec and population status information. Local population
310 numbers correspond to descriptions in Appendix B.

311 Overall, the Canadian population trend appears to be fairly stable (COSEWIC 2002;
312 Boisjoli 2010; CDPNQ 2015). In general, the abundance of the White Wood Aster within
313 Ontario local populations ranges from a few plants or stems to >1,000. Colonies
314 (i.e. multiple stems belonging to a single genetic individual) can be difficult to distinguish
315 from groups of individual plants, so the number of stems is often used as a surrogate
316 measure of abundance within a local population. Although the number of stems is not
317 necessarily equivalent to the number of plants, this survey method is preferred because
318 it is difficult to determine the number of individual plants without applying invasive
319 procedures which may cause harm to the plant (COSEWIC 2002). Based on abundance
320 information, where available for local populations (n=21), it is estimated that there are at
321 least 18,300 plants or stems in Ontario (Appendix B); however, this is almost certainly
322 an underestimate as surveys to assess abundance have not been completed at all local
323 populations in Ontario. When the COSEWIC status report was written in 2002, most of
324 the local populations in Quebec had not undergone recent monitoring. Since then,
325 several local populations have been revisited and new local populations have been
326 discovered. Based on the most recent data, it is estimated that there are approximately
327 15,400 plants or stems in Quebec (CDPNQ 2015).
328

329 **3.3 Needs of the White Wood Aster**

330
331 The White Wood Aster grows in open, deciduous forests typically dominated by a
332 variety of deciduous tree species including Sugar Maple (*Acer saccharum*) and
333 American Beech (*Fagus grandifolia*) and sometimes accompanied by Bitternut Hickory
334 (*Carya cordiformis*) and Ironwood (*Ostrya virginiana*) (COSEWIC 2002). In Quebec the
335 species also occurs in Eastern Hemlock (*Tsuga canadensis*) stands, particularly stands
336 that have undergone forest harvesting (COSEWIC 2002). The moisture regime has
337 been described as fresh to moderately moist with very poor to moderately well-drained
338 soils in Ontario (Imrie et al. 2005), predominantly mesic in Maryland (Yorks et al. 2000),
339 submesic to mesic in the southern Appalachian Mountains (Boyle II et al. 2014), and
340 rich mesic in Massachusetts (Bellemare et al. 2005). Stem density has been observed
341 to decline with distance from old woods as the species is slow to re-colonize
342 regenerated forests that were previously cleared for agriculture (Singleton et al. 2001;
343 Hough 2008).
344

345 The persistence of the White Wood Aster is strongly influenced by light and tree canopy
346 openness (Boisjoli 2010). Under a relatively open tree canopy, the species will utilise
347 sexual reproduction (characterized by flowering, seed production and the recruitment of
348 seedlings), as well as by clonal propagation (Boisjoli 2010). Seed production is only
349 possible when at least two genetically distinct individuals are present within the same
350 area (Avers 1953). The presence of more than one clone has only been confirmed in a
351 few local populations (COSEWIC 2002). For this reason, recovery actions may include
352 increasing the number of individuals within a local population (e.g., via propagation) if
353 feasible and required to maintain local population abundance (Table 2). In less
354 favourable light conditions (e.g., semi-closed to closed tree canopy), the White Wood
355 Aster is able to persist in the form of sterile, mature individuals that remain capable of
356 clonal reproduction. When light conditions improve, the number of stems associated

357 with a population may increase considerably (Boisjoli 2010). The White Wood Aster
358 tolerates, or may even prefer, some level of disturbance as many local populations are
359 found growing in woodlots disturbed by small-scale forest harvesting and along the
360 edges of recreational trails (COSEWIC 2002). The openings in the canopy created by
361 these types of disturbance benefits the species and reflect its preference for open,
362 well-lit areas (Boisjoli 2010).

363

364 The species prefers drier soils but is fairly tolerant of wet conditions. In Quebec, all
365 populations are on dry soils or rocky slopes between 0-58% (Boisjoli 2010). In Ontario,
366 it was reported at sites with very poor to moderately well-drained soils with a slope
367 ranging from 10-57% (Imrie et al. 2005). Litter depth also appears to have a strong
368 influence on the presence of the White Wood Aster. A thick accumulation of litter likely
369 protects seeds and seedlings from freezing and may also serve as an important source
370 of nutrients (Boisjoli 2010).

371

372 In Ontario, the White Wood Aster is currently only known to occur within the Niagara
373 region of the southern Ontario deciduous forest. It is previously known from the
374 Hamilton, Toronto and Kingston areas in Ontario. The Niagara region is one of the
375 warmest regions of Ontario and has the longest growing season. This area is
376 characterized by humid warm to hot summers and mild winters. The region of Quebec
377 containing the White Wood Aster is similarly characterized by warm summers and mild
378 winters (COSEWIC 2002).

379

380

381 **4. Threats**

382

383 **4.1 Threat Assessment**

384

385 The White Wood Aster threat assessment is outlined in Table 1. Threats are described
 386 as proximate activities or processes that have caused, are causing or may cause in the
 387 future the destruction, degradation, and/or impairment of the White Wood Aster
 388 population in Canada. The threats are presented in decreasing order of level of concern
 389 within each category. Additional information on the nature of the threats is presented in
 390 the Description of Threats section (4.2).

391

392 **Table 1. Threat Assessment Table**

Threat	Level of Concern ^a	Extent	Occurrence	Frequency	Severity ^b	Causal Certainty ^c
Habitat Loss or Degradation						
Residential development and urbanization	High	Localized	Historic/ Anticipated	Recurrent	Medium	High
Agricultural development	High	Localized	Historic/ Anticipated	Recurrent	Medium	High
Forest harvesting	Medium	Localized	Historic/ Anticipated	Recurrent	Low	Medium
Changes in Ecological Dynamics or Natural Processes						
Alteration of the natural disturbance regime	Medium	Widespread	Historic/ Current	Continuous	Medium	High
Invasive Species						
Invasive plants	Medium	Widespread	Current	Continuous	Unknown	Low
Invasive invertebrates	Low	Widespread	Current	Continuous	Unknown	Low
Natural Processes or Activities						
Grazing by deer	Low	Localized	Current	Recurrent	Unknown	Low
Disturbance or Harm						
Off-trail recreation	Low	Localized	Current	Recurrent	Low	Medium

393 ^a *Level of Concern: signifies that managing the threat is of (high, medium or low) concern for the recovery of the*
 394 *species, consistent with the population and distribution objectives. This criterion considers the assessment of all the*
 395 *information in the table.*

396 ^b *Severity: reflects the population-level effect (high: very large population-level effect, moderate, low, unknown).*

397 ° Causal certainty: reflects the degree of evidence that is known for the threat (high: available evidence strongly links
 398 the threat to stresses on population viability; medium: there is a correlation between the threat and population viability
 399 e.g. expert opinion; low: the threat is assumed or plausible).

400

401 **4.2 Description of Threats**

402

403 Threats listed for the White Wood Aster include habitat loss due to residential
 404 development, agricultural expansion and forest harvesting alteration of the natural
 405 disturbance regime, invasive plants, invasive invertebrates, grazing by White-tailed
 406 Deer (*Odocoileus virginianus*) and off-trail recreation. Threats are listed below in order
 407 of level of concern.

408

409 *Residential Development and Urbanization*

410 The conversion of woodlands to developed lands leads to the permanent loss or
 411 degradation of White Wood Aster habitat by removing the habitat the species uses or
 412 may disperse into, along with the ecosystems that support them. Residential
 413 development and urbanization poses a serious threat to several White Wood Aster local
 414 populations in both Ontario and Quebec, and is the main cause of local extirpations
 415 (COSEWIC 2002; ECCC, unpublished data). The White Wood Aster occurs in southern
 416 Ontario and Quebec, which is the most heavily populated region of Canada (Statistics
 417 Canada 2008) and has experienced significant changes to the natural landscape over
 418 the last century. It is now a highly developed region dominated by urban and agricultural
 419 landscapes; between 2000 and 2011, about one half of the land (2,348 ha) deforested
 420 in southern Ontario was cleared for urban development purposes (Ontario Biodiversity
 421 Council 2015). The threat from deforestation for residential and commercial
 422 development is expected to continue given the human population growth projected for
 423 2015-2041 within the species' range in Ontario (Ministry of Finance 2016). In southern
 424 Quebec, there was an overall reduction of forest cover of 3% between 1993 and 2001,
 425 with an increase in suburban sprawl (Jobin et al. 2010).

426

427 *Agricultural Development*

428 Habitat for the White Wood Aster has been historically lost due to the conversion of land
 429 for agricultural development. The maintenance and expansion of agricultural lands
 430 continues to threaten the persistence of some White Wood Aster local populations.
 431 For example, the Mont Rougement area in Quebec is home to many apple orchards
 432 and sugar maple stands for the production of maple syrup. Activities carried out for the
 433 maintenance and expansion of these orchards and maple stands (e.g., forest
 434 harvesting, use of pesticides and mowing) may result in damage or destruction of
 435 habitat. In 1991, the Culp's Woods local population in Ontario contained thousands of
 436 White Wood Aster stems; in 2002 only 400 stems were observed. The decline in
 437 population abundance at this site is thought to have been a result of the fragmentation
 438 and loss of suitable woodland habitat due to orchard expansion into adjacent woodlands
 439 (COSEWIC 2002).

440

441 *Forest Harvesting*

442 Wood harvesting can result in different impacts on the White Wood Aster. Under certain
 443 conditions, small scale tree removal and other forest best management practices

444 (e.g., thinning of the forest canopy and/or pruning of vegetation) may actually be
445 beneficial to the species, as creating tree canopy openings is conducive to the species'
446 growth provided careful precautions are taken to avoid direct harm to the species.
447 Forestry operations should also take precautions to avoid spreading invasive species,
448 compacting soils, and using herbicides and insecticides which may harm this aster or its
449 pollinators. However, several local populations in both Ontario and Quebec are
450 vulnerable to habitat loss due to incompatible forest harvesting and regeneration
451 practices (e.g., harvesting that results in the growth of even-aged stands and thus
452 changes to the natural disturbance regime). In addition, asters are generally vulnerable
453 to trampling (e.g., through the use of heavy equipment) (Dignard et al. 2008).

454

455 *Alteration of the Natural Disturbance Regime (Forest canopy closure)*

456 Light and canopy openness are considered the most important factors influencing the
457 growth of the White Wood Aster (Boisjoli 2010). Natural succession leads to maturation
458 of forests and increases in canopy cover. Historically, small gaps in the forest canopy
459 would have been created and maintained by natural processes such as windthrow⁹ and
460 natural tree mortality. Current silvicultural practices (e.g., clearcutting, high grade
461 cutting) have resulted in the alteration of natural forest age structure, creating fairly
462 young, even-aged stands in which mature trees are rare. As part of natural forest
463 dynamics, canopy gaps are naturally formed when mature trees fall to the forest floor.
464 Young forests may not possess trees that are large enough to create gaps sufficient for
465 the White Wood Aster when they fall (Boisjoli 2010). Harvesting practises that select
466 mature trees for removal reduce the potential for natural tree fall. Consequently, natural
467 canopy gaps are less common in harvested forest landscapes (Jetté et al. 2013), a
468 situation that has contributed to canopy closure.

469

470 *Invasive Plants*

471 Invasive species of concern to the White Wood Aster include Garlic Mustard (*Alliaria*
472 *petiolata*) and non-native Common Reed (*Phragmites australis*). Garlic Mustard has
473 been observed at the Two Mile - Four Mile Creek Area of Natural and Scientific Interest
474 (ANSI) and the Short Hills Provincial Park local populations in Ontario (COSEWIC
475 2002). Garlic Mustard is a persistent threat throughout southern Canada due to its
476 ability to outcompete local flora (Catling et al. 2015), and may pose a threat to the White
477 Wood Aster at these locations (COSEWIC 2002). In Ontario, Imrie et al. (2005) found
478 Garlic Mustard to be the second most dominant vascular plant species in deer
479 exclosures constructed for the White Wood Aster. In New England, Stinson et al. (2007)
480 found that the White Wood Aster increased in response to the removal of Garlic
481 Mustard. Non-native Common Reed is present near the Mont Petit Pinacle local
482 population, one of the largest local populations of the White Wood Aster in Quebec
483 based on number of stems (Désilets 2015). The non-native Common Reed is an
484 aggressive invasive plant species that outcompetes local flora and can form very dense
485 colonies (Catling and Mitrow 2011). It will be necessary to monitor these local
486 populations to determine the extent of threat Garlic Mustard and non-native Common
487 Reed pose to the continued persistence of the White Wood Aster. In addition,
488 Norway Maple (*Acer platanoides*) and Bird Cherry (*Prunus avium*) are considered to be

⁹ Trees uprooted or broken by wind

489 degrading the native oak-pine forest at the Fort George National Historic Site
490 (i.e., Two Mile – Four Mile Creek ANSI local population) (Jalava 2004).

491

492 *Invasive Invertebrates*

493 The non-native invasive Hairy Spider Weevil (*Barypeithes pellucidus*) feeds on various
494 species of Aster (Campbell et al. 1989), and has been observed preferentially feeding
495 on the White Wood Aster in central Ohio (Galford 1987). In Quebec, Boisjoli (2010)
496 observed signs of weevil feeding on seeds still attached to flower heads. During recent
497 fieldwork conducted at the Mont Petit Pinnacle local population, nearly 50% of the plants
498 showed signs of damage due to insect feeding (Désilet 2015). The Hairy Spider Weevil
499 is widespread in Canada and one of most common weevil species in several woodlots
500 of southern Ontario (Proctor et al. 2010). This species may pose a significant threat to
501 the White Wood Aster.

502

503 Non-native earthworms may reduce the availability of suitable habitat by reducing leaf
504 litter to nearly bare soil (Alban and Berry 1994; Hale et al. 2005). In addition,
505 earthworms may facilitate the spread and growth of non-native plants, reduce the cover
506 of native plants (Nuzzo et al. 2009; Craven et al 2017), and alter the soil nutrient profile
507 (Sackett et al. 2013; Dobson et al. 2017). Invasive non-native earthworms have been
508 identified as threats to forest ecosystems in southern Quebec and southern Ontario
509 (Wironen and Moore 2006; Sackett et al. 2012). Considering that litter depth is an
510 important factor in seed germination and seedling recruitment (Boisjoli 2010), the
511 presence of non-native earthworms may be having a negative impact on the species but
512 is yet unconfirmed.

513

514 *Grazing by Deer*

515 Grazing by White-tailed Deer is considered a significant threat to some White Wood
516 Aster local populations in southern Ontario, notably at the Short Hills Provincial Park
517 and Fonthill-Sandhill Valley ANSI subpopulations (Faison et al. 2016). The White Wood
518 Aster is known to be preferentially browsed by White-tailed deer in Pennsylvania
519 (Williams et al. 2000). Given the abundant deer populations in southern Ontario and
520 Quebec, deer browse is likely a threat to the species (COSEWIC 2002). Deer browse
521 may also facilitate the growth and spread of some invasive forest understory plants
522 (Shen et al. 2016; Russell et al. 2017). The impact of this threat is dependent on
523 White-tailed Deer population abundance and the deer management techniques that
524 may be applied at specific locations.

525

526 *Off-trail Recreation*

527 The edges of woodlots and trails offer open, sun-exposed light conditions that are
528 favourable to the White Wood Aster. However, where the species occurs near trail
529 edges and other recreational use areas, it may be subject to unintentional trampling.
530 For example, recreational trails run through colonies at the Marcy's Woods, Short Hills
531 Provincial Park and the St. John Conservation Area in Ontario, camping is
532 permitted near the Mont Rougemont local population in Quebec, and the
533 Saint-Blaise-sur-Richelieu and Venise-en-Québec local populations are adjacent to golf
534 courses (COSEWIC 2002).

535

536 *Other Potential Threats*

537 There are several potential threats that are believed to impact the White Wood Aster in
538 Canada, although more information is needed to confirm the extent and level of
539 concern. For example, signs of shallow excavation were observed in the Crescent
540 Estates Woodlot in Ontario which may have been a result of intentional harvesting of
541 the species (COSEWIC 2002) although this is not typically a harvested species.
542 Surveys at the Fort George National Historic Site noted the occurrence of several plants
543 that appeared to be intermediate between the White Wood Aster and the Bigleaf Aster
544 (*Eurybia macrophylla*) (Jalava 2004), therefore it is possible that hybridization may be a
545 threat to the White Wood Aster at this site or others where the species co-occur. Other
546 potential threats mentioned may include erosion and quarry expansion (COSEWIC
547 2002) although the current status of these threats is unknown.

548

549 **5. Population and Distribution Objectives**

550

551 The population and distribution objectives for the White Wood Aster in Canada are:

552

- 553 - Maintain the current distribution and abundance (i.e., total number of stems) of
554 the White Wood Aster in Canada; and
- 555 - Where necessary and technically and biologically feasible, support natural
556 increases of abundance (i.e., total number of stems) of extant local populations.

557

558 The White Wood Aster reaches the northern limit of its North American range in
559 southern Ontario and Quebec, and may never have been common or widespread in
560 Canada (COSEWIC 2002). The number of identified extant local populations and
561 subpopulations has increased since the last COSEWIC status report in 2002 as a result
562 of an increased search effort and data reporting. It is possible that targeted surveys for
563 the species may result in the discovery of previously undetected local populations and
564 subpopulations. Therefore, maintaining the species' current distribution in Ontario and
565 Quebec, including any new local populations that are discovered and identified in the
566 future, is considered an appropriate objective for recovery.

567

568 For most local populations, the species' abundance is measured by the total number of
569 stems, because the number of clones can be difficult to determine without damaging the
570 plants (COSEWIC 2002). Therefore, the total number of stems is used as a measure of
571 abundance for local populations where the number of colonies has not yet been
572 determined. A population viability analysis would be beneficial to determine if and where
573 increases in abundance are considered necessary to promote self-sustaining¹⁰ local
574 populations and long-term persistence of the species. For example, it may be necessary
575 to increase the species' abundance at local populations threatened by small population
576 size (e.g., where only one colony is known to occur). Recovery measures to support
577 natural increases of abundance at local populations will include habitat management

¹⁰ A population that on average demonstrates stable or positive population growth and is large enough to withstand random events and persist in the long term without the need for permanent active management intervention.

578 techniques and threat mitigation; propagation and transplantation is not currently being
579 recommended, but as understanding of the number of individuals at each local
580 population improves, may become important in the future. Additional research may need
581 to be conducted to determine if activities to increase abundance within local populations
582 are feasible and required.
583

584 **6. Broad Strategies and General Approaches to Meet** 585 **Objectives**

587 **6.1 Actions Already Completed or Currently Underway**

588
589 Since 2006, the Habitat Stewardship Program (HSP) for Species at Risk has provided
590 support to enable environmental organizations to implement activities targeting the
591 recovery of the White Wood Aster in both Ontario and Quebec. In Ontario, the
592 Niagara Parks Commission, Nature Conservancy of Canada and the Carolinian Canada
593 Coalition have contributed to the formation of conservation agreements, conservation
594 easements and the acquisition of lands to support the protection of habitat for the White
595 Wood Aster, as well as various habitat restoration, monitoring, and outreach and
596 education activities. Natural area inventories have contributed to the identification of
597 additional local populations including those completed by the Niagara Naturalist Club
598 and the Bert Miller Nature Club of Fort Erie.
599

600 In Ontario, broader scale ecosystem management is contributing to the recovery of
601 species that rely on Carolinian forest habitat. For example, the National Recovery
602 Strategy for Carolinian Woodlands and Associated Species at Risk (Jalava et al. 2009),
603 identifies recovery approaches for threatened habitats and species in the Carolinian life
604 zone. In addition, conservation action plans that specifically identify recovery actions for
605 species at risk including the White Wood Aster have been developed for the
606 Hamilton-Burlington, Short Hills, and Niagara River Corridor areas (Jalava et al.
607 2010a-c) and Fort George National Historic Site (Parks Canada Agency 2016). Best
608 Stewardship Practices¹¹ have also been developed by the Carolinian Canada Coalition
609 specifically for the White Wood Aster.
610

611 In Quebec, the HSP has supported Nature-Action Québec, Centre d'interprétation du
612 milieu écologique du Haut-Richelieu, the Nature Conservancy of Canada and the
613 Appalachian Corridor to implement activities within the areas of Vaudreuil-Soulanges
614 and Mont Rougemont, Missisquoi Bay (northern Lake Champlain area), and a portion of
615 the Appalachians known as the Green Mountains. Over the last few years, these
616 organizations have met with landowners to raise awareness of the importance of
617 conserving this species and promote beneficial forest management practices. This has
618 led to the formation of conservation agreements, conservation easements and the
619 acquisition of lands. Additionally, the exploration of areas adjacent to known
620 occurrences has led to the identification of new local populations.
621

¹¹ https://caroliniancanada.ca/bmp/pdf_depository

622 In Quebec, a significant research project (Boisjoli 2010) was carried out in
623 Saint-Armand and Mont Petit Pinnacle that included studying microhabitat needs and
624 habitat thresholds for canopy openness and litter depth. Additional studies have been
625 undertaken to examine the potential impacts on the White Wood Aster due to invasive
626 species. For example, one study found the species to be sensitive to chemical
627 substances emitted by the roots of the Norway Maple (Rich 2004).

628
629 Over the past few years, exceptional forest ecosystems (EFE) have been designated on
630 Mont Rougemont. The EFE status, regulated by the Quebec government, consists of a
631 long-term strategy for conserving high value or threatened ecosystems and habitats.
632 The Quebec Department of Sustainable Development, Environment and Parks
633 (MDDELCC) carried out an analysis of potential habitats on Mont Rougemont in 2012
634 and conducted population surveys in 2015. In addition, canopy thinning has been tested
635 as a method of habitat restoration (Bachand-Lavallée 2015), and a conservation plan
636 has been developed for the White Wood Aster in Mont Rougemont (Bachand-Lavallée
637 2015).

638 **6.2 Strategic Direction for Recovery**

639

640 **Table 2. Recovery Planning Table**

Threat or Limitation	Broad Strategy to Recovery	Priority ^a	General Description of Research and Management Approaches
Knowledge gaps pertaining to species' population and distribution	Surveys and monitoring	High	<ul style="list-style-type: none"> • Implement existing monitoring protocols, or if necessary develop a standardized monitoring protocol for the species. • Confirm the distribution and abundance of extant local populations and subpopulations and determine the boundaries of contiguous suitable habitat to refine the delineation of the areas containing critical habitat. • Search suitable habitat adjacent to areas containing critical habitat for possible new occurrences or subpopulations.
		Medium	<ul style="list-style-type: none"> • Determine the need to increase local population abundance with consideration of clonal/genetic diversity. If determined to be necessary, identify opportunities to increase abundance via habitat restoration and/or threat mitigation. • Determine the reproductive status of local populations (i.e., ability to produce seed). Determine whether the propagation of individuals is recommended as an activity necessary to maintain or increase abundance in order to support the persistence of self-sustaining local populations. • Conduct surveys within the species' range to identify new or previously unknown extant local populations.
	Research	High	<ul style="list-style-type: none"> • Increase knowledge of the species' ecology and habitat needs (e.g. local and range-wide population viability analysis and interannual variability; genetics studies, seed dispersal; interactions with invasive plants and invertebrates; confirm optimal habitat conditions for the species; determine effectiveness of recovery methods).
Canopy closure, invasive plants, grazing by deer and weevil feeding	Monitoring; habitat management	Medium	<ul style="list-style-type: none"> • Monitor local populations for thresholds in canopy openness. If necessary, determine and implement effective methods of habitat restoration. • Monitor local populations for direct or indirect impacts from

Threat or Limitation	Broad Strategy to Recovery	Priority ^a	General Description of Research and Management Approaches
			invasive plant species. Where necessary, implement best management practices for the control of invasive plant species. <ul style="list-style-type: none"> • Monitor local populations for damage from deer browse. Where necessary implement actions to protect plants from deer browse. • Monitor local populations to determine the impacts from weevils, earthworms and other unforeseen invasive species.
All threats	Communication, outreach and education	Medium	<ul style="list-style-type: none"> • Hold identification workshops for landowners in southern Ontario and Quebec to improve the reliability of observations. • Encourage landowners who have the species on their land to use habitat management and development practices that are favourable to the species. • Develop and implement a communication strategy targeting the general public, private landowners, and appropriate stakeholders to increase awareness of the species and its threats.
Residential development and urbanization, agricultural development, forest harvesting	Land use policy and planning; habitat management and conservation	High	<ul style="list-style-type: none"> • Research and develop measures to mitigate impacts to the species and its habitat as a result of activities that pose a threat to the species or its habitat such as residential development and incompatible forest harvesting. • Develop ecosystem conservation plans for deciduous forests containing White Wood Aster. • Ensure county and municipal or other planning authorities are aware of locations of White Wood Aster local populations and the types of activities that may threaten the species or its habitat. • Support protection, stewardship and restoration of habitat containing local populations.

641 ^a “Priority” reflects the degree to which the broad strategy contributes directly to the recovery of the species or is an essential precursor to an
 642 approach that contributes to the recovery of the species.
 643

644 **6.3 Narrative to Support the Recovery Planning Table**

645

646 There are significant knowledge gaps pertaining to the White Wood Aster's local
647 population distribution, abundance and viability. Surveys of extant local populations are
648 required to more accurately map the current distribution and estimate the abundance of
649 the White Wood Aster in Canada. A standardized monitoring protocol should be
650 adopted or developed and implemented regularly for all known local populations to
651 improve knowledge of natural variability of local populations and trends in abundance.
652 The White Wood Aster may be more common in Canada than current data suggest.
653 Under unfavourable light conditions, the plants rarely flower making them difficult to
654 detect (Boisjoli 2010). Searching for new occurrences in suitable habitat, at sites near
655 previously extirpated populations, is also recommended to confirm, or if possible
656 expand, the known distribution of the species in Canada.

657

658 Studies on the ecology and dynamics of the White Wood Aster population are also
659 necessary to fill knowledge gaps and provide the basis for the species' recovery.
660 For example, determining the number of colonies within a local population will be
661 important, as the genetic diversity within a local population is a key factor in a
662 population's seed production capacity and therefore its long-term viability.

663

664 **7. Critical Habitat**

665

666 **7.1 Identification of the Species' Critical Habitat**

667

668 Section 41(1)(c) of SARA requires that recovery strategies include an identification of
669 the species' critical habitat, to the extent possible, as well as examples of activities that
670 are likely to result in its destruction. Under section 2(1) of SARA, critical habitat is "the
671 habitat that is necessary for the survival or recovery of a listed wildlife species and that
672 is identified as the species' critical habitat in the recovery strategy or in an action plan
673 for the species".

674

675 Where detailed surveys have been conducted and White Wood Aster plant locations are
676 known, critical habitat is identified as the extent of biophysical attributes (7.1.1) up to
677 80 m (radial distance) around existing mapped observations of the White Wood Aster
678 (7.1.2). In cases where little or no mapping and/or documentation of plant locations or
679 habitat features exists, but the approximate location of the local population has been
680 verified, the area containing critical habitat is identified as the ecological or landscape
681 feature containing the local population (7.1.2), and critical habitat for White Wood Aster
682 is identified as the extent of biophysical attributes (7.1.1) up to 80 m (radial distance)
683 from any single plant wherever they occur within the areas containing critical habitat
684 (7.1.2). Additionally, as the White Wood Aster may be found near the transition zone
685 between suitable and unsuitable habitat (e.g., within small forest openings, or along

686 woodland edges), a critical function zone distance¹² of 50 m (radial distance) is
 687 identified as critical habitat when the biophysical attributes around an individual plant or
 688 patch of plants extend for less than 50 m.

689
 690 Critical habitat is identified for 51 of 56 known¹³ extant local populations of the White
 691 Wood Aster in Canada (Appendix B-C). The identified critical habitat is considered
 692 insufficient to achieve the population and distribution objectives. Available information
 693 on the species at a number of locations is outdated or lacking detailed spatial
 694 references or additional information is required to confirm the continued persistence of
 695 the species. To address these knowledge gaps, a Schedule of Studies (section 7.3,
 696 Table 3) has been developed which outlines the activities required for the identification
 697 of additional critical habitat necessary to support the population and distribution
 698 objectives. Extant local populations and subpopulations where persistence or location
 699 information is unverified will be targeted by the schedule of studies to identify additional
 700 critical habitat. If new or additional information becomes available (e.g., new or
 701 re-discovered local populations and/or subpopulations), refinements to, or additional
 702 critical habitat may be identified in an amendment to this recovery strategy.

703

704 **7.1.1 Biophysical Attributes**

705

706 The White Wood Aster occurs in open, dry deciduous forests with undulating
 707 topography (ridges, slopes, and terraces) and in fresh-moist deciduous swamp forests
 708 (COSEWIC 2002). These forests are typically dominated by Sugar Maple and American
 709 Beech. In Ontario, associated trees species may also include red, white and black oaks,
 710 Shagbark Hickory (*Carya ovata*), Basswood (*Tilia americana*) and other Carolinian
 711 forest species (COSEWIC 2002) and in Quebec, tree associates of Eastern Hemlock
 712 (*Tsuga canadensis*), Bitternut Hickory and Ironwood may occur. The biophysical
 713 attributes of the critical habitat for the White Wood Aster include:

714

- 715 • Tree canopy cover is 60% or greater, of which 75% or more of the canopy cover
 716 consists of deciduous tree species:
 - 717 ○ The dominant tree species is most often Sugar Maple, but may also be
 718 Red Maple (*Acer rubrum*), American Beech, Red Oak (*Quercus rubra*),
 719 Bitternut Hickory, Shagbark Hickory, Yellow Birch (*Betula*
 720 *alleghaniensis*), Eastern Hemlock, Basswood or Black Maple (*Acer*
 721 *nigrum*)
 - 722 ○ Other overstory species present typically include White Oak (*Quercus*

¹² Critical function zone distance is the radial length surrounding an occurrence that is required to maintain constituent microhabitat properties (e.g. light, moisture, and humidity levels) critical to the survival of an individual of the species. Although it is not clear at what exact distances physical and/or biological processes begin to negatively affect White Wood Aster, existing research provides a logical basis for suggesting a minimum critical function zone distance of 50 m for rare plant species occurrences (see: http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6A845288-1%20-%20Toc285808423#_Toc285808423 Appendix 1). The area within the critical function zone distance may include habitat that does not contain the biophysical attributes described for the species and may not be currently mapped as part of the area containing critical habitat

¹³ Based on data available to Environment and Climate Change Canada as of September 2016.

- 723 *alba*), Black Oak (*Quercus velutina*), White Ash (*Fraxinus*
 724 *pennsylvanica*), White Elm (*Ulmus americana*), Basswood (*Tilia*
 725 *americana*) and Black Cherry (*Prunus serotina*)
 726 ○ Ironwood is a common mid-story tree species
 727 ● Micro-topography may include undulating dry upland features such as dune
 728 ridges, slopes and terraces, and lowlands of wet-mesic troughs and
 729 depressions;
 730 ● Moisture regime is often mesic to dry-mesic in upland habitat (dune ridges,
 731 slopes and terraces) and wet mesic in lowland features (troughs and
 732 depressions);
 733 ● Soils range from silty and loamy clay, sand, and rocky hills.

7.1.2 Areas Containing Critical Habitat

737 In Canada, the presence and persistence of the White Wood Aster in a given location
 738 depends on an area greater than that occupied by individual plants. The areas
 739 containing the critical habitat for the White Wood Aster are the continuous deciduous
 740 forest ecosystems that promote and maintain suitable habitat conditions for the plants
 741 where they are known to occur¹⁴, and provide for natural processes related to
 742 population dynamics and reproduction (e.g., dispersal and pollination).

744 A tiered approach is used to identify the areas containing critical habitat for White Wood
 745 Aster, based on the accuracy of available data for verified local populations. Areas
 746 containing critical habitat for White Wood Aster are identified as follows:

- 747 1) In cases where detailed surveys have been conducted and White Wood Aster
 748 plant locations are known, application of 80 m¹⁵ (radial distance) from any
 749 existing mapped observation within the local population or subpopulation. This
 750 case currently applies to all Quebec local populations.
 751 OR
 752 2) In cases where little or no mapping and/or documentation of plant locations or
 753 habitat features exists, but the approximate local population has been verified,
 754 the areas containing critical habitat are identified as the ecological or landscape
 755 feature (i.e., the extent of continuous deciduous forest) where a White Wood
 756 Aster local population or subpopulation is known to occur. This case currently
 757 applies to all Ontario local populations;
 758

¹⁴ For White Wood Aster plants observed in the last 25 years.

¹⁵ At present, the minimum area of suitable habitat required to allow for the maintenance of viable local population or subpopulations of the White Wood Aster, and to also allow for natural processes related to population dynamics and reproduction (e.g., dispersal) to occur, is unknown. Existing research provides a logical basis for suggesting an area with a minimum radial distance of 80 m to support the maintenance of suitable habitat for the White Wood Aster by minimizing edge effects and associated threats such as invasion by exotic species and White-tailed Deer browse (Gratton and Nantel 1999; Ranney et al. 1981). Therefore, an 80 m distance from any White Wood Aster mapped observation is deemed an appropriate distance to ensure that a minimum area of suitable habitat is maintained and incorporated in the identification of critical habitat.

759 The tiered approach uses the precautionary principle to identify generalized areas as
 760 containing critical habitat where more detailed data on the plant locations are not
 761 currently available. The areas containing critical habitat are presented in Appendix C.
 762 Due to provincial data sharing agreements in Ontario, critical habitat in Ontario is only
 763 presented using the 1 x 1 km UTM grid squares to indicate the general geographic
 764 areas containing critical habitat (Appendix C, Figures C-1-1 to C-1-15). In Quebec, the
 765 areas containing critical habitat are represented by the shaded yellow polygons
 766 (Appendix C, Figures C-2-1 to C-2-12). The UTM grid squares presented in Appendix C
 767 are part of a standardized grid system that indicates the general geographic location of
 768 the areas within which critical habitat is found, which can be used for land use planning
 769 and/or environmental assessment purposes. For more information on critical habitat
 770 identification, contact Environment and Climate Change Canada – Canadian Wildlife
 771 Service at ec.planificationduretablissement-recoveryplanning.ec@canada.ca.

772

773 **7.2 Schedule of Studies to Identify Critical Habitat**

774

775 **Table 3. Schedule of studies to identify critical habitat**

Description of Activity	Rationale	Timeline
Confirm the continued persistence and location of the species and its biophysical attributes at locations where critical habitat was not identified.	Locations of local populations and/or subpopulations considered extant but having insufficient spatial accuracy are confirmed, and if the species persists at these locations, critical habitat is identified.	2018-2023

776

777 **7.3 Activities Likely to Result in the Destruction of Critical Habitat**

778

779 Understanding what constitutes destruction of critical habitat is necessary for the
 780 protection and management of critical habitat. Destruction is determined on a case by
 781 case basis. Destruction would result if part of the critical habitat was degraded, either
 782 permanently or temporarily, such that it would not serve its function when needed by the
 783 species. Destruction may result from a single activity or multiple activities at one point in
 784 time or from the cumulative effects of one or more activities over time. It should be
 785 noted that not all activities that occur in or near critical habitat are likely to cause its
 786 destruction. Activities described in Table 4 are examples of those likely to cause
 787 destruction of critical habitat for the species; however, destructive activities are not
 788 necessarily limited to those listed.

789

790

791 **Table 4. Activities Likely to Result in the Destruction of the White Wood Aster's Critical**
 792 **Habitat**

Description of Activity	Description of Effect in Relation to Function Loss	Details of Effect
Conversion of wooded habitats to other land uses, including residential, agricultural, recreational or industrial areas (e.g., subdivisions, row crops, roads, quarries, landfills, golf courses).	Direct destruction of critical habitat. These activities remove soils, tree and vegetation cover and alter natural hydrological patterns that are required for the growth, reproduction and dispersal of White Wood Aster.	When this activity occurs within the bounds of critical habitat, at any time of year, the effects will be direct, and is certain to result in the permanent destruction of critical habitat. There are no possible thresholds for this activity.
Incompatible forest management activities including: clear cutting; some types of small-scale forest harvesting; and operation of heavy equipment.	<p>Clear cutting and small-scale forest harvesting may result in direct removal and loss of tree canopy and light conditions, indirectly changing soil moisture regimes of critical habitat.</p> <p>Use of forestry equipment (if not cleaned properly) may result in an increase in the probability of propagules of invasive species being introduced.</p>	<p>When this activity occurs within critical habitat, it may result in its destruction. The effects may be direct (e.g. through habitat loss) or indirect (e.g. through introduction of invasive species).</p> <p>Some small-scale forest harvesting that results in the thinning of the forest canopy, and/or pruning of vegetation may be beneficial provided careful precautions are taken (e.g., forestry equipment is properly cleaned, use of existing roads and trails, direct harm to the species is avoided, responsible removal of brush and wood from habitat as needed).</p>
Introduction of non-native species, especially plants or invertebrates (e.g., introduction of non-native plant seeds, plants, foreign soil, composting or dumping of garden waste).	Non-native species may out-compete the White Wood Aster, and/or cause physical changes to habitat (e.g., changes in canopy cover), such that the habitat is no longer suitable for this species.	When this activity occurs within or adjacent to critical habitat, at any time of year, the effects may be direct and/or cumulative. The introduction of an invasive species can lead to gradual destruction of critical habitat over time (i.e., cumulative impacts).

793

794

795 8. Measuring Progress

796

797 The performance indicators presented below provide a way to define and measure
798 progress toward achieving the population and distribution objectives.

799

800 Every five years, success of recovery strategy implementation will be measured against
801 the following performance indicators:

802

- 803 - Species distribution and abundance is maintained; and
- 804 - Where necessary and technically and biologically feasible, natural increases in
805 abundance are supported at extant local populations.

806

807 9. Statement on Action Plans

808

809 One or more action plans will be completed by December 31, 2024.

810

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1055 and nitrogen in an old-growth forest in southern Quebec. *Canadian Journal of*
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1062 **Appendix A: Conservation Ranks of the White Wood Aster in**
 1063 **Canada and the United States**
 1064

Global (G) Rank	National (N) Rank	Subnational (S) Rank
G5	Canada: N2N3	Ontario (S2S3), Quebec (S2)
	United States: N5	Alabama (SNR), Connecticut (SNR), Delaware (S4), District of Columbia (SNR), Georgia (S5), Kentucky (S5), Maine (S3), Maryland (SNR), Massachusetts (SNR), New Hampshire (SNR), New Jersey (S5), New York (S5), North Carolina (S5), Ohio (SU), Pennsylvania (SNR), Rhode Island (SNR), South Carolina (SNR), Tennessee (SNR), Vermont (SNR), Virginia (S5), West Virginia (S5)

- 1065
 1066 **Rank Definitions (Master et al. 2012)**
 1067
 1068 **G5/N5/S5: Secure:** At very low risk of extinction or elimination due to a very extensive range, abundant
 1069 populations or occurrences, and little to no concern from declines or threats.
 1070
 1071 **S4: Apparently Secure:** At a fairly low risk of extirpation in the jurisdiction due to an extensive range
 1072 and/or many populations or occurrences, but with possible cause for some concern as a result of local
 1073 recent declines, threats, or other factors.
 1074
 1075 **N3/S3: Vulnerable:** At moderate risk of extinction or elimination due to a fairly restricted range, relatively
 1076 few populations or occurrences, recent and widespread declines, threats, or other factors.
 1077
 1078 **N2/S2: Imperilled:** At high risk of extirpation in the jurisdiction due to restricted range, few populations or
 1079 occurrences, steep declines, severe threats, or other factors.
 1080
 1081 **SNR: Unranked:** Conservation status not yet assessed
 1082
 1083 **U:** Unrankable: Currently unrankable due to lack of information or due to substantially conflicting
 1084 information about status or trends.
 1085
 1086 **N#S#/S#S#:** **Range Rank:** A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty
 1087 about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used
 1088 rather than S1S4).
 1089

Appendix B: Local populations and subpopulations of the White Wood Aster, with estimated abundance, last observed date and population status^a.

Local Population	Local Population Status ^b	Subpopulation	COSEWIC Population	Conservation Data Centre Element Occurrence (EO) ID	# plants/stems	Last Observed	Area Containing Critical Habitat ^c
ONTARIO							
1. Crescent Estates & Helena Road Woodlots	Extant	1a. Crescent Estates Woodlot	Crescent Estates Woodlot	n/a	100 plants	2002	Yes
		1b. Helena Road Woodlot			Unknown	2015	Yes
2. Culp's Woods	Extant		Culp's Woods	EO11196	400 plants	2002	Yes
3. Dufferin Island	Extant		Dufferin Island	EO66852	15-20 plants	2008	Yes
4. Fonthill-Sandhill Valley ANSI	Extant		Fonthill-Sandhill Valley ANSI	EO31887	1000's of plants "appears widespread throughout ANSI (2002)"	2016	Yes
5. Marcy's Woods and Point Abino	Extant	5a. Marcy's Woods	Marcy's Woods (Point Abino Peninsula ANSI)	EO31886	200 plants	2001	Yes
		5b. Point Abino			Unknown; single patch	2000	No
6. Miller Creek Swamp Woodlot (Fort Erie North)	Extant		Miller Creek Swamp Woodlot	EO66857	100 plants	2002	Yes
7. Nelson Quarries	Extant		Nelson Quarries	EO31897	Unknown	1999	Yes
8. North Pelham Valley ANSI	Extant		North Pelham Valley ANSI	EO31898	30 plants or stems	2008	Yes
9. Oakhill Forest (Ridgewood)	Extant		Oakhill Forest - 1	EO66853	10-20 plants or stems	2002	Yes
10. Oakhill Forest (Ridgeway)	Extant		Oakhill Forest - 2	EO66854	6 plants or stems	2002	Yes
11. South Fort Erie (Ridgeway)	Extant	11a. Dominion Woods	South Fort Erie	EO66855	Unknown "species is persistent"	2004	Yes
		11b. South of Thunder Bay Rd			20-30 plants; habitat since destroyed, now considered extirpated	2002	No*
12. South Fort Erie 2 (Crystal Beach)	Extant		South Fort Erie 2	EO66856	3 plants	2002	Yes
13. Short Hills Provincial Park	Extant	13a. Twelve Mile Creek ANSI	Short Hills Provincial Park - Twelve Mile Creek ANSI	EO1711	1555 plants "plants are scattered in the area"	2002	Yes
		(13a.) Howell Pumpkin Farm			Unknown	2006	Yes
		13b. Cataract Woods	Short Hills Provincial Park - Cataract Woods		3800 stems "very abundant throughout; evidence deer management has increased abundance and spread"	2016	Yes
		13c. Terrace Creek			5350 stems	2002	Yes
14. St. Johns Conservation Area	Extant		St. Johns Conservation Area	EO31888	3 stems	2002	Yes

Local Population	Local Population Status ^b	Subpopulation	COSEWIC Population	Conservation Data Centre Element Occurrence (EO) ID	# plants/stems	Last Observed	Area Containing Critical Habitat ^c
15. Summer Street Woodlot (Fort Erie North)	Extant		Summer Street Woodlot	EO66859	20 plants	2002	Yes
16. Two Mile – Four Mile Creek ANSI	Extant	16a. Four Mile Creek	Two Mile-Four Mile Creek ANSI (Niagara Shores Conservation Area)	EO1708	146	2003	Yes
		16b. Two Mile Creek	Two Mile-Four Mile Creek ANSI (Department of National Defense)		>425	2009	Yes
		16c. Three Mile Creek		n/a	>550 plants	2009	Yes
17. Welland Canal	Extant			EO93597	Unknown "a few flowering stems"	2004	Yes
18. Paradise Grove	Extant			EO92423	>200 flowering stems; 3 patches	2006	Yes
19. Fernwood Woodlot Park	Extant			EO92702	~200 plants or stems "scattered clumps in northeast corner"	2016	Yes
20. Kunda Park	Extant			n/a	~2900 plants or stems	2008	Yes
21. Lancaster Park	Extant			n/a	~50-70 plants or stems	2016	Yes
22. Woodlawn Park	Extant			n/a	1000s plants or stems "common to abundant; expanding throughout forest"	2016	Yes
23. Woodlot at Wilford and Putnam	Extant			n/a	Unknown	2007	Yes
24. Fort Erie Wetland	Extant			n/a	~30 plants or stems	2007	Yes
25. Burns Road Woodlot	Extant			n/a	Unknown	2010	Yes
26. Along Bruce Trail North of Queenston Quarry	Extant			n/a	~12 plants or stems	2008	Yes
27. Kingston Mills	Extirpated			EO31899		1991	No*
28. Niagara Falls	Extirpated			EO5076		1893	No*
29. St. Catherines	Extirpated			EO5077		1987	No*
30. Swansea	Extirpated			EO1710		1927	No*
31. Royal Botanical Gardens	Extirpated			EO1709		1955	No*
32. Queenston Heights	Extirpated			EO1705		1898	No*
33. Beamsville Shoreline	Historic			EO1706	Unknown	1973	No
34. Beamsville Escarpment Life Science ANSI	Extant			n/a	Unknown	2008	Yes
35. Windmill Point	Unknown (currently pending); however likely extirpated and considered lost			n/a	Unknown	1879	No

Local Population	Local Population Status ^b	Subpopulation	COSEWIC Population	Conservation Data Centre Element Occurrence (EO) ID	# plants/stems	Last Observed	Area Containing Critical Habitat ^c
36. Cooks Mills	Extant			n/a	Unknown	2006	Yes
37. HAL-32	Extant			n/a	Unknown	2007	No
38. Old Lincoln Street Slough Forest	Extant			n/a	Unknown	2007	Yes
39. Fireman's Park	Extant			n/a	Unknown	2008	No
40. Juard Woods - Ridgeville Swamp	Extant			n/a	Unknown "an amazing abundance throughout the ground layer"	2008	Yes
41. Coyle Creek Headwaters	Extant			n/a	Unknown	2008	Yes
42. Rose Little Woods – Merritt Road Swamp	Extant			n/a	Unknown	2008	Yes
43. Elsie Road Woods	Extant			n/a	Unknown	2007	No
44. Fork Creek Meanders	Extant			n/a	Unknown	2007	No
45. Morgan's Point	Extant			n/a	Unknown	2007	No
46. Doan's Ridge	Extant			n/a	Unknown "very abundant, 30% cover throughout property"	2016	Yes
47. Woodland Elementary School Grove	Extant			n/a	Unknown	2002	Yes
48. Wetland South of Rose Little	Extant			n/a	100's of plants or stems "very abundant, 50-70% cover along western edge"	2016	Yes
49. Hillcrest Park, Pelham	Extant			n/a	100's of plants or stems "very abundant, 40 stems/m ² in ~60-150m ² area"	2016	Yes
50. Woodlot "13D"	Extant			n/a	Unknown	2005	Yes
51. Woodlot "13A" – Ridge Street @ Split Rock Ridge	Extant			n/a	Unknown "seen along western edge road allowance"	2016	Yes
52. Woodlot "6D" – Cherry Hill Woodlot	Extant			n/a	Unknown	2003	Yes
QUEBEC							
1. Mont Rougemont	Extant	2 subpopulations	Mont Rougemont	3865	805	2014	Yes
2. Collines de Saint-Armand	Extant	2 subpopulations	Saint-Armand	3866	50	2013	Yes
3. Venise-en-Québec	Extant	2 subpopulations	Venise-en-Québec	3867	271	2011	Yes
4. Mont-Saint-Grégoire	Extirpated		Mont St-Grégoire	3868	15	1987	No*
5. Monts Petit-Pinnacle et Pinnacle	Extant	6 subpopulations	Frelighsburg -Petit Pinnacle / Mont Pinnacle / Colline Spruce	3870	2700	2015	Yes

Local Population	Local Population Status ^b	Subpopulation	COSEWIC Population	Conservation Data Centre Element Occurrence (EO) ID	# plants/stems	Last Observed	Area Containing Critical Habitat ^c
6. Saint-Blaise-sur-Richelieu	Extant	3 subpopulations	Saint-Blaise	3872	1032	2017	Yes
7. Frelighsburg (Saint-Armand centre)	Extant		Frelighsburg - Saint-Armand Centre	3873	100	1997	Yes
8. Saint-Armand ouest	Extant			11275	300	2005	Yes
9. Notre-Dame-de-l'Île-Perrot 2	Extant			19830	75	2009	Yes
10. Sutton 1	Extant			20860	Unknown	2011	Yes
11. Sutton 2 Mont Round Top	Extant			20861	40	2010	Yes
12. Mont-Rougemont 2 (Saint-Damase)	Extant			21901	35	2014	Yes
13. Frelighsburg Eccles Hill	Extant	2 subpopulations		22348	10000	2014	Yes

^a Sources: COSEWIC (2002); Bert Miller Nature Club (2003); Jalava (2004); AMEC Earth & Environmental Limited 2009; Niagara Peninsula Conservation Authority (2010); CDPNQ (2015); Garofalo (pers. comm. 2016); Natural Heritage Information Centre (2016); Sankey (pers. comm. 2016); Monette (pers. comm. 2018); ECCC (unpublished data); Niagara Falls Nature Club (unpublished data).

^b Status is indicated for the local population. Extant: record from 1997-2017; historic: record predates 1997 (habitat remains suitable); extirpated: no longer exists (confirmed); unknown: likely extirpated (unconfirmed).

^c Yes: local populations or subpopulations where areas containing critical habitat have been identified and mapped (Appendix C); No: local populations or subpopulations where areas potentially containing critical habitat have not been identified or mapped, confirmation of persistence of the species or spatial verification is required (i.e., included in the schedule of studies). No*: local population or subpopulation is extirpated (i.e., not included in schedule of studies).

Appendix C: Critical Habitat for the White Wood Aster in Canada

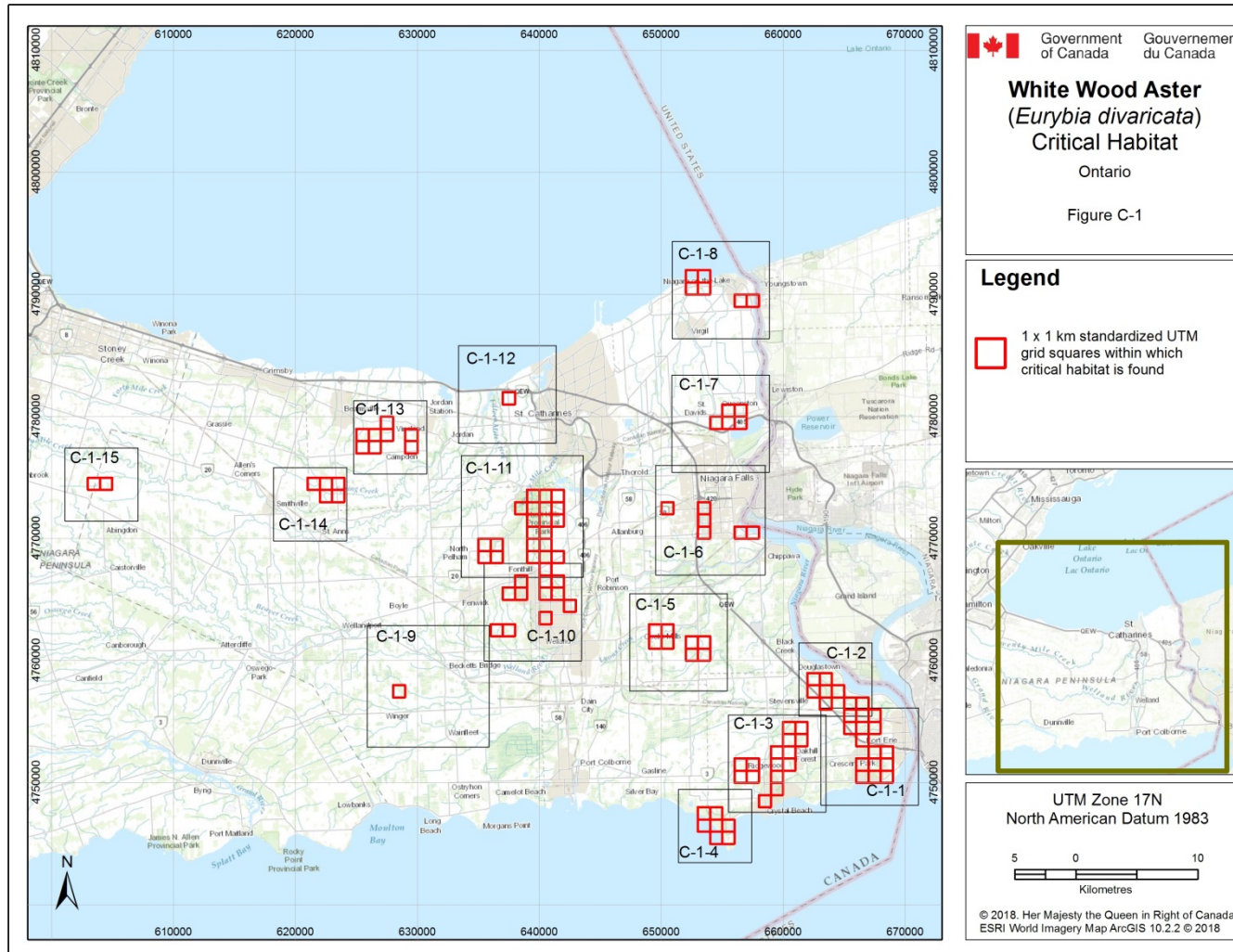


Figure C-1. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

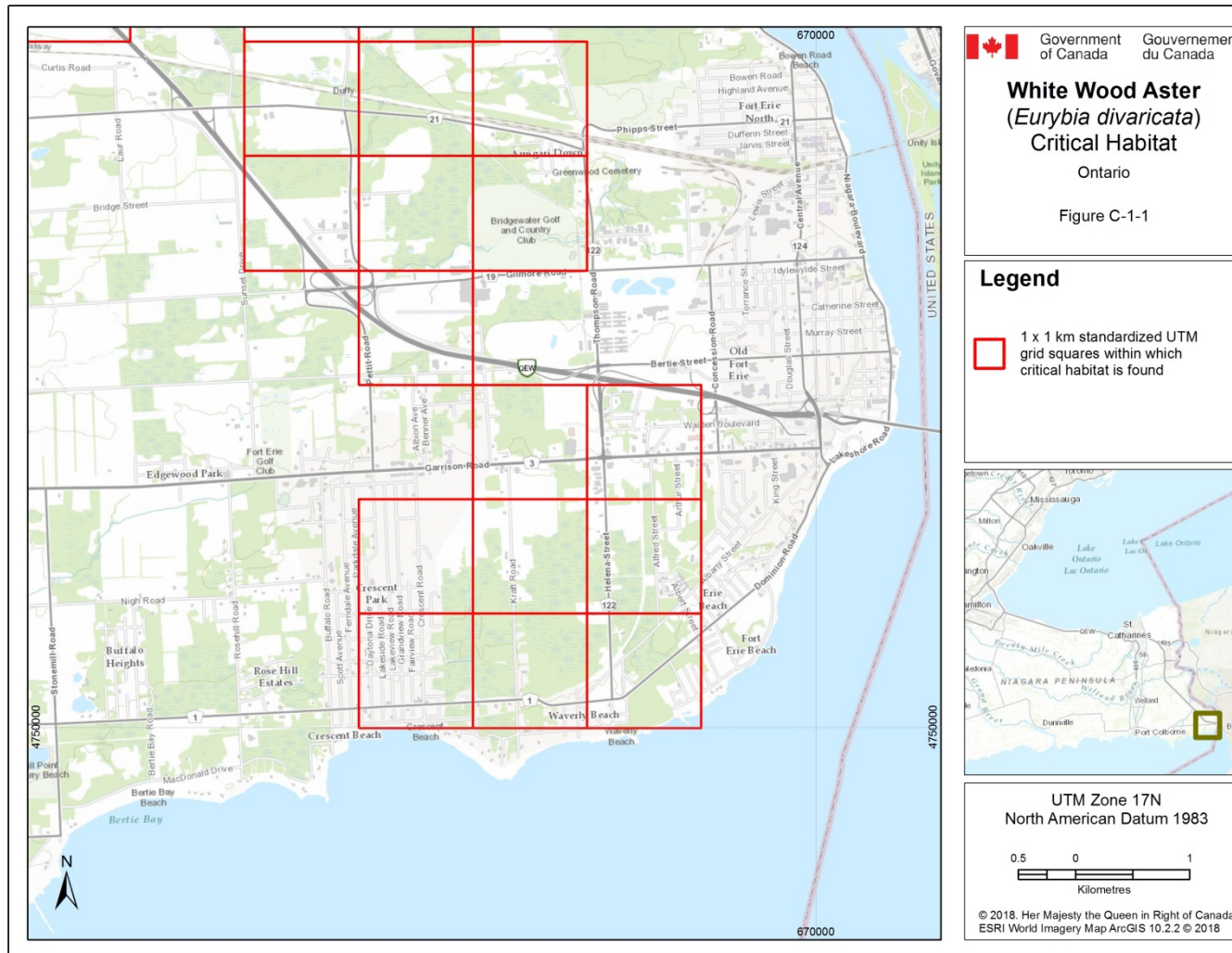


Figure C-1-1. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

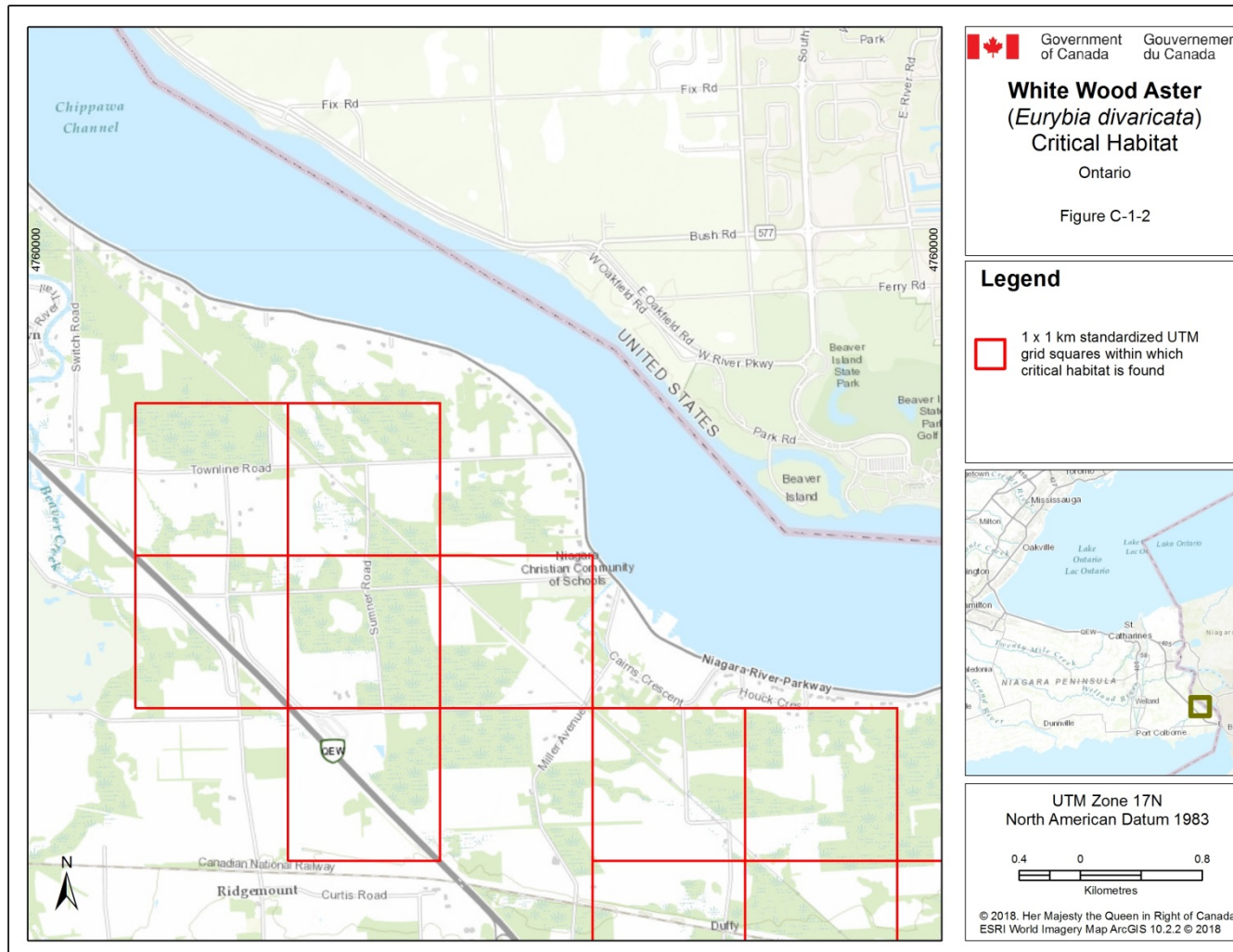


Figure C-1-2. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

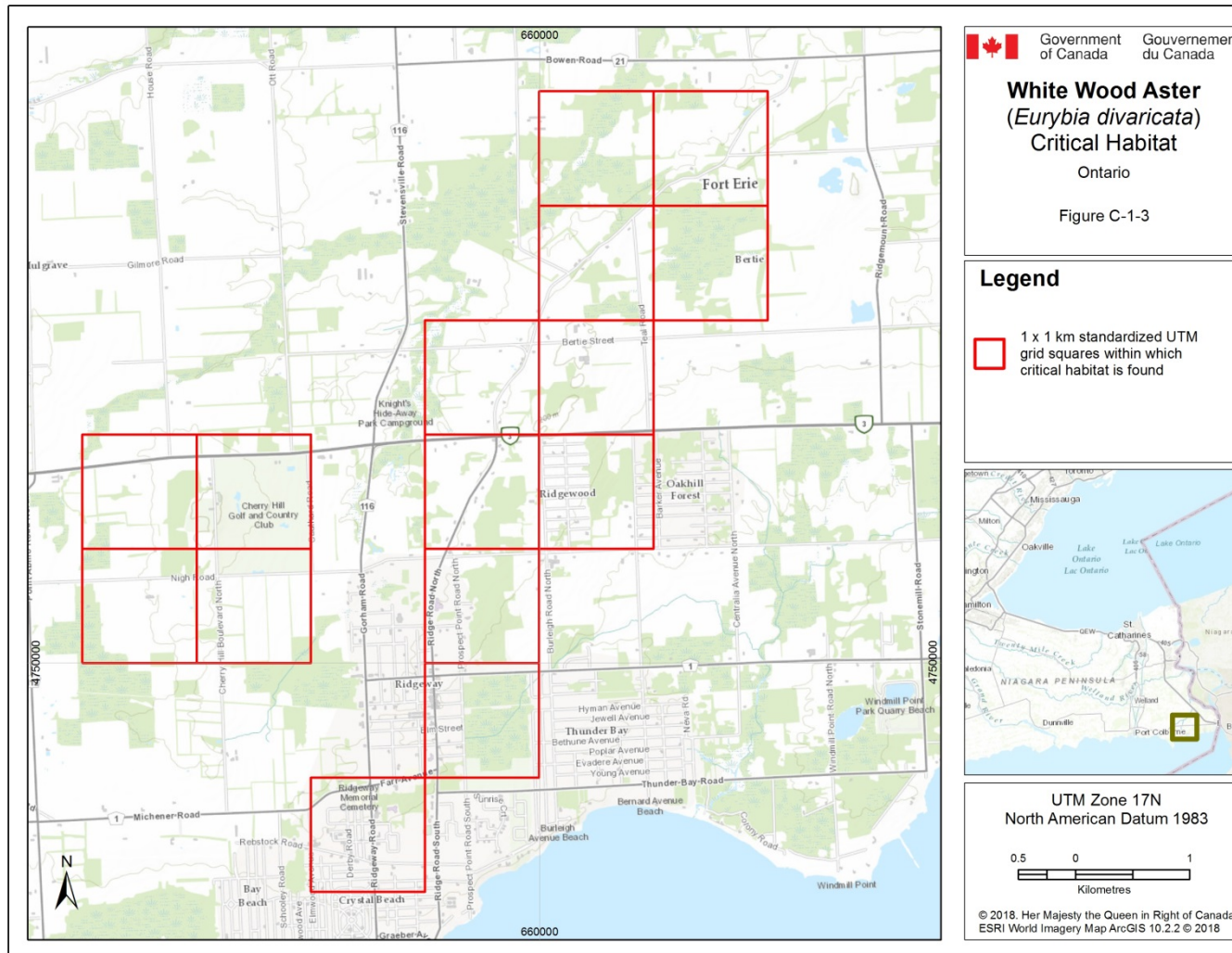


Figure C-1-3. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

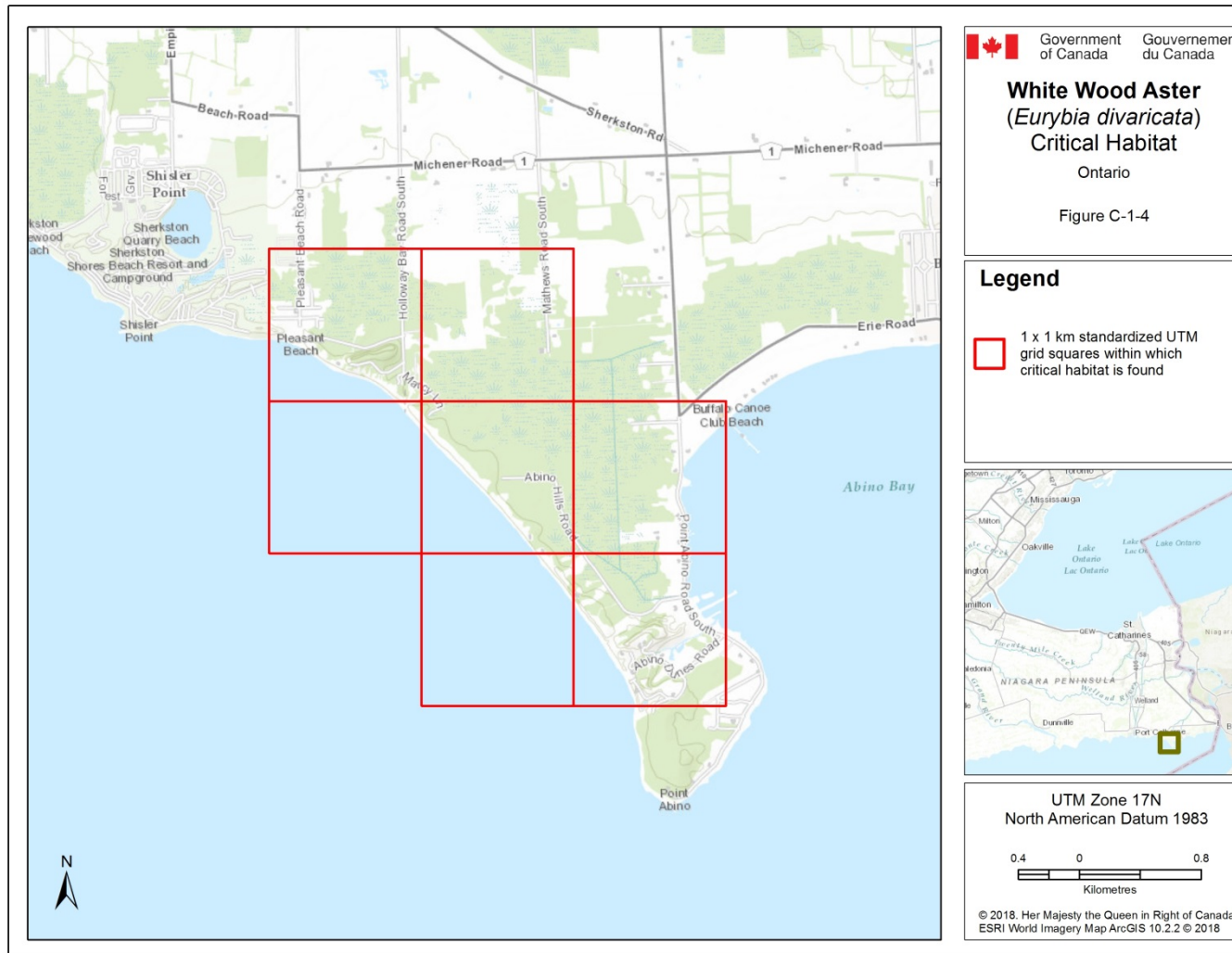


Figure C-1-4. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

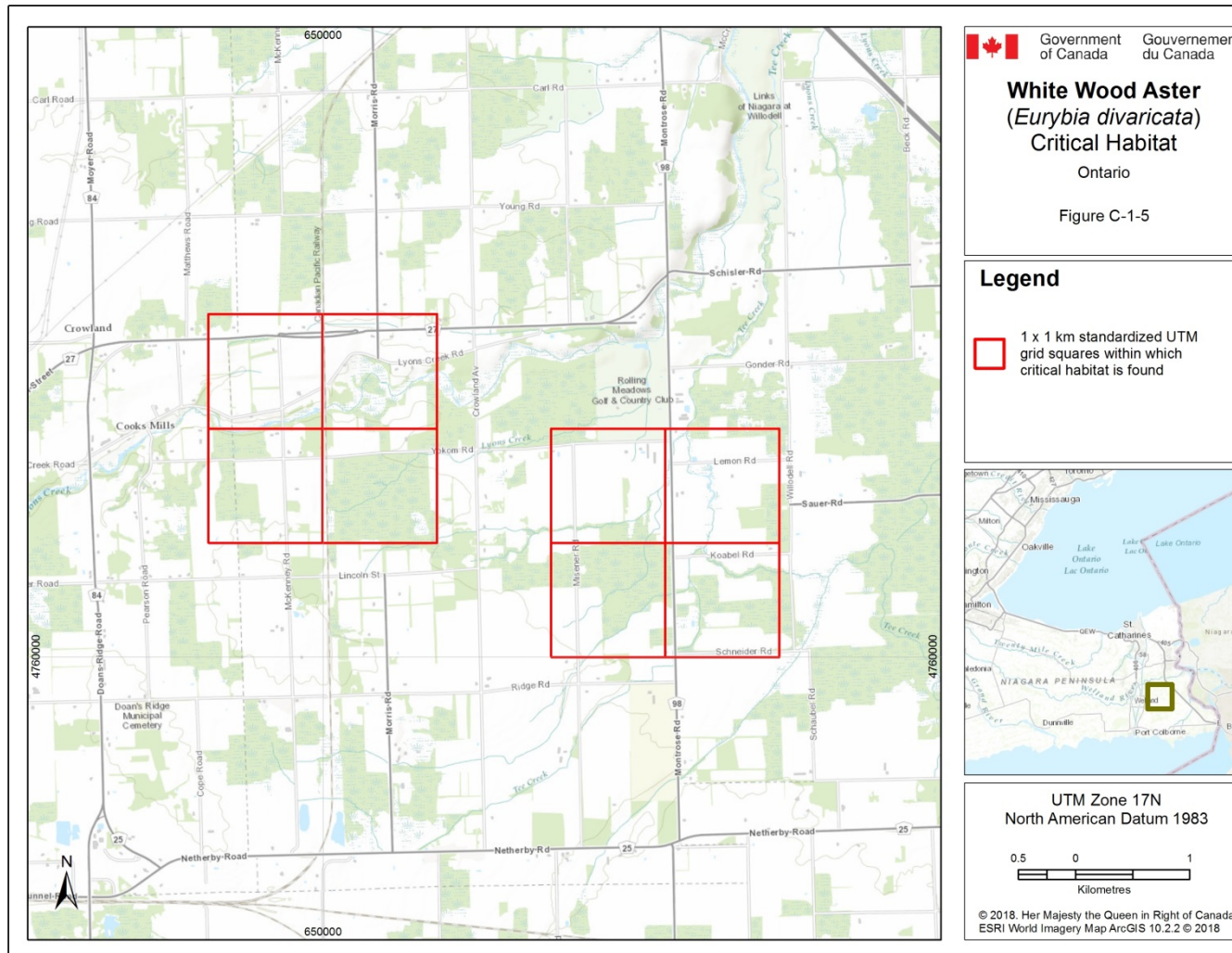


Figure C-1-5. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

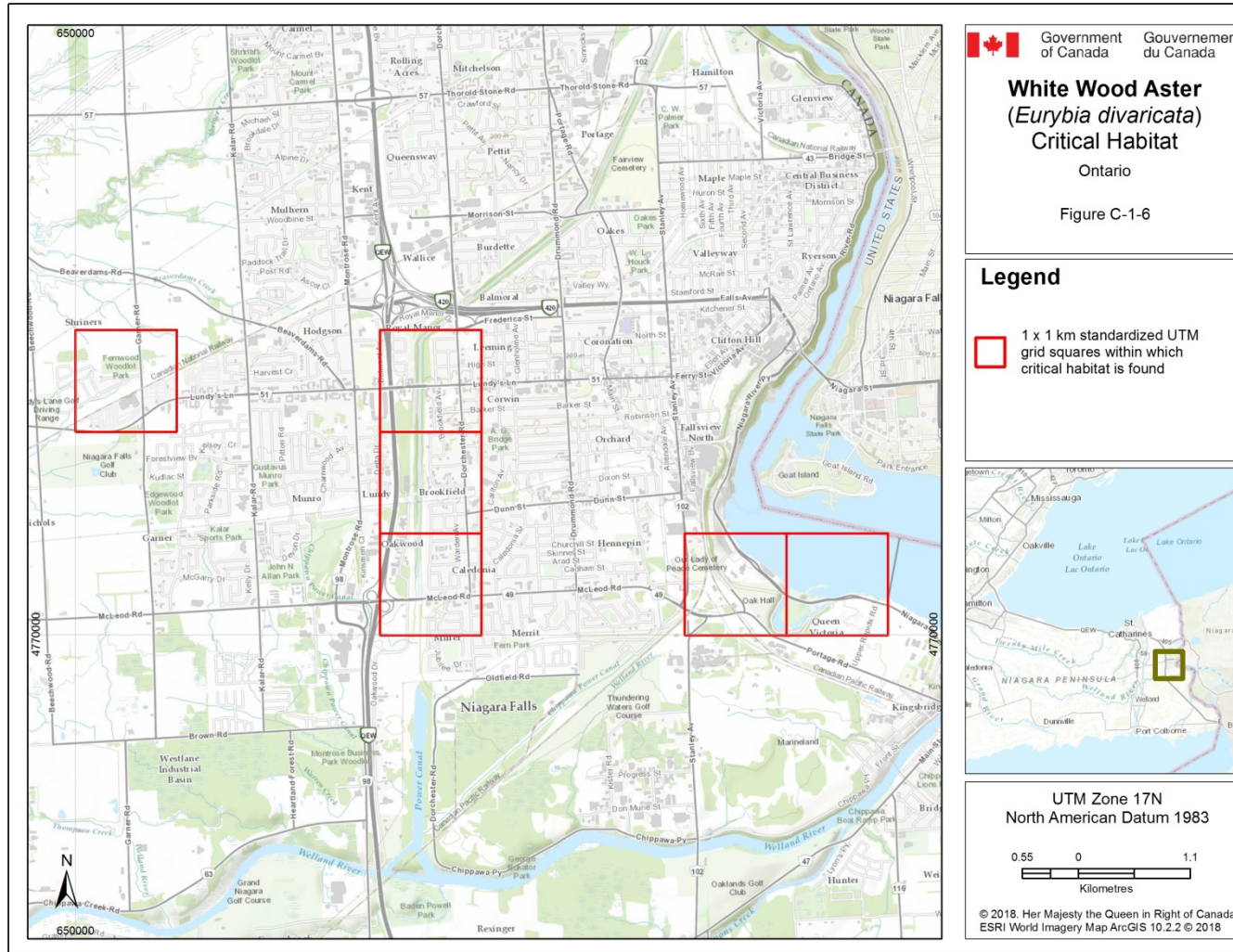


Figure C-1-6. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

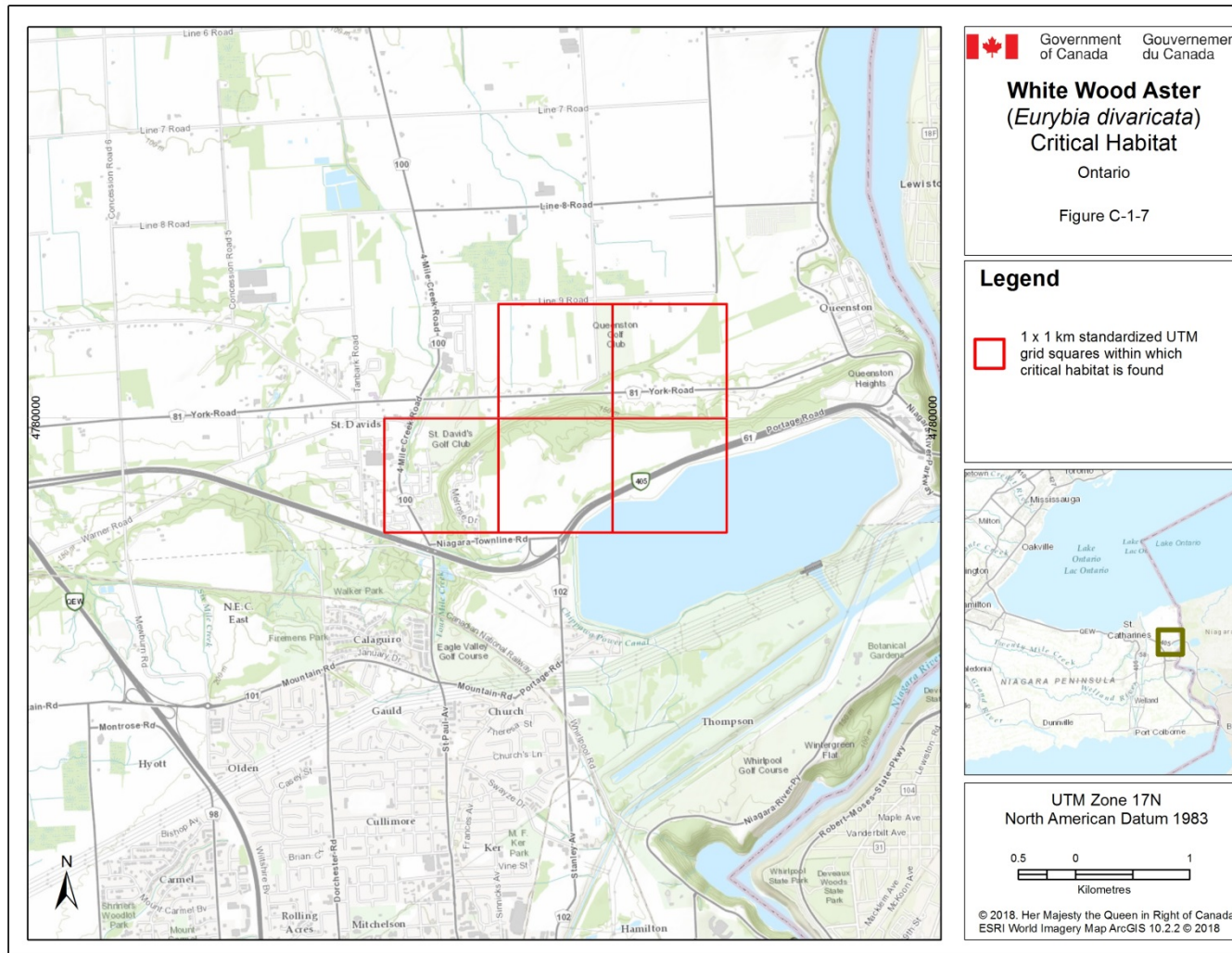


Figure C-1-7. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

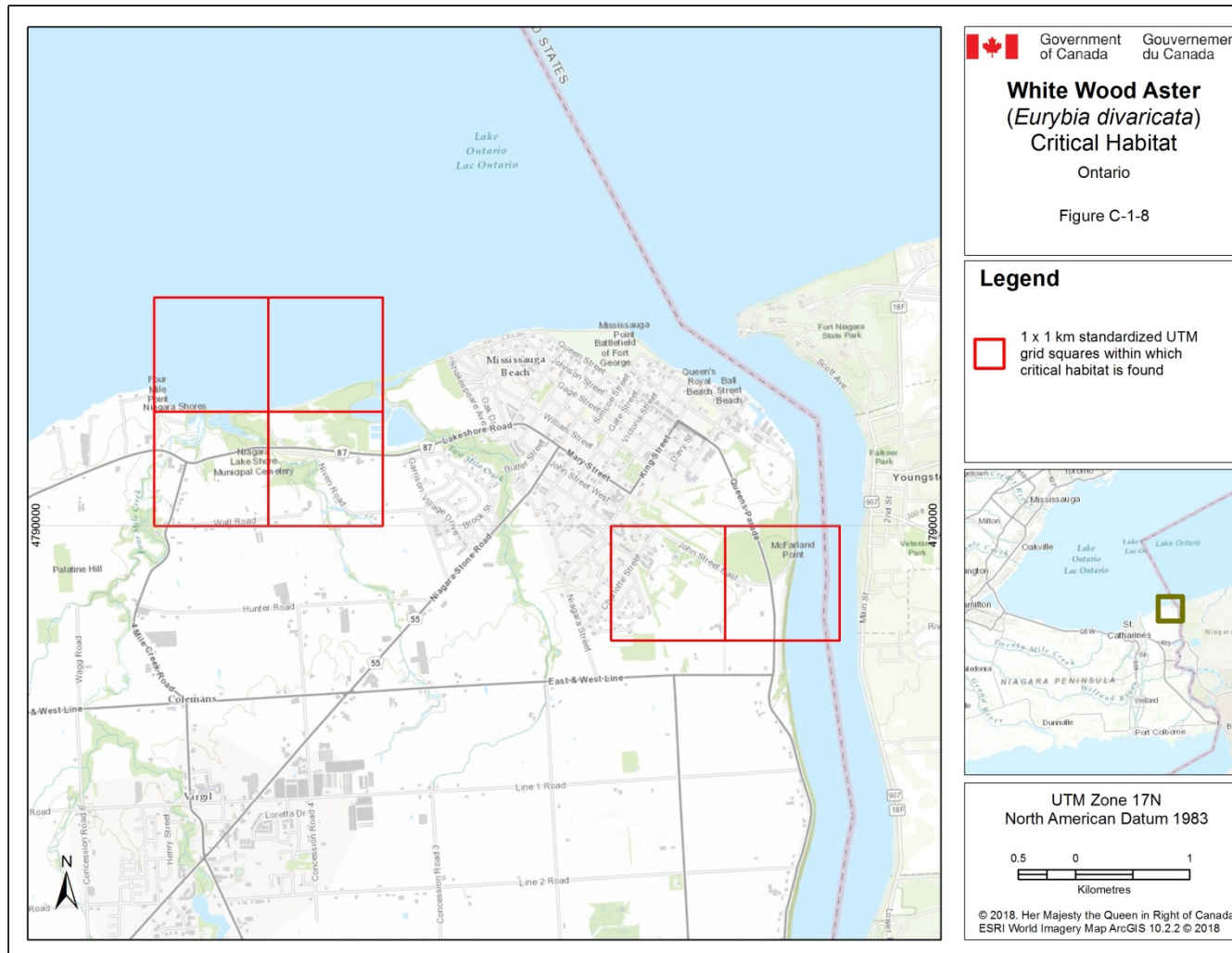


Figure C-1-8. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

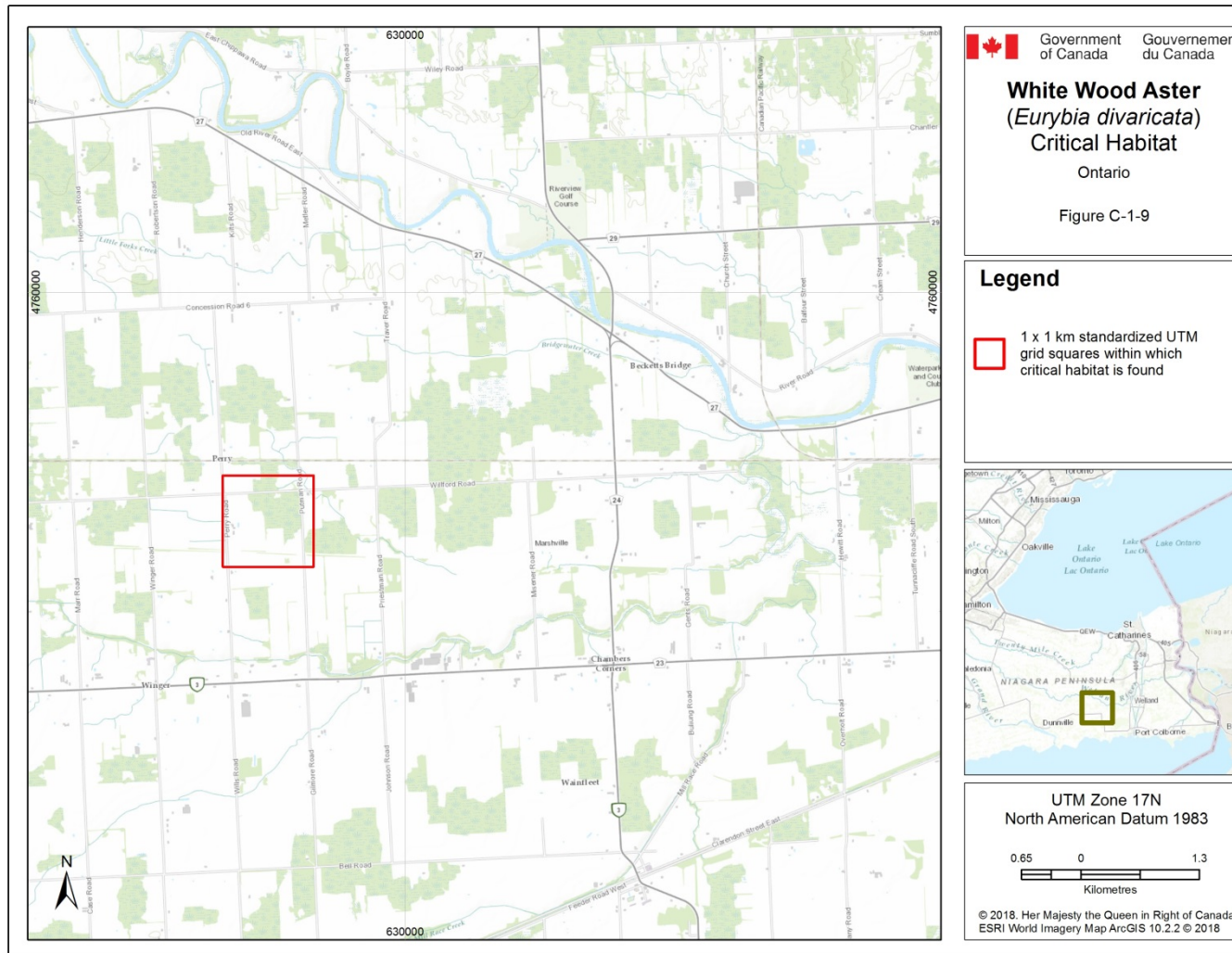


Figure C-1-9. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

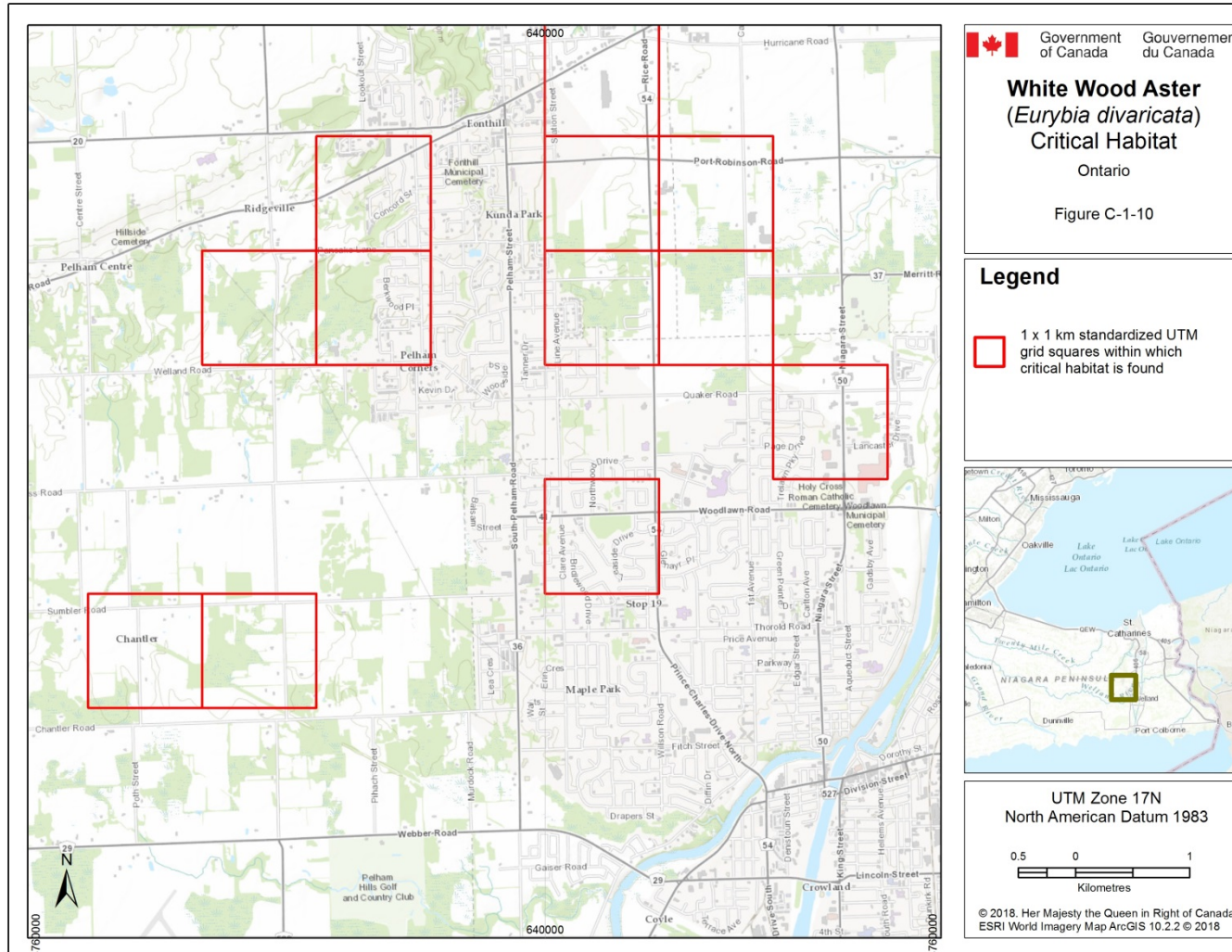


Figure C-1-10. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

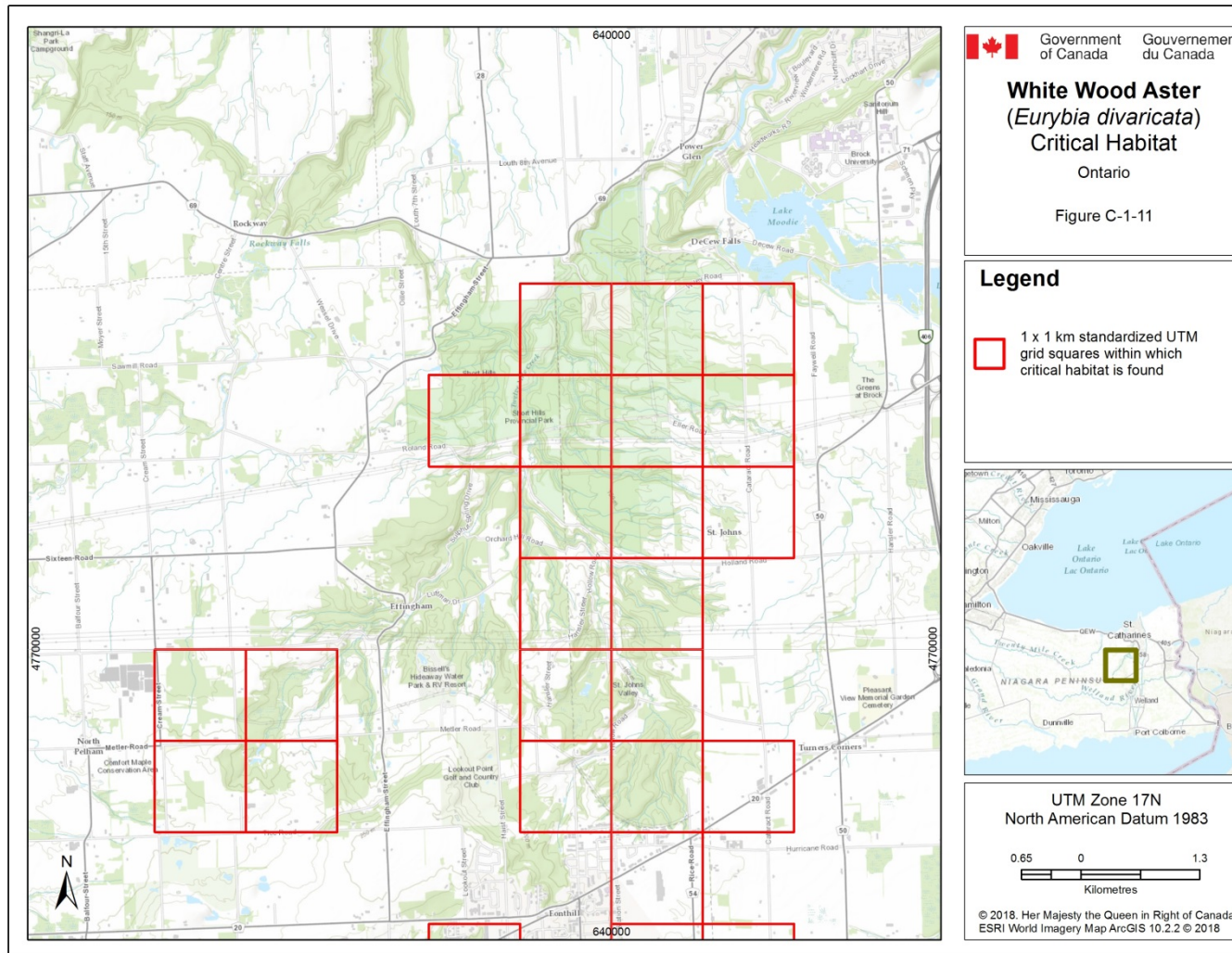


Figure C-1-11. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

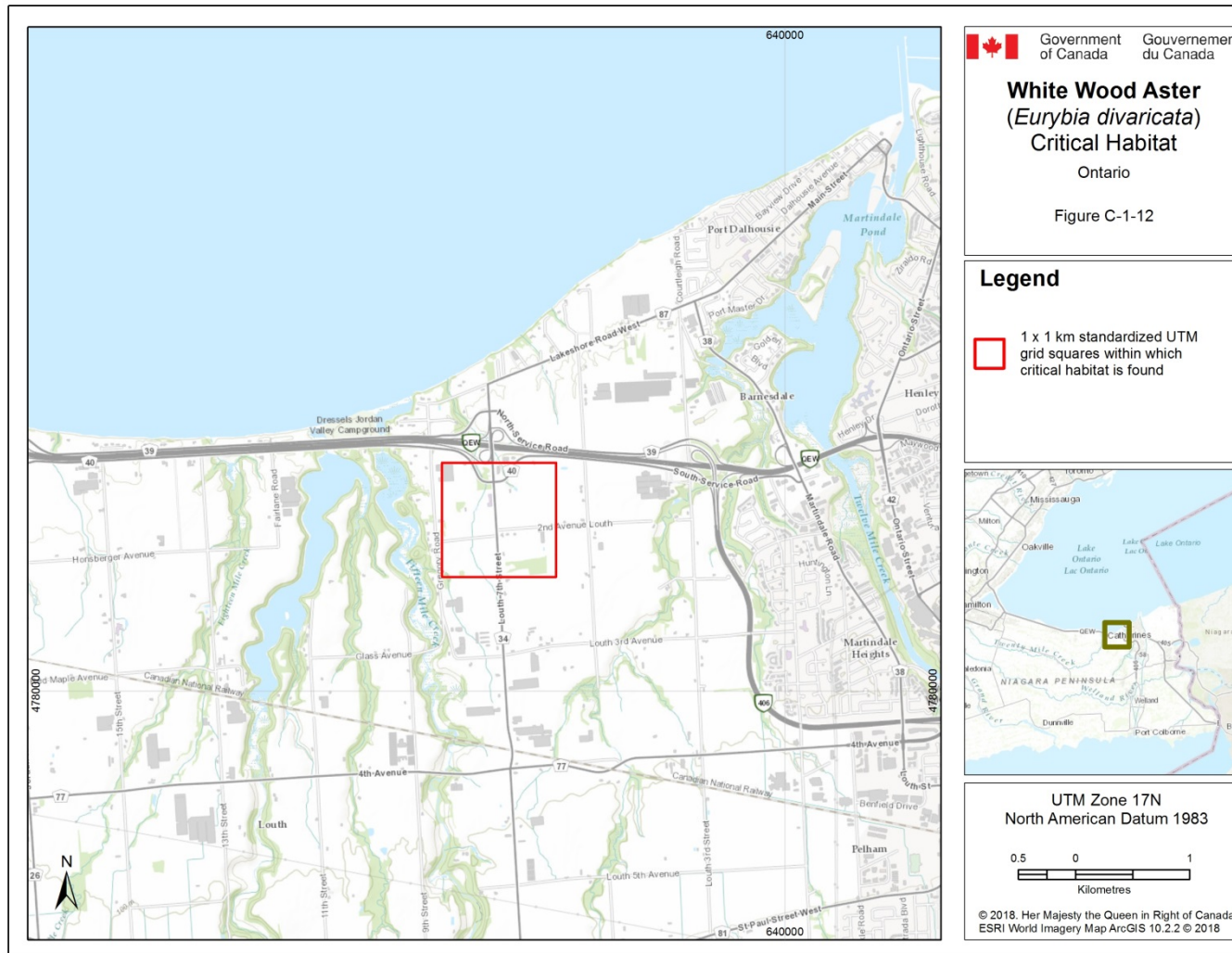


Figure C-1-12. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

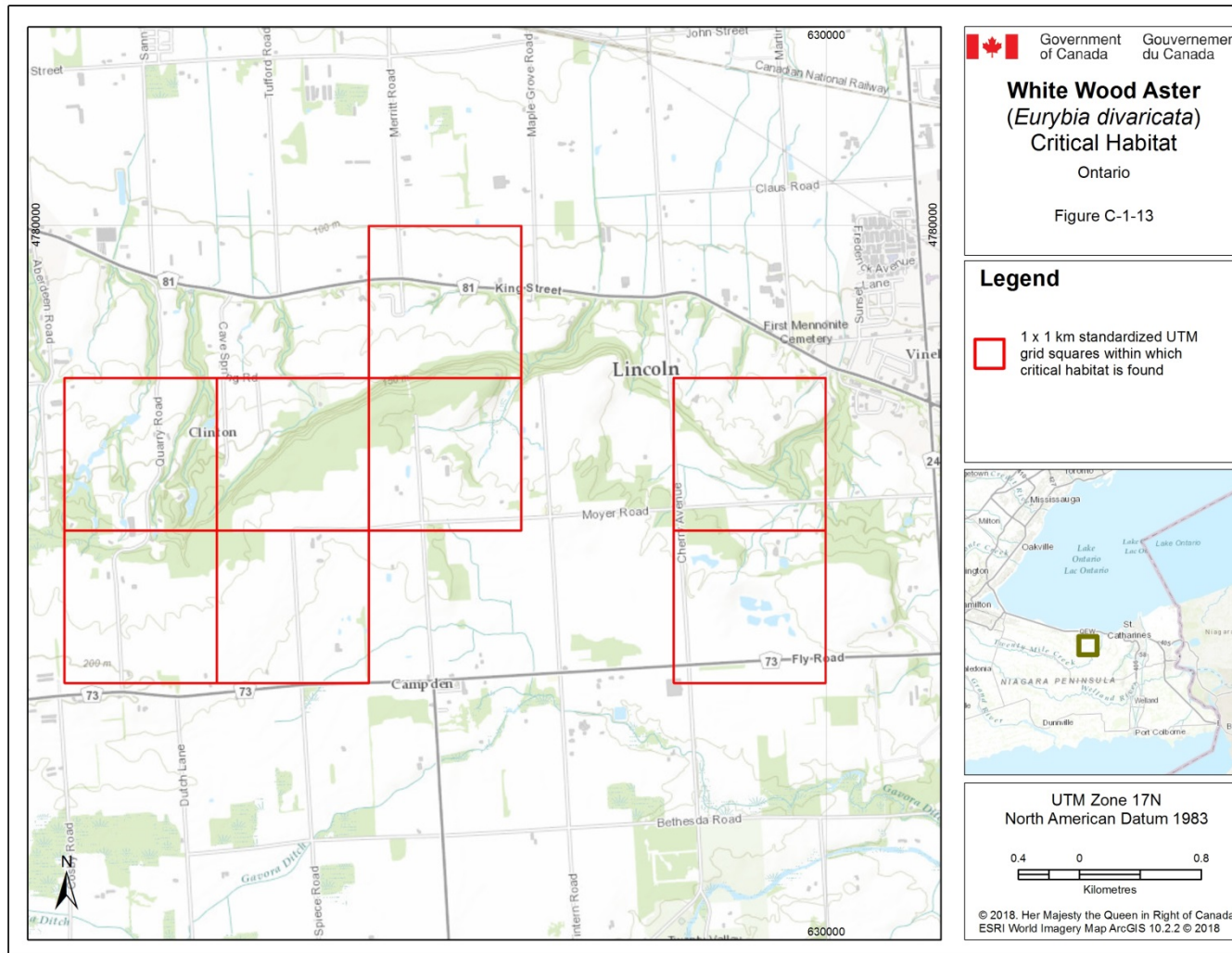


Figure C-1-13. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

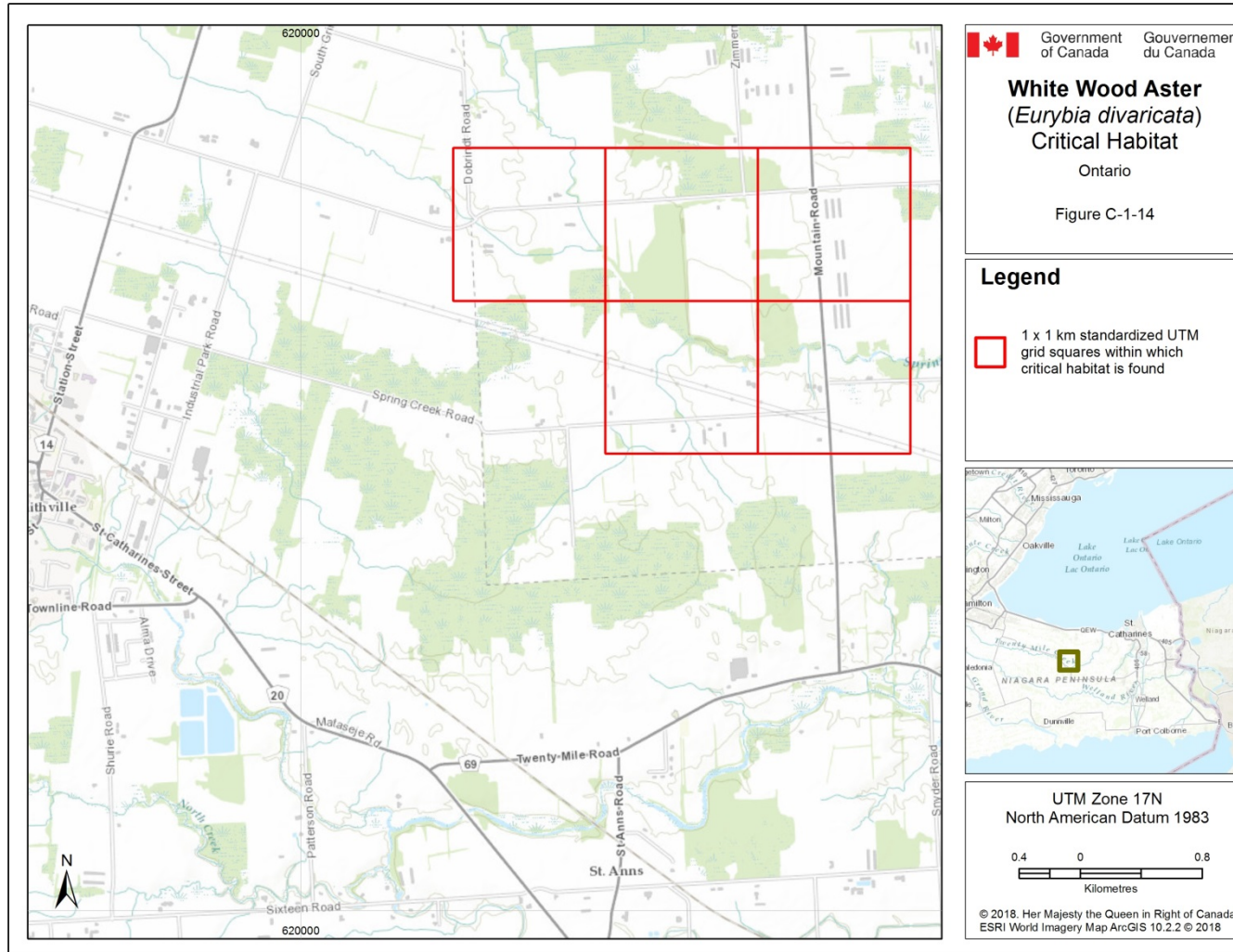


Figure C-1-14. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

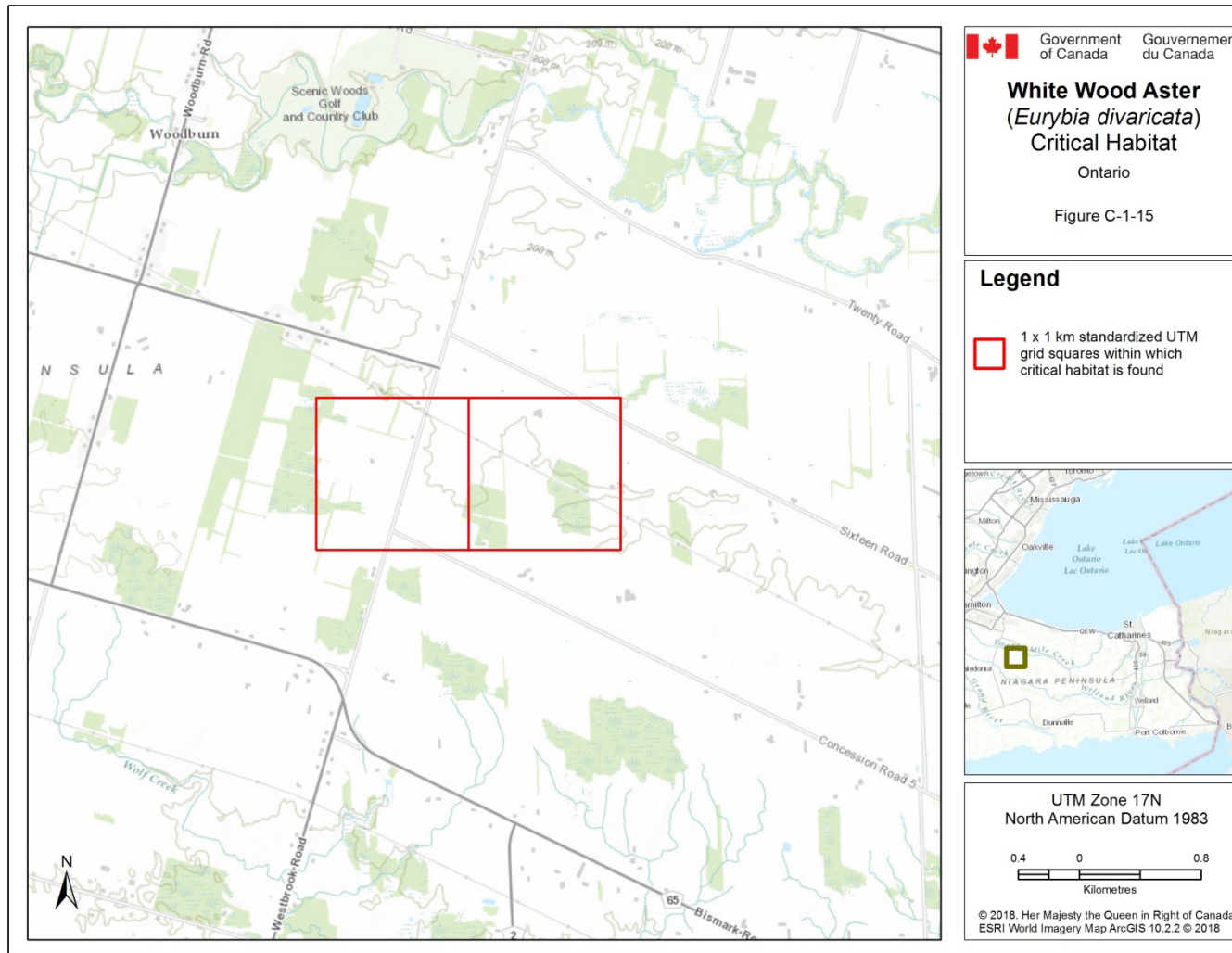


Figure C-1-15. Critical habitat for the White Wood Aster in Ontario occurs within these 1 x 1 km standardized UTM grid squares (red squares), where the criteria and methodology set out in Section 7 are met. This standardized national grid system indicates the general location within which critical habitat is found. The areas containing critical habitat, as described in Section 7.1.2, are not shown on the map.

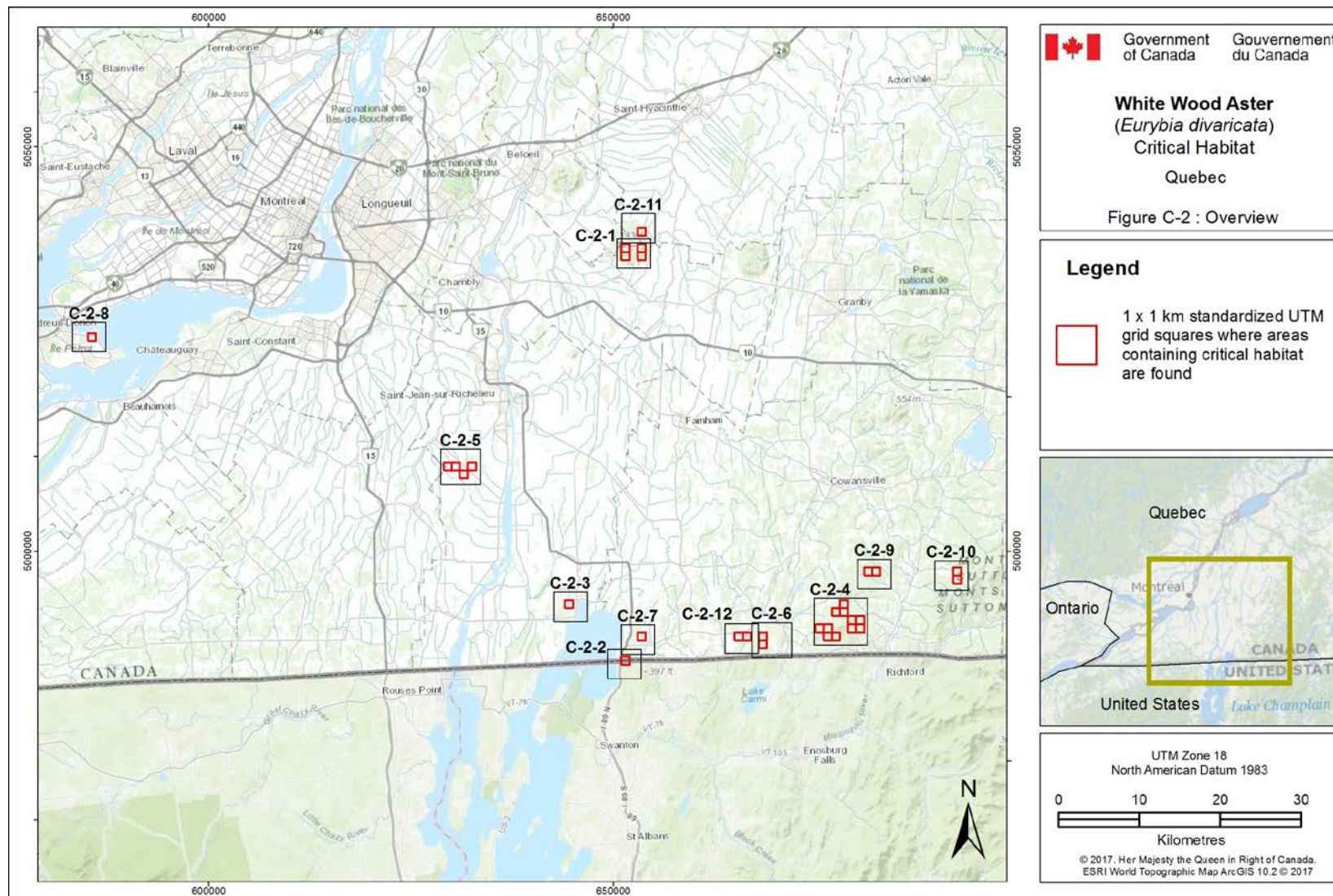


Figure C-2. Critical habitat for the White Wood Aster in Quebec occurs within the areas containing critical habitat (yellow shaded units – not shown on index map), where the criteria set out in Section 7 are met. The 1 x 1 km UTM grid (red squares) shown on the figure is a standardized national grid system that indicates the general location containing critical habitat.

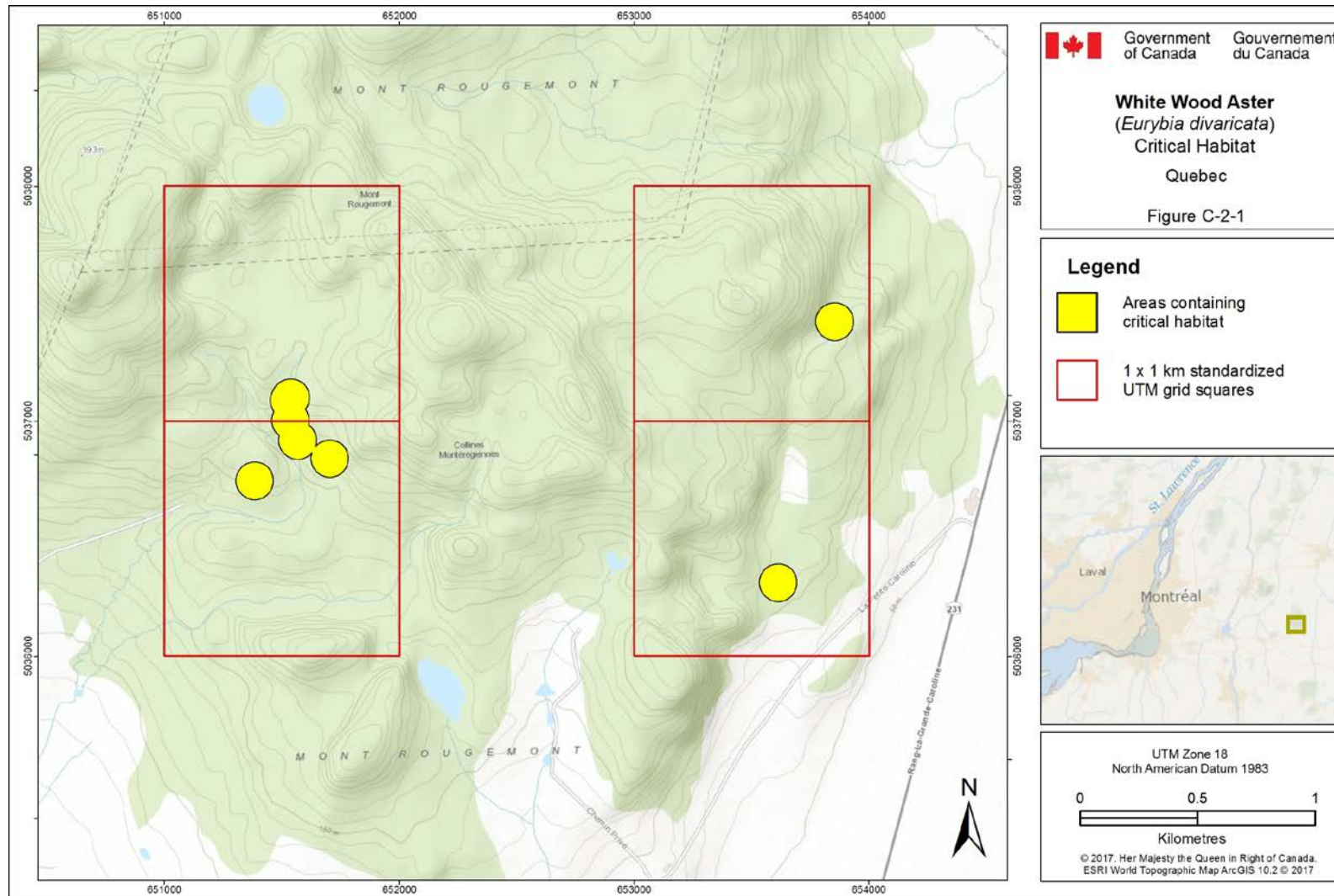


Figure C-2-1. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

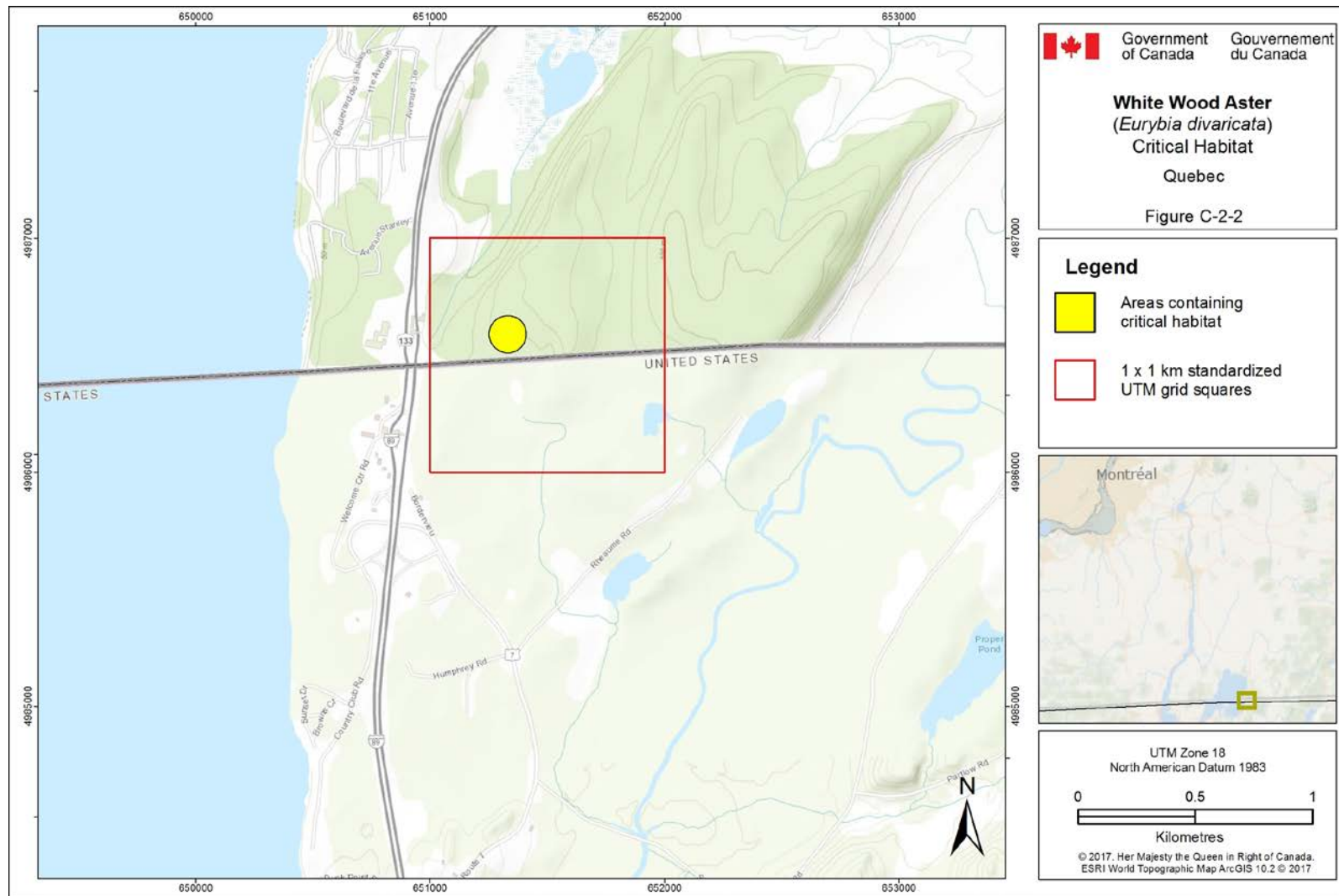


Figure C-2-2. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

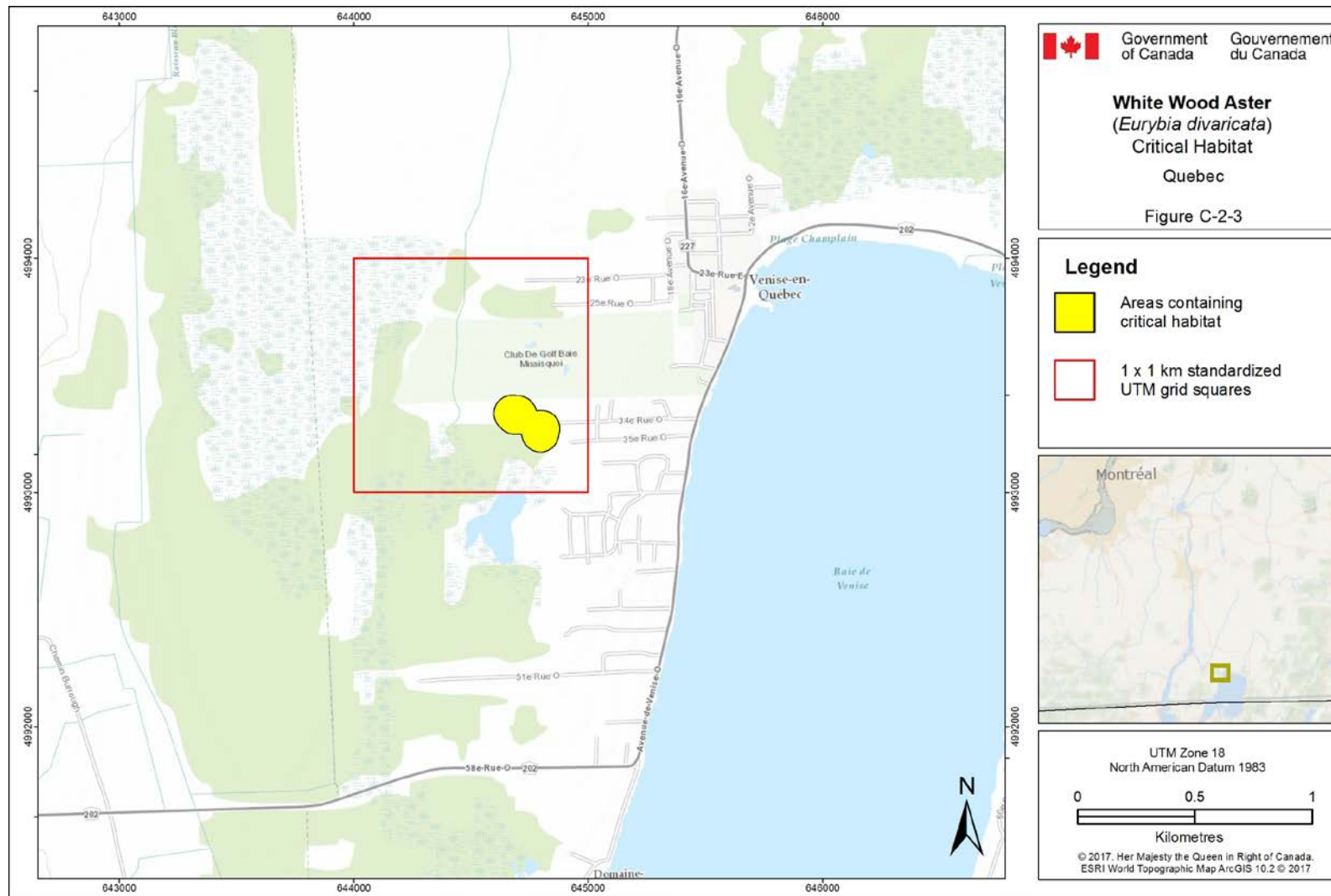


Figure C-2-3. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

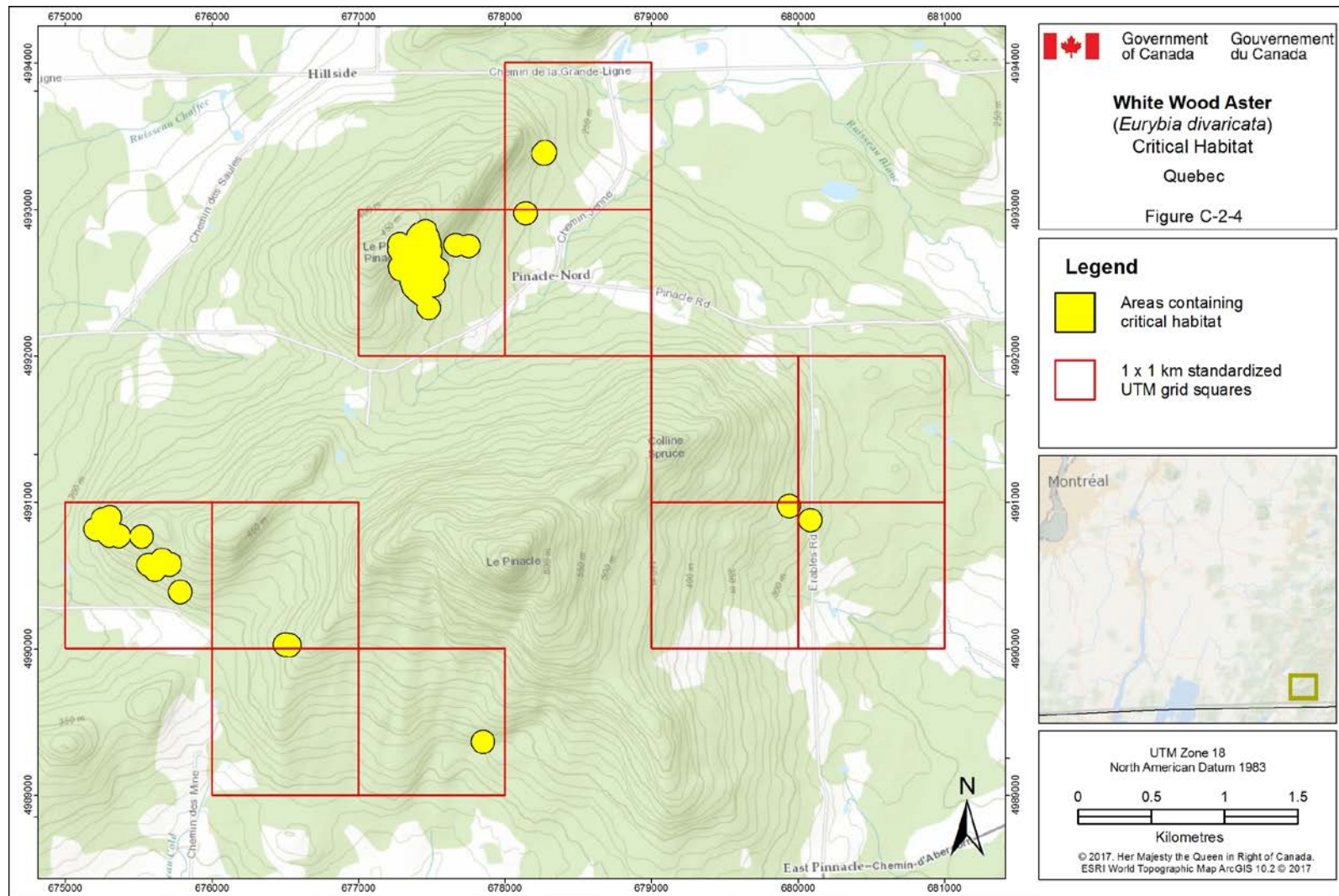


Figure C-2-4. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

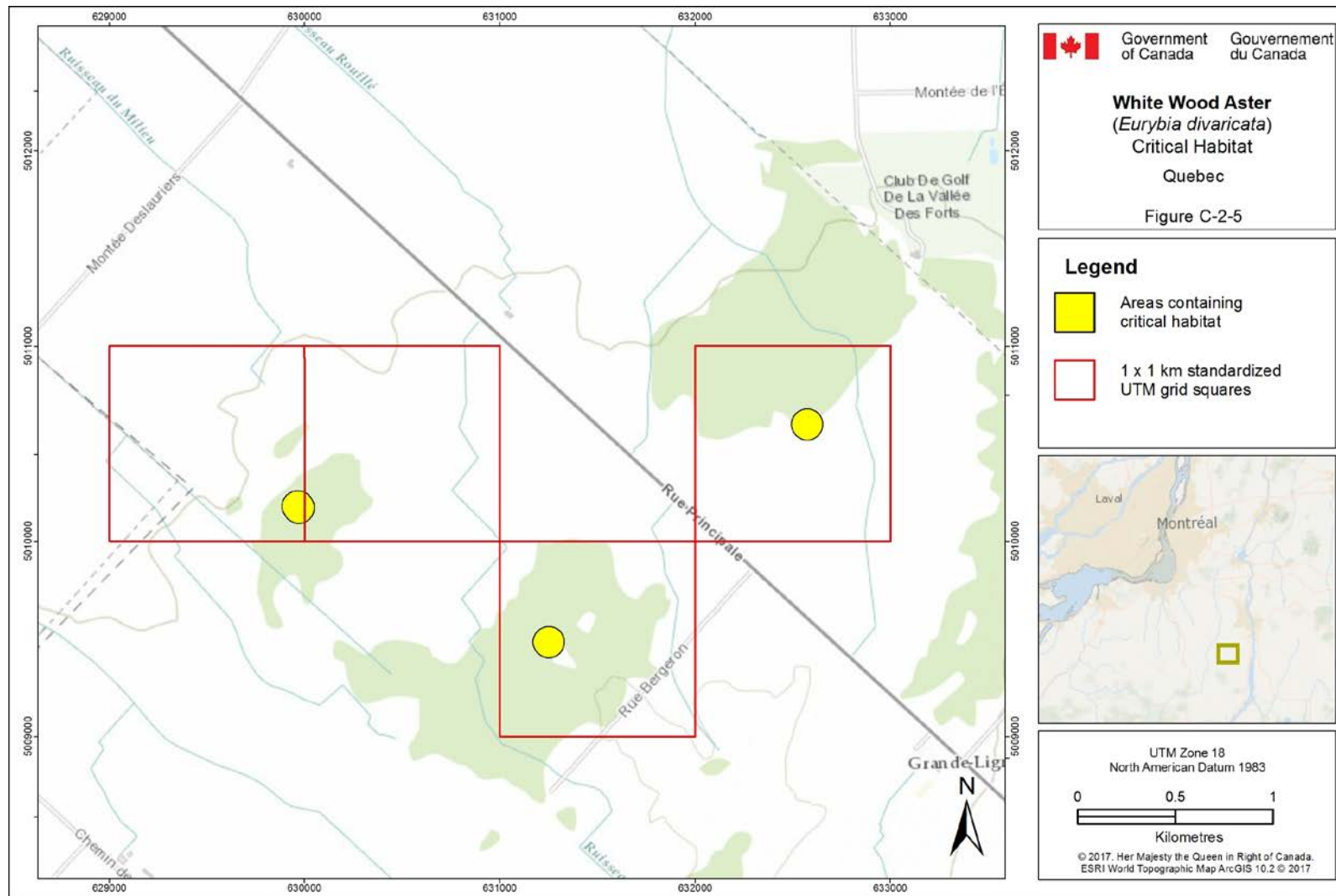


Figure C-2-5. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

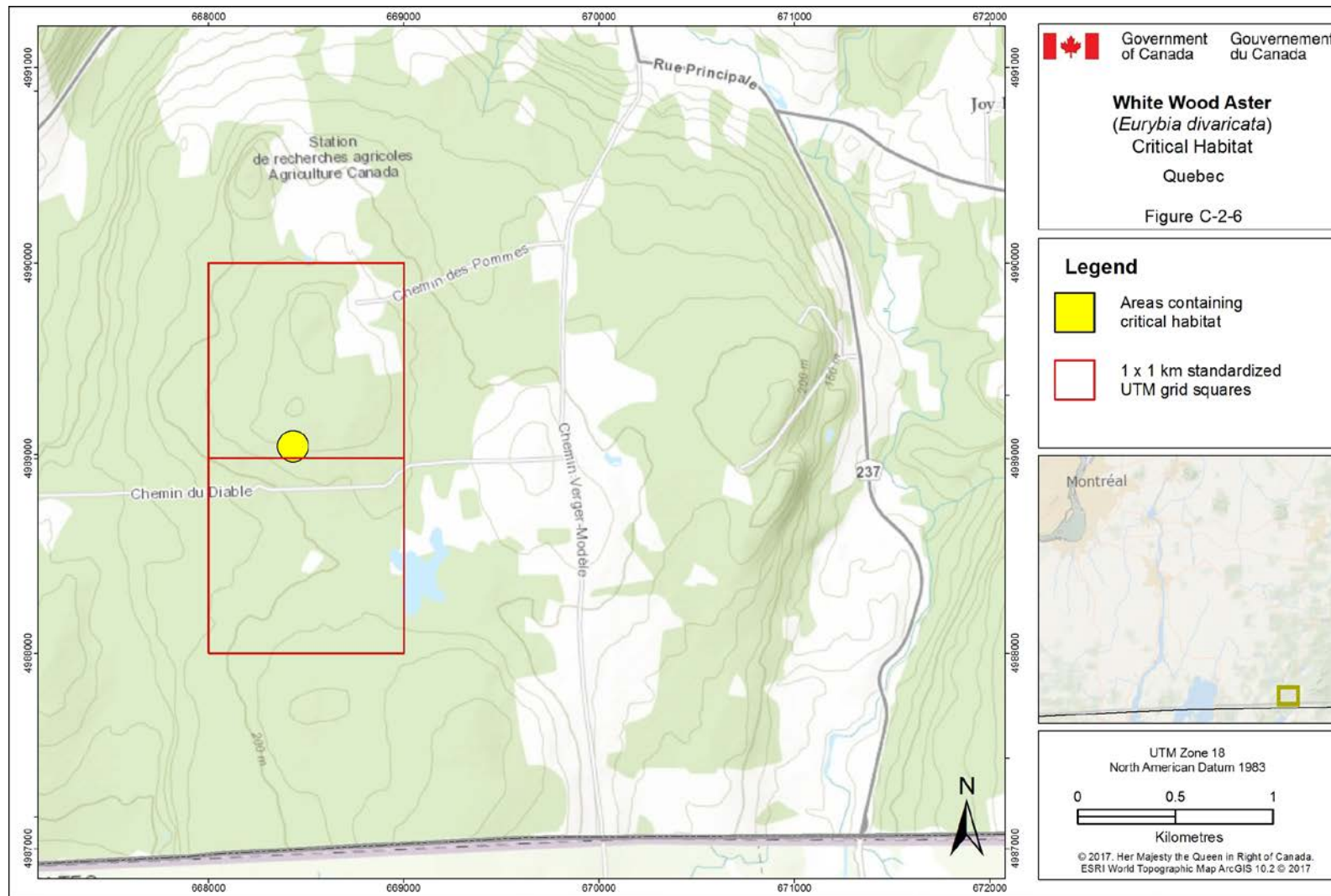


Figure C-2-6. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

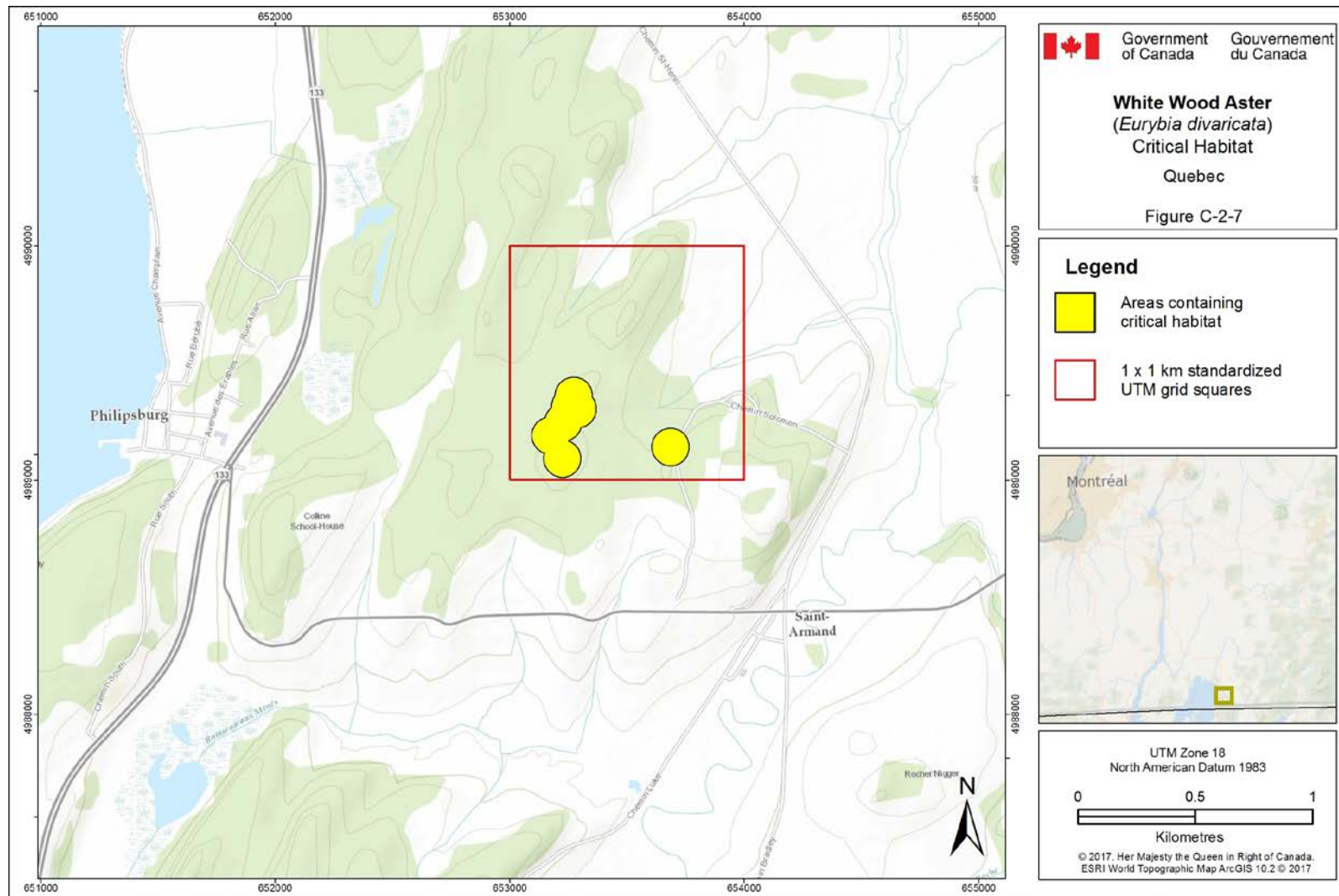


Figure C-2-7. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

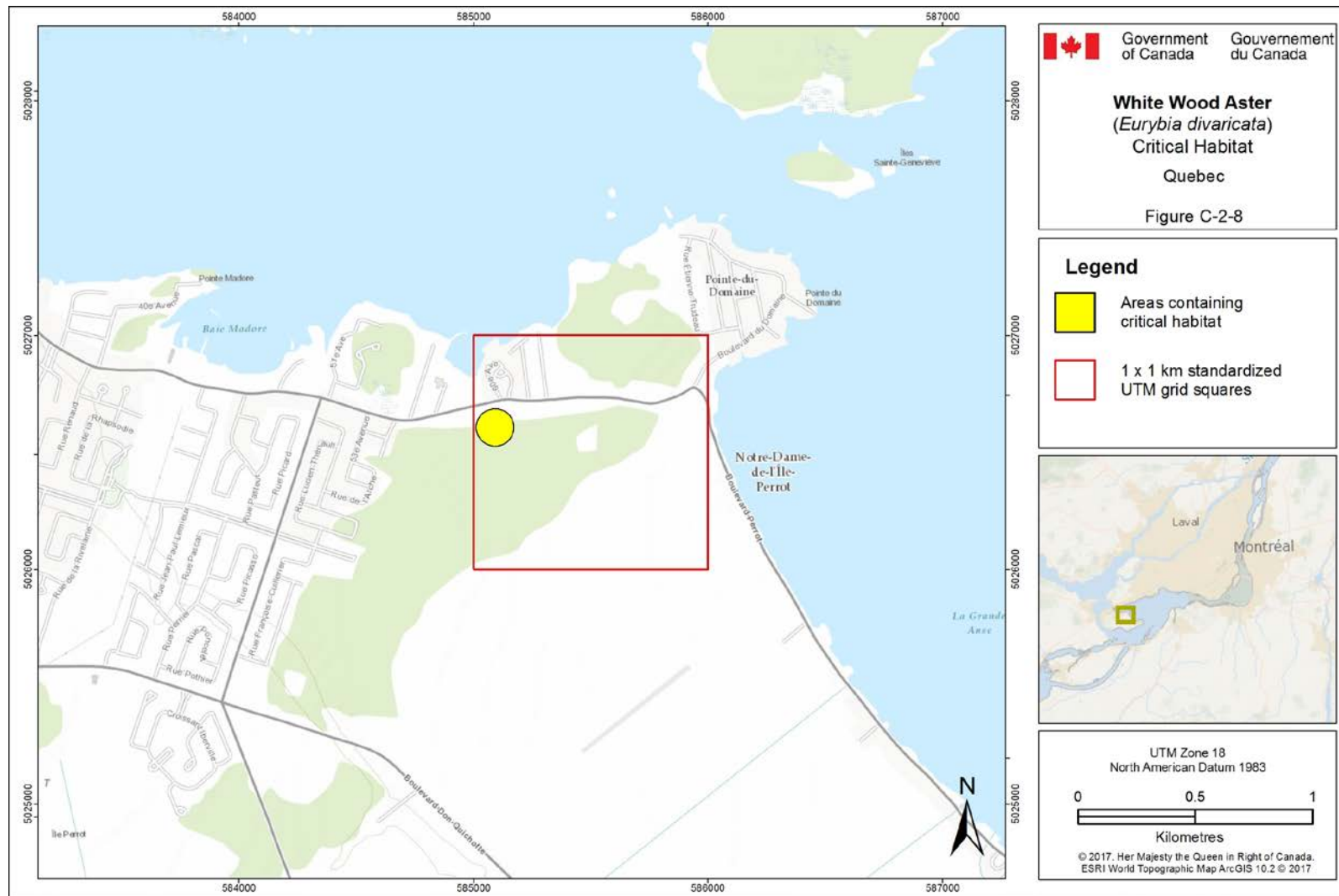


Figure C-2-8. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

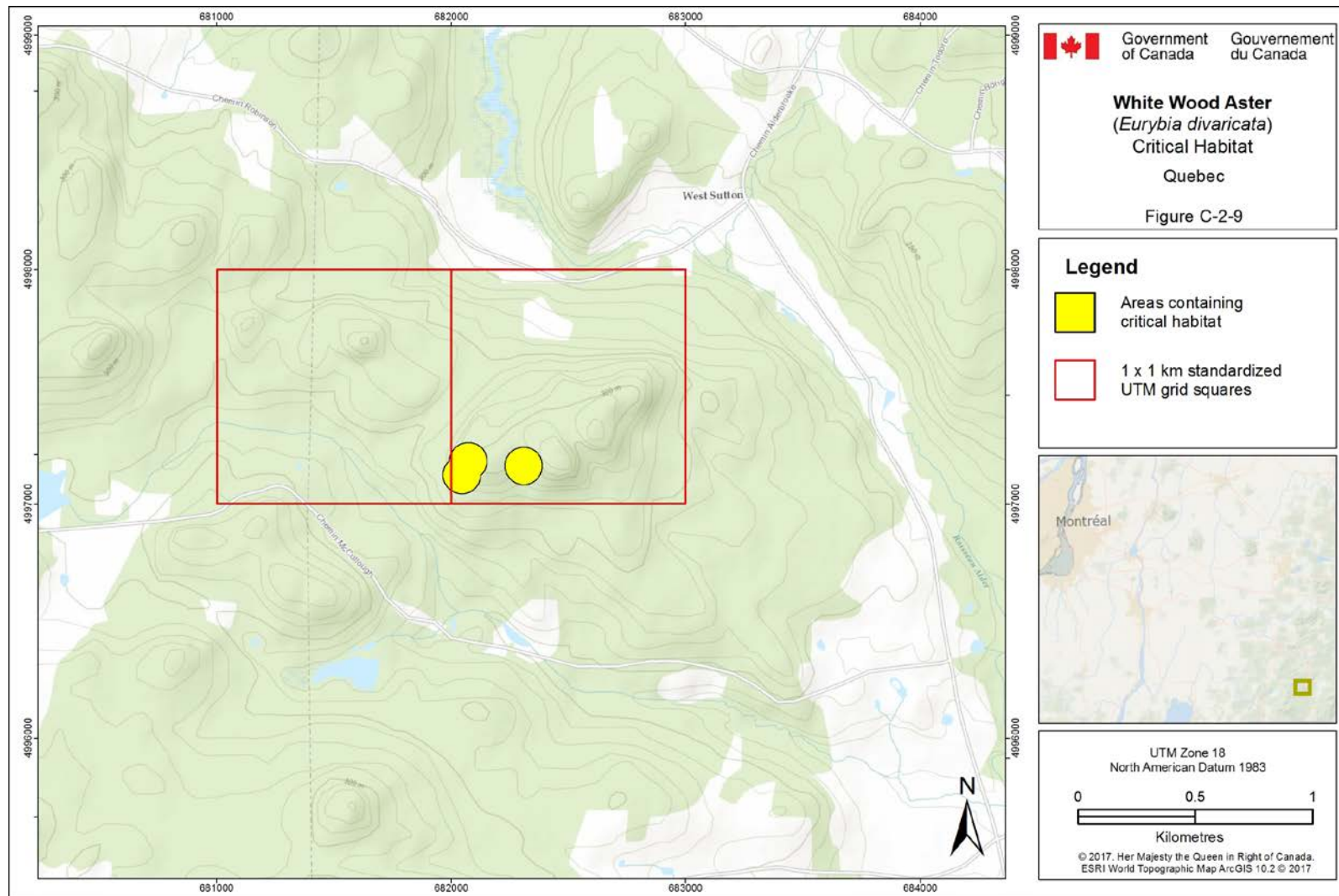


Figure C-2-9. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

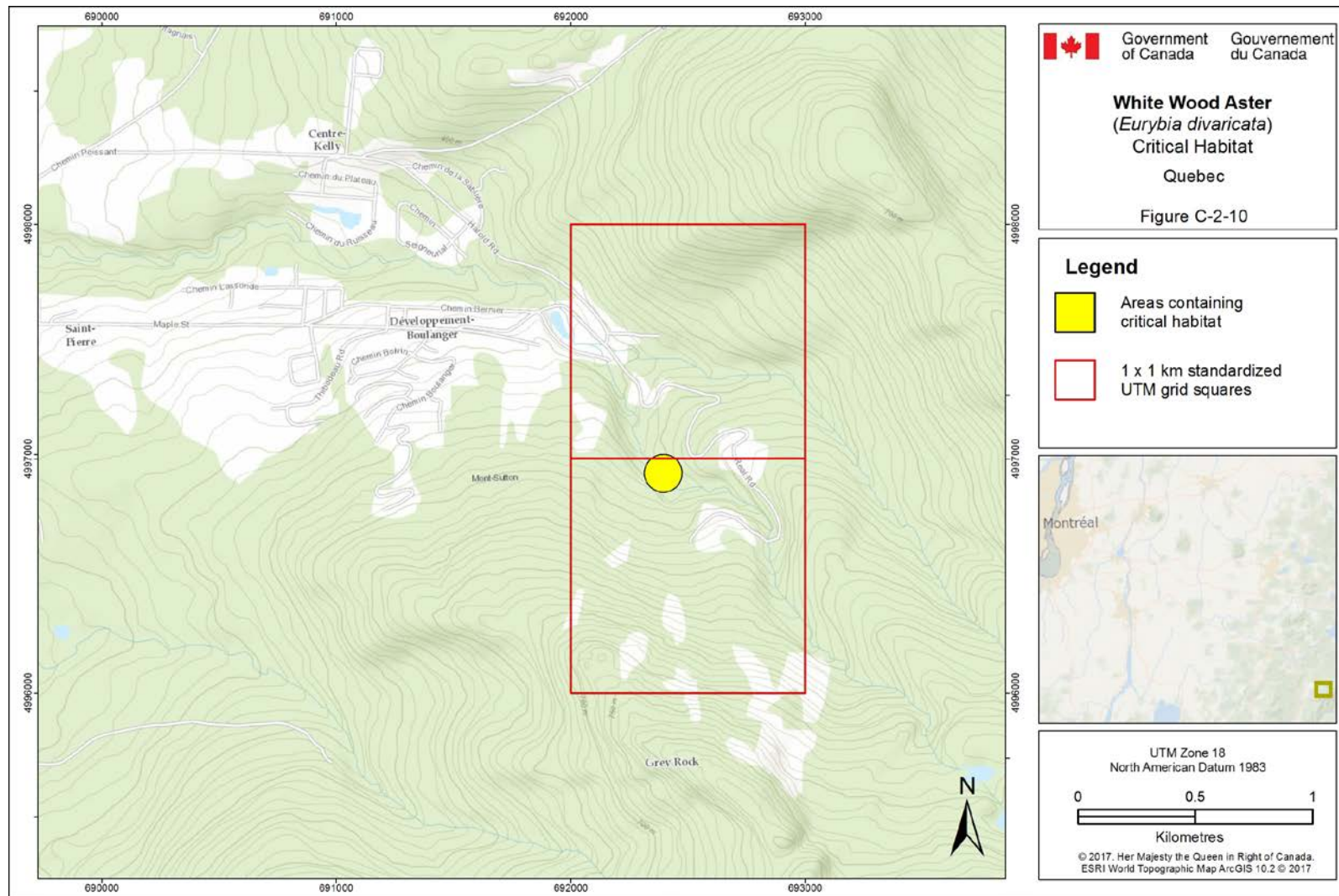


Figure C-2-10. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

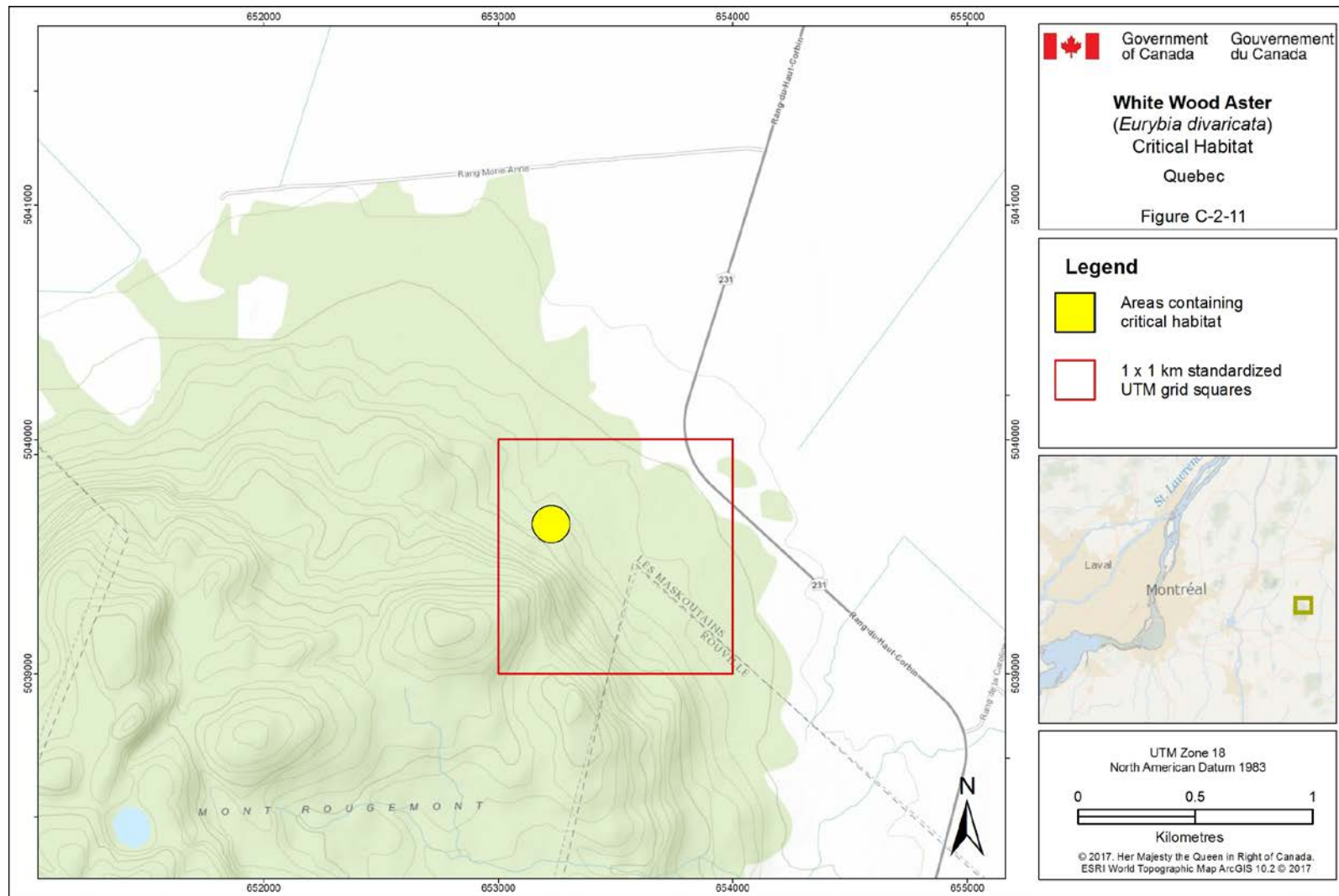


Figure C-2-11. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

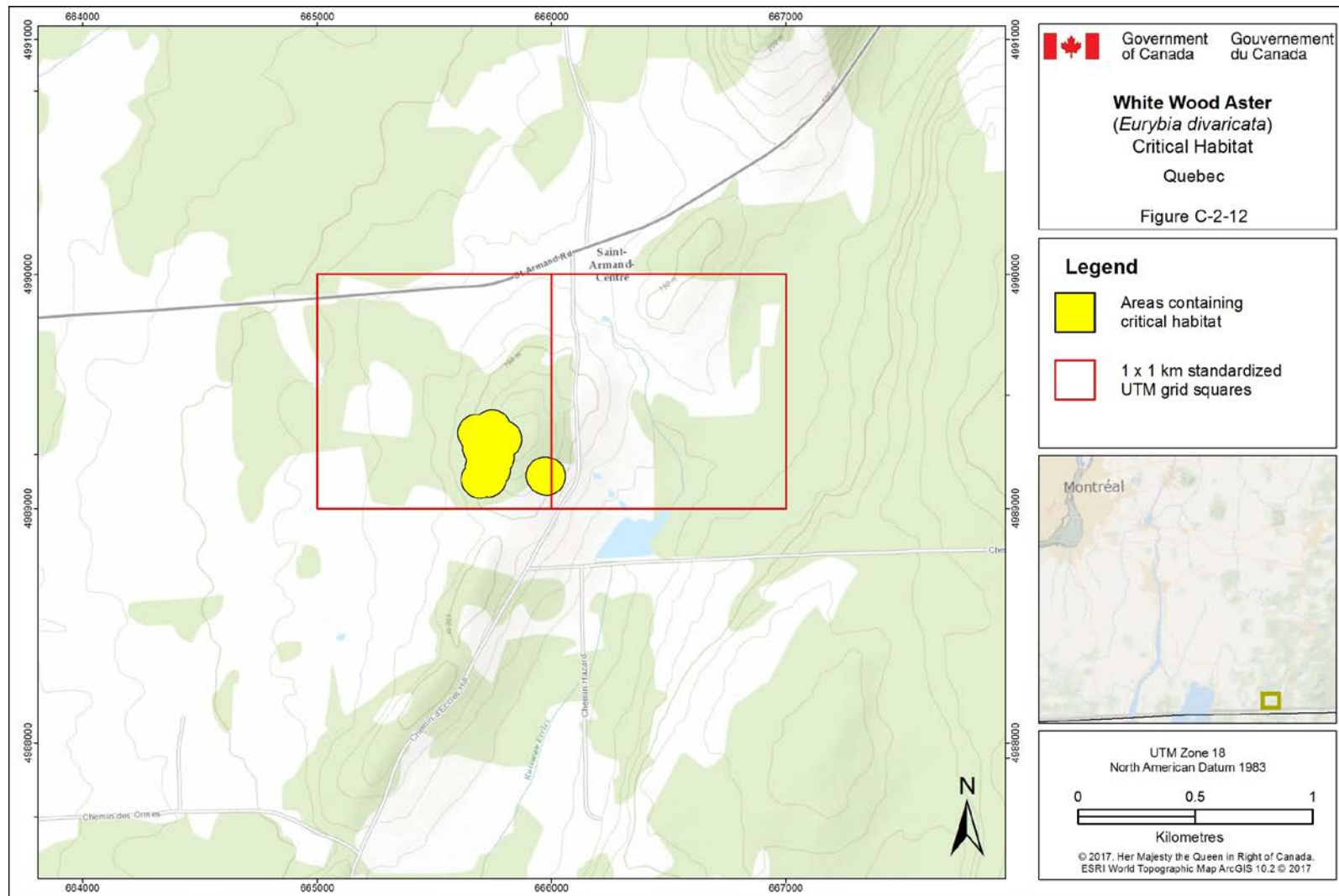


Figure C-2-12. The area containing critical habitat for the White Wood Aster in Quebec, as described in section 7, is represented by the yellow shaded unit. Within this area, critical habitat occurs where the biophysical attributes described in section 7.1.1 exist. The 1 km x 1 km standardized UTM grid overlay (red outline) shown on this figure is a standardized national grid system used to indicate the general geographic area within which critical habitat is found.

Table C-1. 1 x 1 km standardized UTM grid squares within which critical habitat for the White Wood Aster is found in Canada. Critical habitat occurs where the criteria set out in Section 7 are met.

Local Population #	1 x 1 km Standardized UTM grid square ID ^a	UTM Grid Square Coordinates ^b		Land Tenure ^c
		Easting	Northing	
Ontario				
1	17TPH6560 17TPH6561 17TPH6570 17TPH6571 17TPH6572 17TPH6580 17TPH6581 17TPH6582	666000 666000 667000 667000 667000 668000 668000 668000	4750000 4751000 4750000 4751000 4752000 4750000 4751000 4752000	Non-federal Land
2	17TPH2797 17TPH2798	629000 629000	4777000 4778000	Non-federal Land
3	17TPH5760 17TPH5770	656000 657000	4770000 4770000	Non-federal Land
4	17TPH3698 17TPH3699 17TPH3790 17TPH4607 17TPH4608 17TPH4609 17TPH4618 17TPH4700	639000 639000 639000 640000 640000 640000 641000 640000	4768000 4769000 4770000 4767000 4768000 4769000 4768000 4770000	Non-federal Land
5	17TPH5436 17TPH5437 17TPH5445 17TPH5446 17TPH5447 17TPH5455 17TPH5456	653000 653000 654000 654000 654000 655000 655000	4746000 4747000 4745000 4746000 4747000 4745000 4746000	Non-federal Land
6	17TPH6556 17TPH6566	665000 666000	4756000 4756000	Non-federal Land
7	17TPH2714 17TPH2723 17TPH2724 17TPH2733 17TPH2734	621000 622000 622000 623000 623000	4774000 4773000 4774000 4773000 4774000	Non-federal Land
8	17TPH3658 17TPH3659 17TPH3668 17TPH3669	635000 635000 636000 636000	4768000 4769000 4768000 4769000	Non-federal Land
9	17TPH5590 17TPH5591	659000 659000	4750000 4751000	Non-federal Land
10	17TPH6501 17TPH6502	660000 660000	4751000 4752000	Non-federal Land
11	17TPH5499	659000	4749000	Non-federal Land
12	17TPH5488	658000	4748000	Non-federal Land

13	17TPH3782 17TPH3791 17TPH3792 17TPH3793 17TPH4700 17TPH4701 17TPH4702 17TPH4703 17TPH4711 17TPH4712 17TPH4713	638000 639000 639000 639000 640000 640000 640000 640000 641000 641000 641000	4772000 4771000 4772000 4773000 4770000 4771000 4772000 4773000 4771000 4772000 4773000	Non-federal Land
14	17TPH3698 17TPH3699	639000 639000	4768000 4769000	Non-federal Land
15	17TPH6527 17TPH6528 17TPH6536 17TPH6537 17TPH6538 17TPH6547	662000 662000 663000 663000 663000 664000	4757000 4758000 4756000 4757000 4758000 4757000	Non-federal Land
16	17TPH5920 17TPH5921 17TPH5930 17TPH5931	652000 652000 653000 653000	4790000 4791000 4790000 4791000	Other Federal Land and Non-federal Land
17	17TPH5730 17TPH5731 17TPH5732	653000 653000 653000	4770000 4771000 4772000	Non-federal Land
18	17TPH5869 17TPH5879	656000 657000	4789000 4789000	Other Federal Land
19	17TPH5702	650000	4772000	Non-federal Land
20	17TPH4605 17TPH4606	640000 640000	4765000 4766000	Non-federal Land
21	17TPH4624	642000	4764000	Non-federal Land
22	17TPH4603	640000	4763000	Non-federal Land
23	17TPH2587	628000	4757000	Non-federal Land
24	17TPH6554 17TPH6555 17TPH6563 17TPH6564 17TPH6565 17TPH6574 17TPH6575	665000 665000 666000 666000 666000 667000 667000	4754000 4755000 4753000 4754000 4755000 4754000 4755000	Non-federal Land
25	17TPH0734 17TPH0744	603000 604000	4774000 4774000	Non-federal Land
26	17TPH5749 17TPH5759 17TPH5769 17TPH5850 17TPH5860	654000 655000 656000 655000 656000	4779000 4779000 4779000 4780000 4780000	Non-federal Land
34	17TPH2757 17TPH2758 17TPH2767 17TPH2768 17TPH2778 17TPH2779	625000 625000 626000 626000 627000 627000	4777000 4778000 4777000 4778000 4778000 4779000	Non-federal Land

36	17TPH4691	649000	4761000	Non-federal Land
	17TPH4692	649000	4762000	
	17TPH5601	650000	4761000	
	17TPH5602	650000	4762000	
38	17TPH5620	652000	4760000	Non-federal Land
	17TPH5621	652000	4761000	
	17TPH5630	653000	4760000	
	17TPH5631	653000	4761000	
40	17TPH3675	637000	4765000	Non-federal Land
	17TPH3685	638000	4765000	
	17TPH3686	638000	4766000	
41	17TPH3662	636000	4762000	Non-federal Land
	17TPH3672	637000	4762000	
42	17TPH4615	641000	4765000	Non-federal Land
	17TPH4616	641000	4766000	
46	17TPH4691	649000	4761000	Non-federal Land
47	17TPH3871	637000	4781000	Non-federal Land
48	17TPH4605	640000	4765000	Non-federal Land
49	17TPH3686	638000	4766000	Non-federal Land
50	17TPH5592	659000	4752000	Non-federal Land
	17TPH6502	660000	4752000	
51	17TPH6503	660000	4753000	Non-federal Land
	17TPH6504	660000	4754000	
	17TPH6513	661000	4753000	
	17TPH6514	661000	4754000	
52	17TPH5560	656000	4750000	Non-federal Land
	17TPH5561	656000	4751000	
	17TPH5570	657000	4750000	
	17TPH5571	657000	4751000	
Québec				
1	18TXR5136	651000	5036000	Non-federal Land
	18TXR5137	651000	5037000	
	18TXR5336	653000	5036000	
	18TXR5337	653000	5037000	
2	18TXQ5186	651000	4986000	Non-federal Land
3	18TXQ4493	644000	4993000	Non-federal Land
5	18TXQ7590	675000	4990000	Non-federal Land
	18TXQ7689	676000	4989000	
	18TXQ7690	676000	4990000	
	18TXQ7789	677000	4989000	
	18TXQ7792	677000	4992000	
	18TXQ7892	678000	4992000	
	18TXQ7893	678000	4993000	
	18TXQ7990	679000	4990000	
	18TXQ7991	679000	4991000	
	18TXQ8090	680000	4990000	
18TXQ8091	680000	4991000		
6	18TXR2910	629000	5010000	Non-federal Land
	18TXR3010	630000	5010000	
	18TXR3109	631000	5009000	
	18TXR3210	632000	5010000	
7	18TXQ6888	668000	4988000	Non-federal Land
	18TXQ6889	668000	4989000	
8	18TXQ5389	653000	4989000	Non-federal Land

9	18TWR8526	585000	5026000	Non-federal Land
10	18TXQ8197	681000	4997000	Non-federal Land
	18TXQ8297	682000	4997000	
11	18TXQ9296	692000	4996000	Non-federal Land
	18TXQ9297	692000	4997000	
12	18TXR5339	653000	5039000	Non-federal Land
13	18TXQ6589	665000	4989000	Non-federal Land
	18TXQ6689	666000	4989000	

^a Based on the standard UTM Military Grid Reference System (see <http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/maps/9789>), where the first 2 digits represent the UTM Zone, followed by a letter representing the UTM Band, the following 2 letters indicate the 100 x 100 km standardized UTM grid, followed by 2 digits to represent the 10 x 10 km standardized UTM, and the last 2 digits indicate the 1 x 1 km standardized UTM grid containing the geographic location of the area containing critical habitat. This unique alphanumeric code is based on the methodology produced from the Breeding Bird Atlases of Canada (See <http://www.bsc-eoc.org> for more information on breeding bird atlases).

^b The listed coordinates are a cartographic representation of where the areas containing critical habitat can be found, presented as the southwest corner of the 1 x 1 km standardized UTM grid square. The coordinates are provided as a general location only.

^c Land tenure is provided as an approximation of the types of land ownership that exist at the geographic location of the area containing critical habitat and should be used for guidance purposes only. Accurate land tenure will require cross referencing geographic location boundaries with surveyed land parcel information.

Appendix D: 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](#)¹⁶. 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 and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s¹⁷ (FSDS) goals and targets.

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 other species was considered. Some habitat restoration activities, including opening forest canopy, have the potential to harm certain other species, at least in the short term. The ecological risks of such activities must be considered individually before undertaking them, in order to reduce possible negative effects. Some species, such as the Hooded Warbler (*Wilsonia citrina*), are expected to benefit from tree canopy openings created through activities aimed at restoring habitat for the White Wood Aster. In general, protecting the deciduous forest habitat of this species in Canada will benefit other species that co-occur with the White Wood Aster including several species at risk such as the Round-leaved Greenbrier (*Smilax rotundifolia*), Cucumber Tree (*Magnolia acuminata*), American Columbo (*Frasera caroliniensis*), and Eastern Flowering Dogwood (*Cornus florida*). Controlling invasive species and promoting responsible recreational use of public trails are also expected to be beneficial to other native species that occur with the White Wood Aster.

Because of the potential benefit of forest conservation and management to several other species at risk, the SEA concluded that this strategy will clearly benefit the environment and will not entail significant adverse effects.

¹⁶ www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1.

¹⁷ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1.