Species at Risk Act
Action Plan Series

Action Plan for the Boreal Felt Lichen (*Erioderma pedicellatum*) (Atlantic population) and Vole Ears Lichen (*Erioderma molissimum*), in Canada

Boreal Felt Lichen (Atlantic population) and Vole Ears Lichen

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

Cover illustration: Boreal Felt Lichen (Atlantic population) and Vole Ears Lichen on Balsam Fir, eastern shore, Nova Scotia. Photo by Mersey Tobeatic Research Institute (MTRI), used with permission.

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[1] www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)[2] agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of action plans for species listed as Extirpated, Endangered, and Threatened for which recovery has been deemed feasible. They are also required to report on progress within five years after the publication of the final document on the SAR Public Registry.

Under SARA, one or more action plan(s) provides the detailed recovery planning that supports the strategic direction set out in the recovery strategy for the species. The plan outlines what needs to be done to achieve the population and distribution objectives (previously referred to as recovery goals and objectives) identified in the recovery strategy, including the measures to be taken to address the threats and monitor the recovery of the species, as well as the proposed measures to protect critical habitat that has been identified for the species. The action plan also includes an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation. The action plan is considered one in a series of documents that are linked and should be taken into consideration together. Those being the COSEWIC status report, the recovery strategy, and one or more action plans.

The Minister of Environment and Climate Change is the competent minister under SARA for the Boreal Felt Lichen (Atlantic population) (hereafter Boreal Felt Lichen) and Vole Ears Lichen and has prepared this action plan to implement the recovery strategies, as per section 47 of SARA. The minister responsible for the Parks Canada Agency (PCA) is a competent minister for the Vole Ears Lichen where the species occurs on lands administered by PCA. To the extent possible, this action plan has been prepared in cooperation with the Provinces of New Brunswick, Nova Scotia, and Newfoundland and Labrador, the Nova Scotia Lichen Recovery Team, environmental non-government organizations, Indigenous groups, industry stakeholders, and private landowners, as per section 48(1) of SARA.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions and actions set out in this action plan and will not be achieved by Environment and Climate Change Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this action plan for the benefit of the Boreal Felt Lichen and Vole Ears Lichen and Canadian society as a whole.

Implementation of this action plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

[2] www.canada.ca/en/environment-climate-change/services/species-risk-act-accord-funding.html#2

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

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area[3] be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

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

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

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

[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.

Acknowledgments

This action plan was prepared by Brad Toms (Mersey Tobeatic Research Institute), Julie McKnight (Environment and Climate Change Canada – Canadian Wildlife Service), and Rob Cameron (Nova Scotia – Environment) with extensive input from Mark Elderkin (Nova Scotia Department of Natural Resources). Maureen Toner (New Brunswick Department of Natural Resources), Claudia Hanel (Newfoundland and Labrador Department of Environment and Conservation) and André Arsenault (Natural Resources Canada – Canadian Forest Service) provided comments on this action plan. The efforts and contributions of the Nova Scotia Cyanolichen Recovery Team and the Newfoundland and Labrador Department of Natural Resources Lichen Working Group are gratefully acknowledged. Appreciation is also extended to Matt Mahoney (Environment and Climate Change Canada – Canadian Wildlife Service) for developing the critical habitat maps.

Executive Summary

This action plan complements the amended recovery strategy for Boreal Felt Lichen (*Erioderma pedicellatum)* (Environment and Climate Change Canada 2018), and the recovery strategy for the Vole Ears Lichen (*Erioderma mollissimum*) (Environment Canada 2014). It addresses the population and distribution objectives established in the amended Boreal Felt Lichen recovery strategy and the Vole Ears recovery strategy. Recovery measures are identified, in relation to the broad strategies set out in the recovery strategies for Boreal Felt Lichen and Vole Ears Lichen.

The amended recovery strategy for Boreal Felt Lichen contains the identification of critical habitat for that species.

This action plan identifies new critical habitat for Vole Ears Lichen in Nova Scotia taking into account new population information. 1000 hectares of critical habitat were identified in the recovery strategy and an additional 1420 hectares of critical habitat in Nova Scotia are identified in this action plan. Critical habitat is now identified at a total of 2420 hectares along the Atlantic Coast of Nova Scotia. Critical habitat for Vole Ears Lichen in Newfoundland and Labrador is identified in the recovery strategy for the species at 106 hectares on the Avalon Peninsula (Figures 23-25).

Proposed measures to protect critical habitat are presented in section 1.4. The recovery measures included in this plan build on the recommended approaches outlined in the amended recovery strategy for the Boreal Felt Lichen and the recovery strategy for the Vole Ears Lichen. An implementation schedule is included and prioritizes each recovery measure and delineates timelines.

Proposed recovery measures in this action plan will have limited socio-economic impact and constraints to human land use. Indirect costs are expected to be minimal and the benefits relate to the value of biodiversity to Canadians, positive impacts cultural values, and conservation of other species.

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1. Recovery Actions

1.1 Context and Scope of the Action Plan

Boreal Felt Lichen (*Erioderma pedicellatum*) is an epiphytic cyanolichen. It is restricted to cool, moist, oceanic regions, occurring at elevations less than 200 m above sea level within 25 km of the Atlantic coast only in mature to over mature Balsam Fir (*Abies balsamea*) forests within or adjacent to wetlands where sphagnum species cover the ground. There are two designated populations in Canada: the Boreal population in Newfoundland and the Atlantic population in New Brunswick and Nova Scotia. This action plan covers the Atlantic population. The Boreal Felt Lichen (Atlantic population) (hereafter Boreal Felt Lichen) was listed under the *Species at Risk Act* (*SARA*) as Endangered in 2005. It is believed to be extirpated from New Brunswick (Cameron et al. 2009).

The Vole Ears Lichen (*Erioderma mollissimum*) is also an epiphytic cyanolichen. It requires cool humid coastal conifer forests in and adjacent to wetlands dominated by Balsam Fir and/or Red Maple (*Acer rubrum*) and/or Yellow Birch (*Betula alleghaniensis*) where sphagnum species cover the ground. Vole Ears Lichen was listed under the *Species at Risk Act* as Endangered in 2012.

The recovery strategy for the Boreal Felt Lichen in Canada was posted on the Species at Risk Registry in 2007 (Environment Canada 2007) and was amended in 2020 (Environment and Climate Change Canada 2020). The recovery strategy for Vole Ears Lichen was posted on the Species at Risk Registry in 2014 (Environment Canada 2014). This action plan should be considered along with the Multi-species Action Plan for Kejimkujik National Park and National Historic Site of Canada (Parks Canada Agency 2017).

The population and distribution objectives established by both recovery strategies are to ensure the species' extent of occurrence (i.e., known range) and the health of the populations are not impacted by anthropogenic habitat deterioration or loss (i.e., through biological resource use (of the species' host tree), transportation and service corridors, or residential and commercial development).

All broad strategies and general approaches to meet objectives detailed in the amended recovery strategy for Boreal Felt Lichen and the recovery strategy for Vole Ears Lichen are addressed in this document.

Surveys undertaken from 2005 to present have increased the number of known sites of Boreal Felt Lichen, however, loss of the lichen from sites continues to occur and the estimated 10 year decline is 34% (COSEWIC 2014). Many new sites of Vole Ears Lichen have been found since 2012 due to recent survey efforts but declines continue, particularly in Nova Scotia, where at least 80% of sites documented in the 1980's no longer contain the lichen. It is important to maintain intact biophysical attributes at sites that have apparently lost their lichens recently because they may still contain the necessary building blocks for colonization and juveniles are difficult to inventory until they reach a certain size.

Critical habitat is partially identified in the amended recovery strategy for Boreal Felt Lichen and the recovery strategy for Vole Ears Lichen. No new critical habitat is identified for Boreal Felt Lichen in this document. New critical habitat is identified for Vole Ears Lichen in this action plan (refer to section 1.3) in addition to the 29 sites in two populations in Nova Scotia and the five sites in one population in Newfoundland and Labrador identified in the recovery strategy.

This action plan should be considered along with the amended recovery strategy for the Boreal Felt Lichen and the recovery strategy for the Vole Ears Lichen. The recovery strategies provide more details on the strategic direction for recovery of the species, critical habitat information, and background information on the species and their threats.

1.2 Measures to be Taken and Implementation Schedule

The recovery measures outlined below are arranged according to the broad strategies identified in the amended recovery strategy for Boreal Felt Lichen and the recovery strategy for Vole Ears Lichen.

Table 1: Implementation schedule

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
Broad Strategy: Law and policy				
	Approach: Engage in existing pollution reduction programs for local and transboundary pollution and greenhouse gasses			
1	Collaborate with government departments to continue implementing the Nova Scotia Energy Strategy and the Nova Scotia Climate Change Action Plan.	H	Air-borne pollutants	ongoing
2	Collaborate to incorporate Boreal Felt Lichen and Vole Ears Lichen in air pollution reduction programs and general air quality education materials.	M	Air-borne pollutants	ongoing
	Approach: Review and revise Beneficial Management Practices (BMPs)/ Special Management Practices (SMPs) for the species and their habitat, where necessary			
3	Ensure Vole Ears Lichen is maintained on Crown Land in Nova Scotia (NS) through implementation of 'Special Management Practices'.	H	Logging & wood harvesting	annually
4	Identify existing or planned land uses that could negatively impact Boreal Felt Lichen or Vole Ears Lichen sites. Implement relevant recovery measures to address threats.	H	Logging & wood harvesting, Roads & railroads, and Housing & urban areas	annually (NS) as identified (NL)
	Approach: In NL: Support existing relevant programs by the provincial Department of Natural Resources			
5	Quantify extent of the forest regeneration problem due to invasive species and encourage multi-stakeholder collaboration.	M	Invasive non-native/alien species/diseases and problematic native species	ongoing

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
	Approach: Engage forest certification systems to implement private standards and codes governing private sector practice that are beneficial for the species			
6	Evaluate efficacy of private sector certifications in the conservation of cyanolichens at risk. Determine gaps in current certifications and work with certifiers to fill gaps.	L	Logging & wood harvesting and Roads & railroads	2022
	Approach: Monitor and enforce compliance with relevant laws, policies, and regulations, and voluntary standards and codes			
7	During surveys and inventory work, identify any potential infractions and engage enforcement branches when necessary.	H	Logging & wood harvesting, Roads & railroads, and Housing & urban areas	ongoing
Broad Strategy: Education and awareness, stewardship, and partnerships				
	Approach: Foster cooperative relationships with landowners, foresters, industry, and volunteers to maintain critical habitat			
8	Develop stewardship agreements with landowners where possible.	H	Logging & wood harvesting, Roads & railroads, and Housing & urban areas	As opportunities are identified
9	Inform interested landowners regarding formal habitat conservation options.	H	Logging & wood harvesting, Roads & railroads, and Housing & urban areas	2023
10	Contact stakeholders regarding the significance and requirements of Boreal Felt Lichen and Vole Ears Lichen and share BMPs (NL) and SMPs (NS) to conserve the species.	H	Logging & wood harvesting, Roads & railroads, and Housing & urban areas	as new stakeholders are identified

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
	Approach: Promote volunteer participation in surveys and monitoring			
11	Provide identification workshops for interested individuals and organizations.	M	All	completed in 2008, 2009; thereafter as needed
	Approach: Promote ecosystem conservation through forest certification, if deemed effective for recovery of the species			
12	Investigate extent of forest certification in Eastern Canada and promote the use of third-party certified sustainable forest management certification standards where appropriate.	L	Logging & wood harvesting and Roads & railroads	2023
	Approach: Promote compliance with Federal, Provincial, and Municipal Acts and Policies as well as BMPs/SMPs that protect the species and their habitat			
13	Evaluate existing education materials, revise and reprint as needed.	M	All	completed 2008
	Approach: Promote the species as an indicator of healthy coastal rain forests			
14	Develop an outreach plan for engaging Forest managers and private woodlot owners on “lichens at risk”.	M	Logging & wood harvesting and Roads & railroads	2024
Broad Strategy: Habitat and species protection and management				
	Approach: Conserve habitat for the species			
15	Engage private landowners of priority sites to conserve lichens.	H	Logging & wood harvesting, Roads & railroads, and Housing & urban areas	2024
	Approach: Prevent gastropods from ascending phorophytes			
16	Use collars, tapes, and traps to ensure cyanolichens are not grazed by gastropods if research determines these tools are safe for lichens.	L	Invasive non-native/alien species/diseases and problematic native species	research completed by 2023; implementation as deemed necessary
	Approach: Develop a protocol for transplanting cyanolichens if phorophyte is lost			
17	Refine methodology developed for transplanting Boreal Felt Lichen, Boreal population (2014) and implement protocol at sites where the lichen will be lost due to immitigable anthropogenic circumstances.	L	All	if deemed necessary

#	Recovery Measures	Priority[a]	Threats or objectives addressed	Timeline
Broad Strategy: Monitoring and Research				
	Approach: Implement inventory and monitoring protocol(s)			
18	Inventory new sites identified by the predictive habitat model.	H	Monitoring	ongoing
19	Track site size and vigour (e.g., condition, health, presence of disease or herbivory) of individuals.	H	Monitoring	ongoing
20	Track threats (e.g., Logging and wood harvesting, roads, gastropod grazing).	H	Monitoring	ongoing
21	Track habitat conditions (e.g., forest composition, forest age structure, presence of indicator species).	H	Monitoring	ongoing
	Approach: Research (refer to Appendix B in respective recovery strategies)			
22	Collaborate with researchers working with the cyanolichens to address the following knowledge gaps relevant to the survival and recovery of the species: their life cycle, growth rates, habitat dynamics, genetic diversity, minimum viable population size, sensitivity to specific pollutants and acid deposition, sensitivity to specific forestry practices.	H	Knowledge gaps	2025
23	Consult the National Pollutant Release Inventory to identify point sources of important pollutants and assess whether location and survival of lichens are affected.	H	Air-borne pollutants	2023

[a] "Priority" reflects the degree to which the measure contributes directly to the recovery of the species or is an essential precursor to a measure that contributes to the recovery of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the population and distribution objectives for the species. Medium priority measures may have a less immediate or less direct influence on reaching the population and distribution objectives, but are still important for the recovery of the population. Low priority recovery measures will likely have an indirect or gradual influence on reaching the population and distribution objectives, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

1.2.1 Monitoring

While there is currently no published monitoring protocol for Boreal Felt Lichen or Vole Ears Lichen, monitoring measures for Boreal Felt Lichen are in place and will be applied for Vole Ears Lichen as new sites are found and extant sites are revisited. Each time a site is visited, the following criteria/measures will be recorded:

- maturity of the lichen (i.e., adult or juvenile);
- the width and height of the lichen;
- a rating of the lichen's health;
- percentage of the thallus area grazed; and
- a score for necrosis (percentage of thallus area discolored by death of the fungus).

Monitoring Boreal Felt Lichen habitat is currently conducted during site visits and involves collecting habitat parameters using a standardized method (visual assessments of any major changes – e.g., death of trees, cutting). This methodology will be adopted for Vole Ears Lichen as new sites are found and extant sites are revisited.

1.3 Critical Habitat

The critical habitat deemed necessary to meet the population and distribution objectives was partially identified for Boreal Felt Lichen in the amended recovery strategy. The amended recovery strategy contains the methodology for identifying critical habitat and outlines a schedule of studies required to complete the identification of critical habitat. Additional critical habitat for Boreal Felt Lichen is not identified in this action plan.

Critical habitat was also partially identified for Vole Ears Lichen in its recovery strategy. The recovery strategy contains the methodology for identifying critical habitat and outlines a schedule of studies required to complete the identification of critical habitat. Critical habitat for Vole Ears Lichen in Newfoundland and Labrador is identified in the recovery strategy for the species (106 hectares) and is located on the Avalon Peninsula (Figures 23-25). Critical habitat for Vole Ears Lichen in Nova Scotia is identified in the recovery strategy for the species (1000 hectares) in two populations. An additional 1420 hectares, in two populations along the Atlantic Coast of Nova Scotia, are identified in this action plan based on recent inventories, using the same approach described in the recovery strategy.

1.3.1 Identification of Vole Ears Lichen critical habitat

Critical habitat description

Critical habitat for Vole Ears Lichen is presented in Figures 1-25. Critical habitat for Vole Ears Lichen in Canada occurs within the shaded yellow and blue polygons (units where the critical habitat criteria and methodology described in section 7.1 of the recovery strategy, and included as Appendix B of this document, are met). The UTM grid overlay shown in the figures is a standardized national grid system that indicates the general geographic area containing critical habitat.

More information on critical habitat to support protection of the species and its habitat may be requested, by contacting Environment and Climate Change Canada's Recovery Planning section at: ec.planificationduretablissement-recoveryplanning.ec@canada.ca.

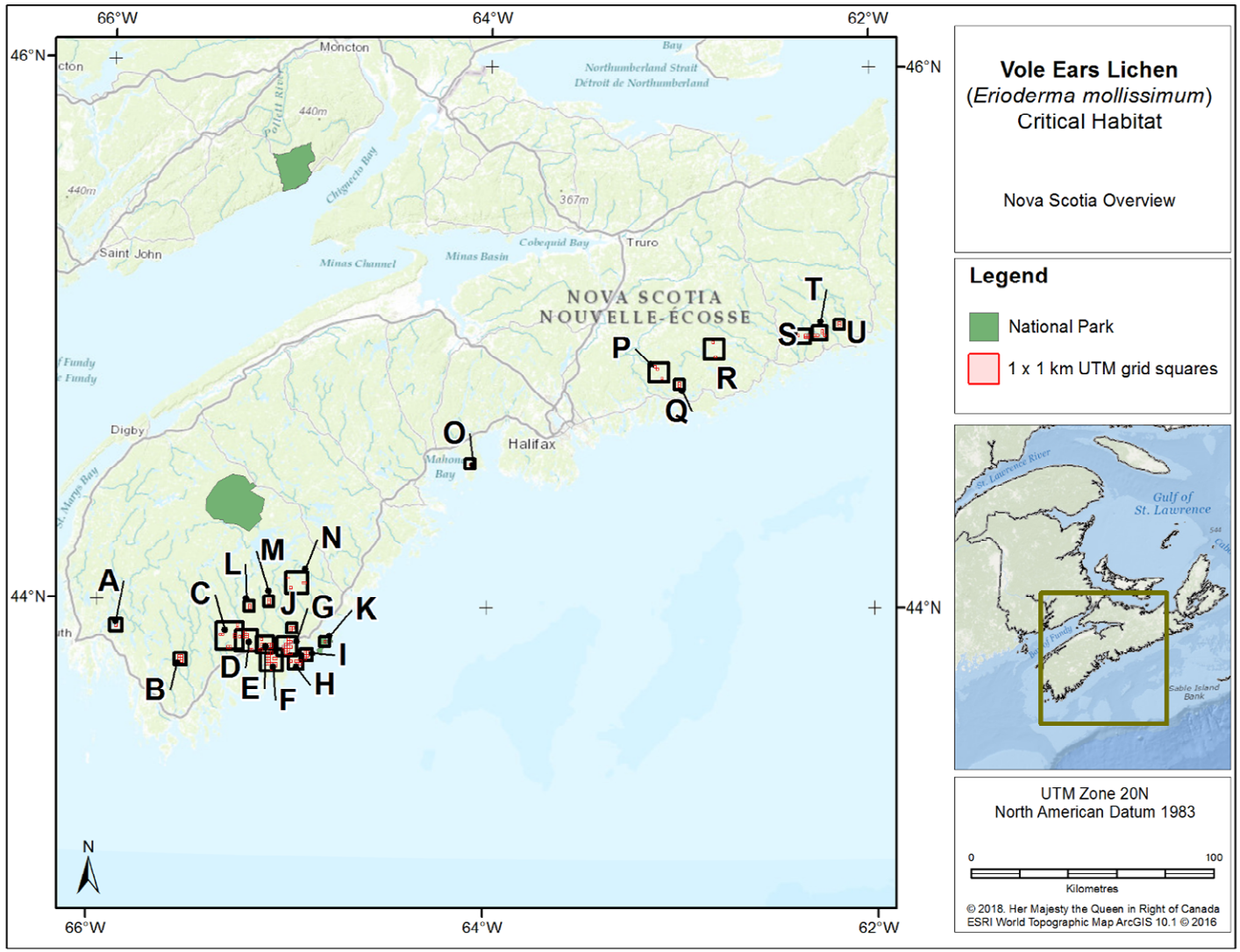

Figure 1. Overview map of critical habitat for Vole Ears Lichen in Nova Scotia. Refer to Figures 2-22 for detailed representations of critical habitat.

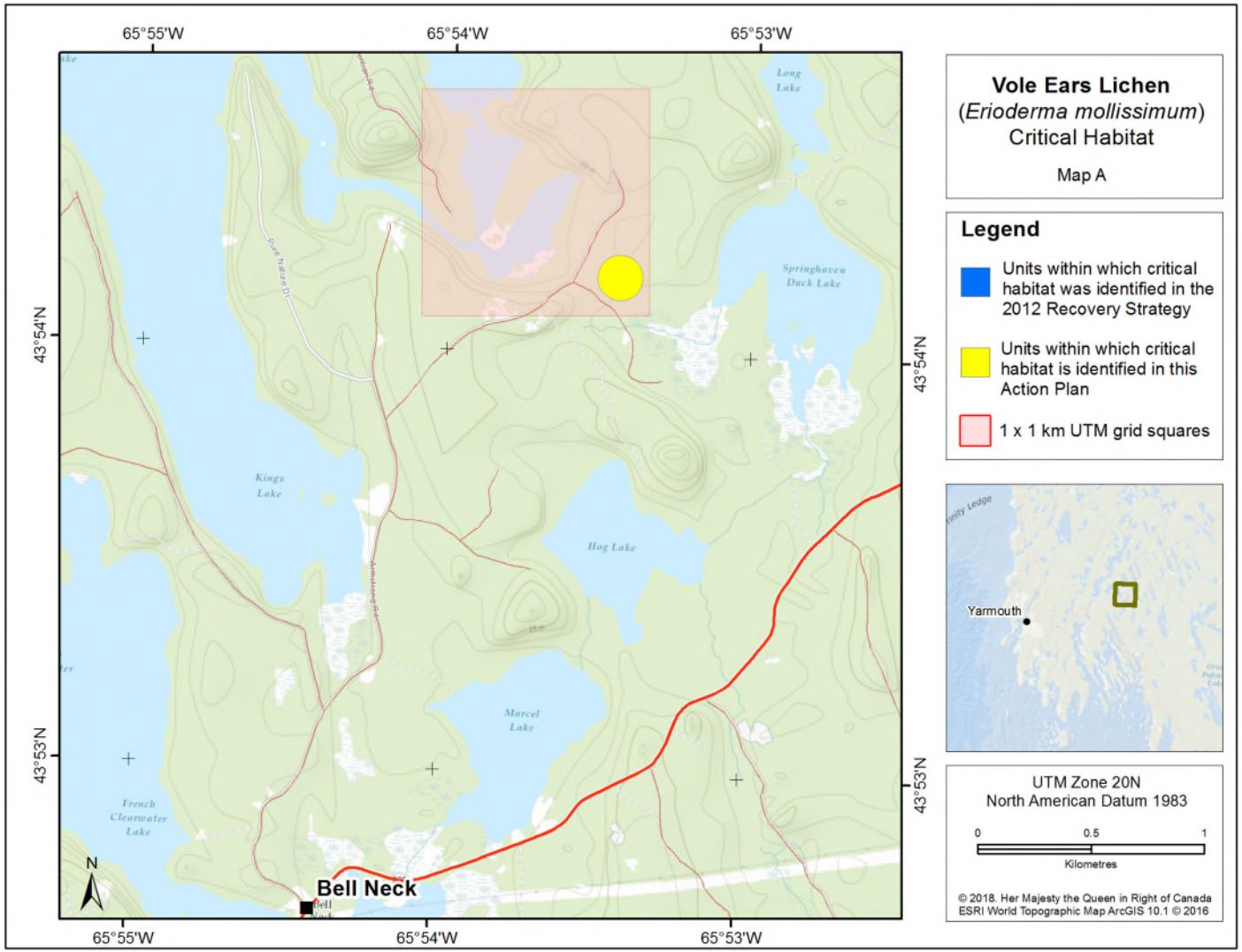

Figure 2. Critical habitat for Vole Ears Lichen in Yarmouth County (see Nova Scotia overview map area A) is represented by the yellow shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

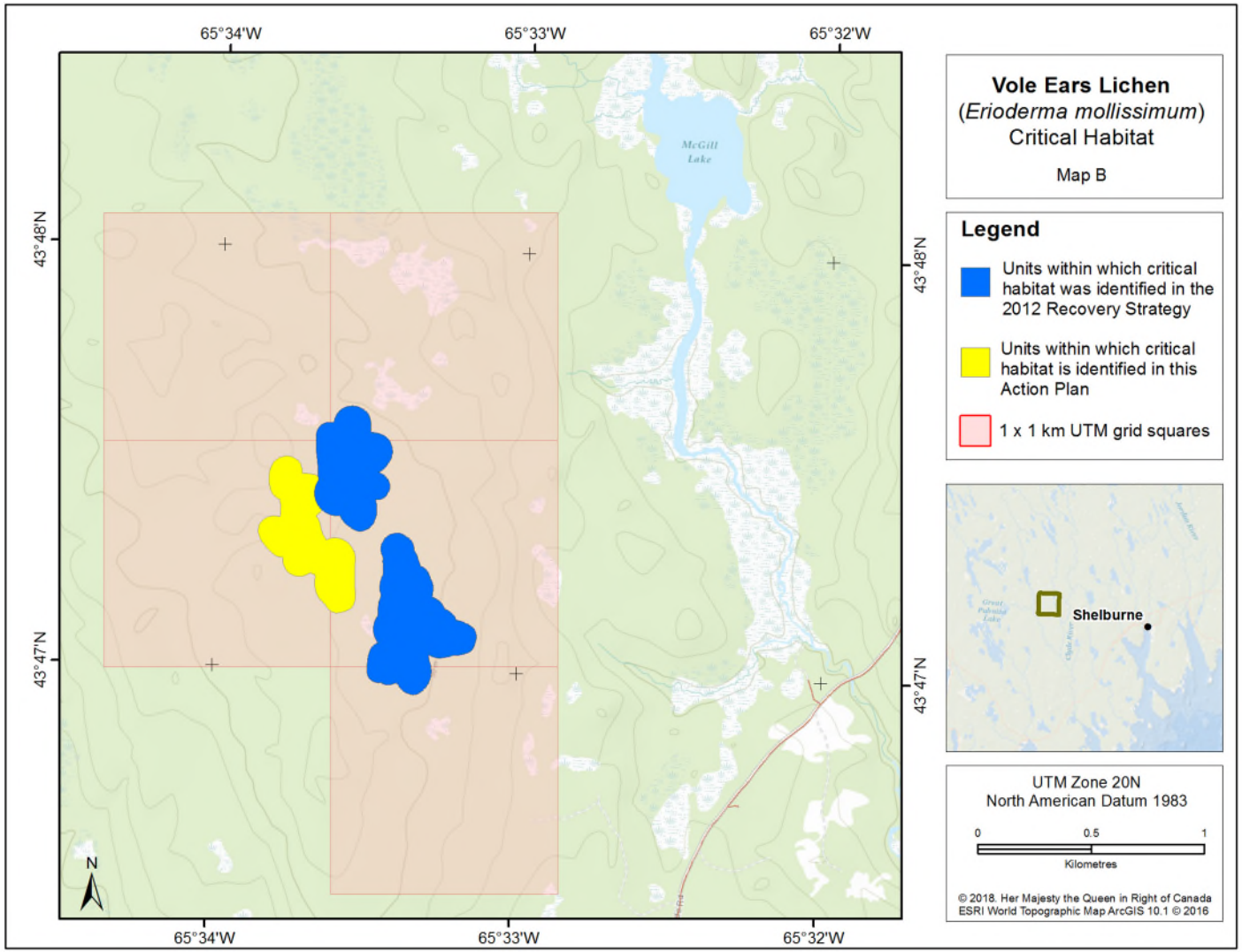

Figure 3. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area B) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

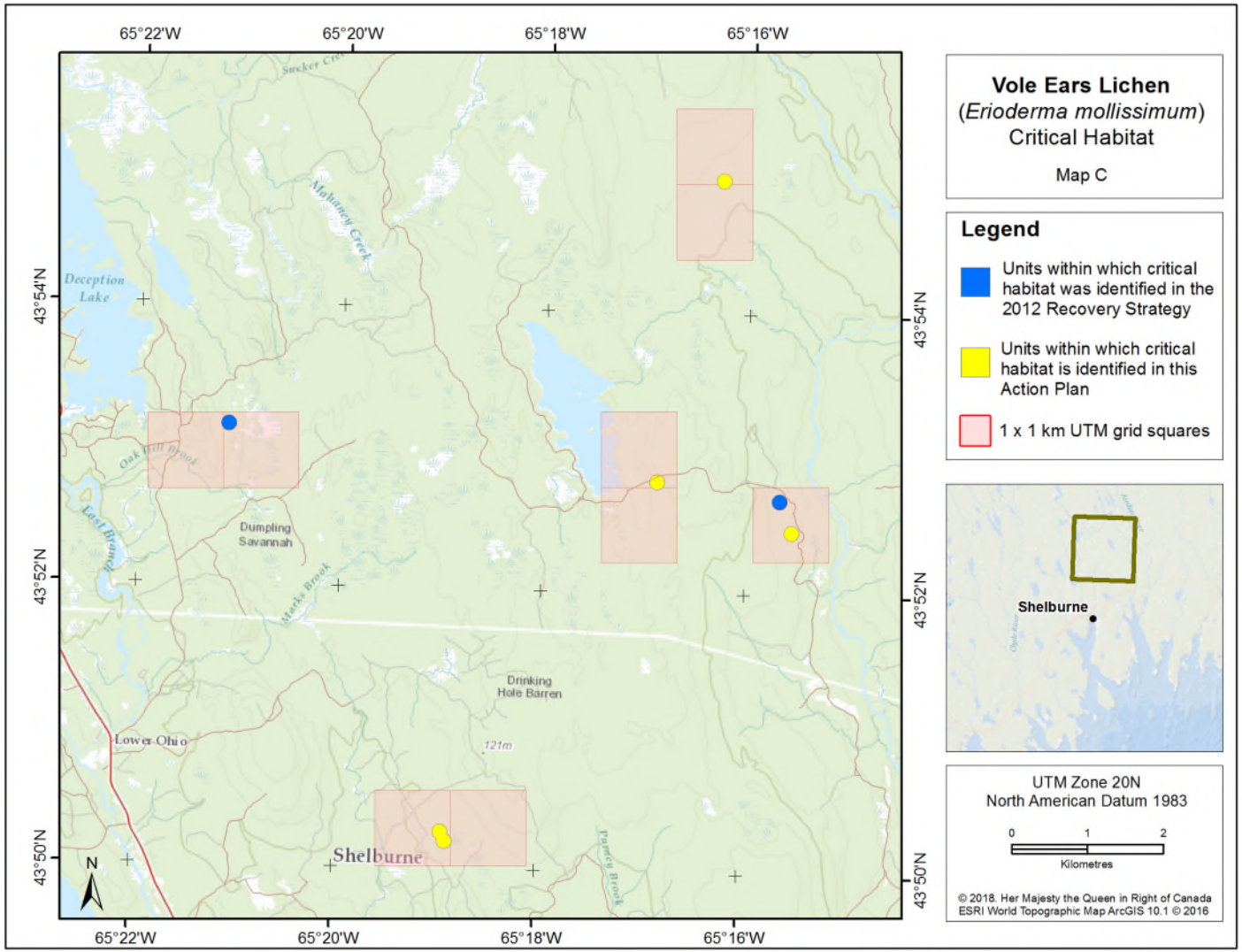

Figure 4. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area C) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

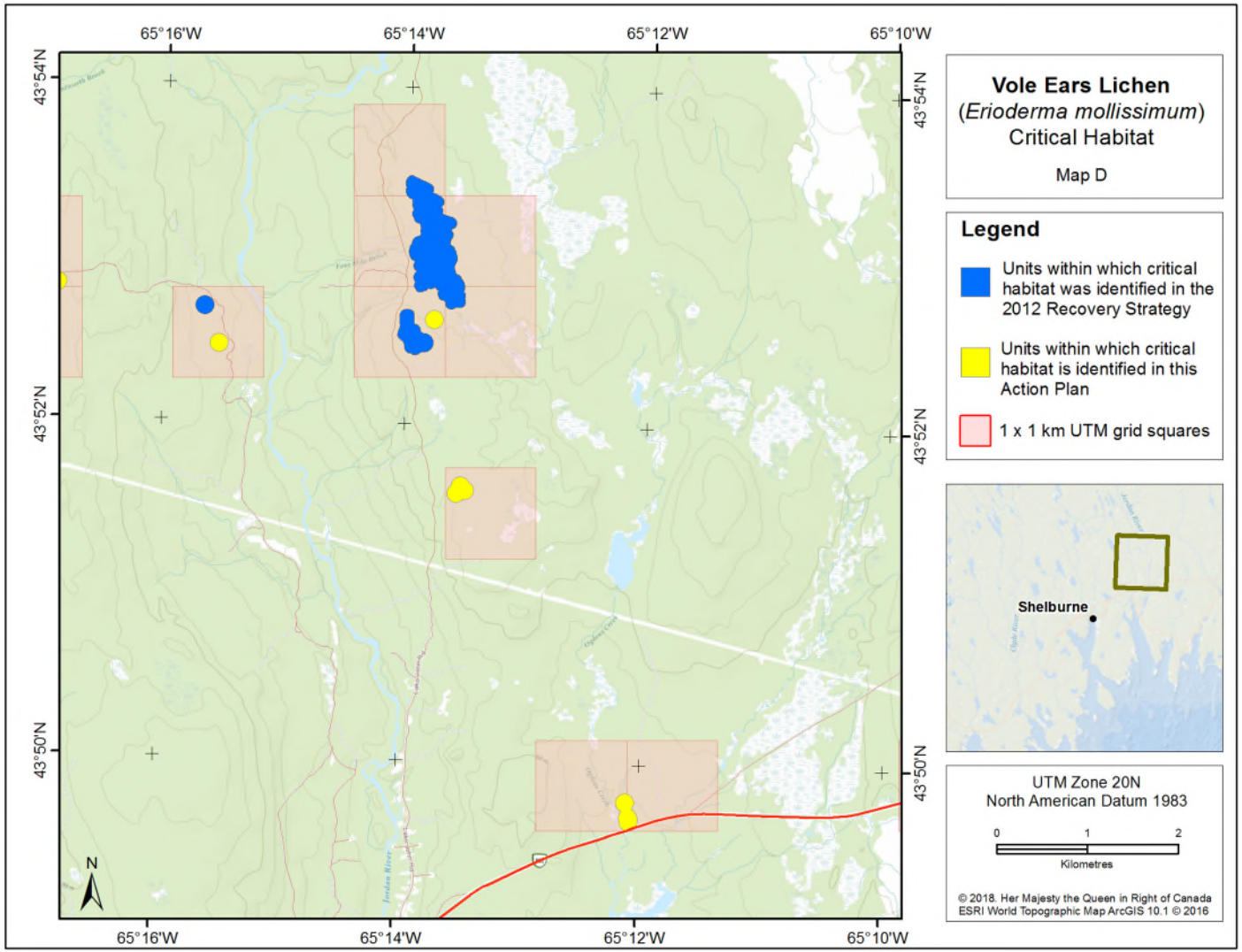

Figure 5. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area D) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

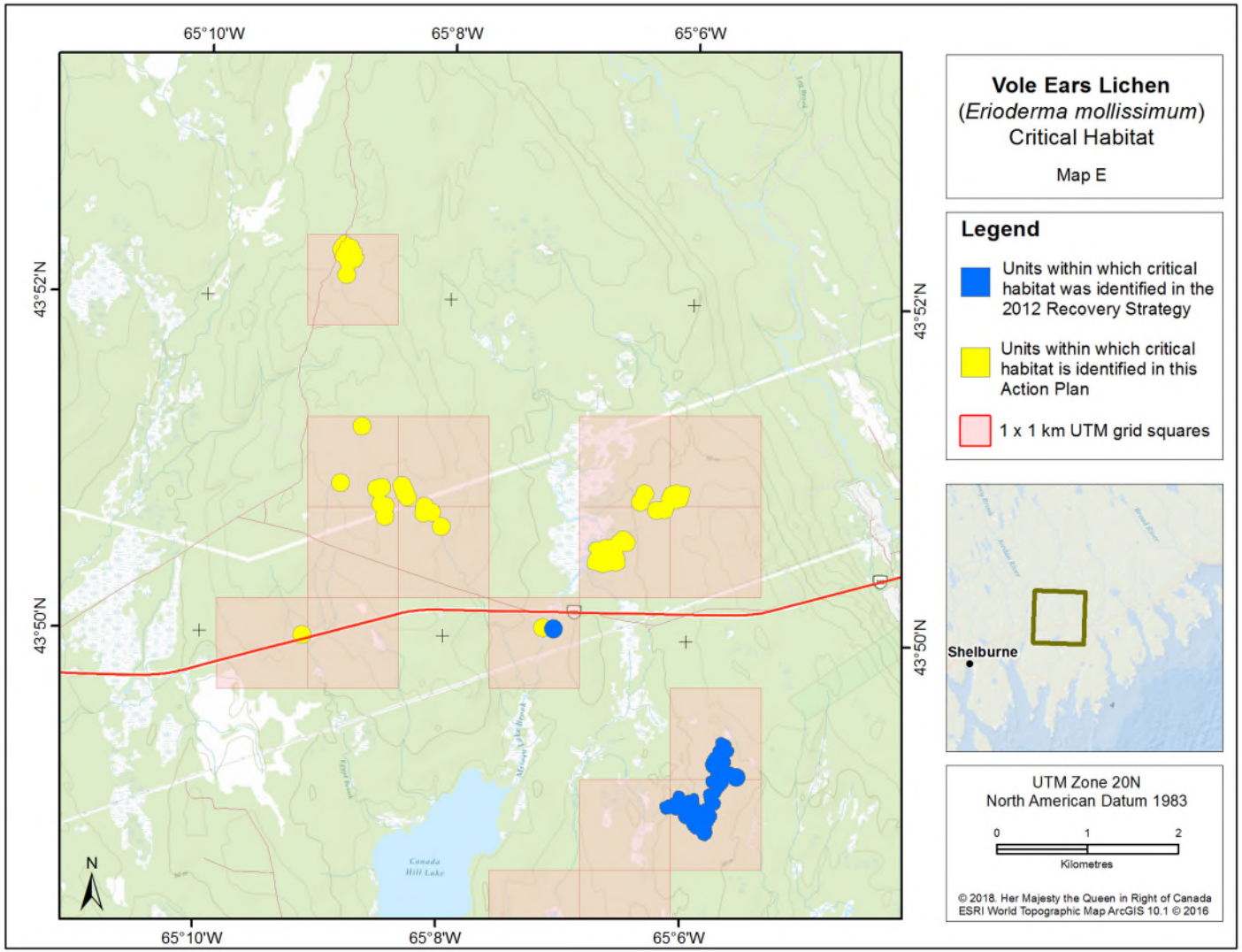

Figure 6. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area E) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

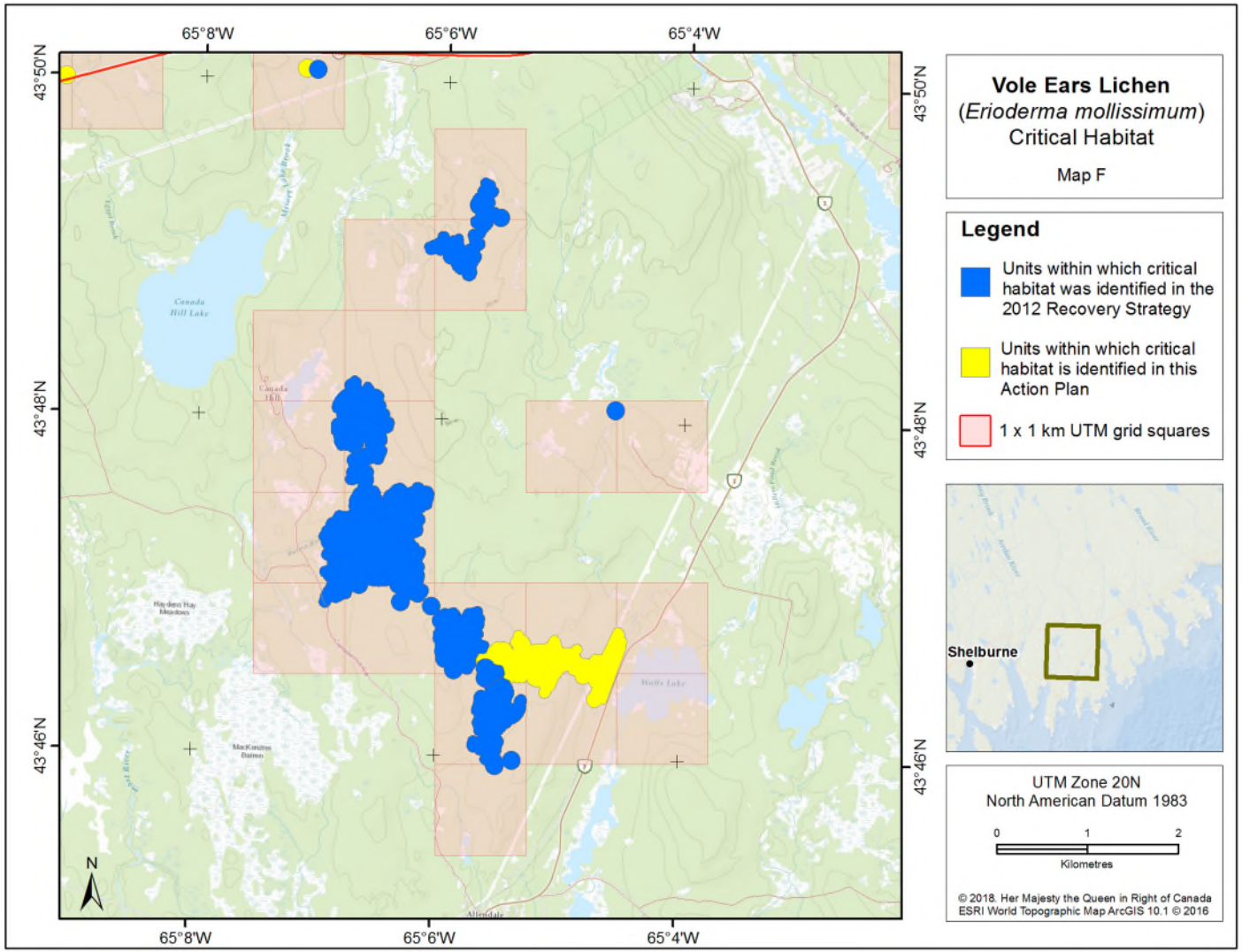

Figure 7. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area F) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

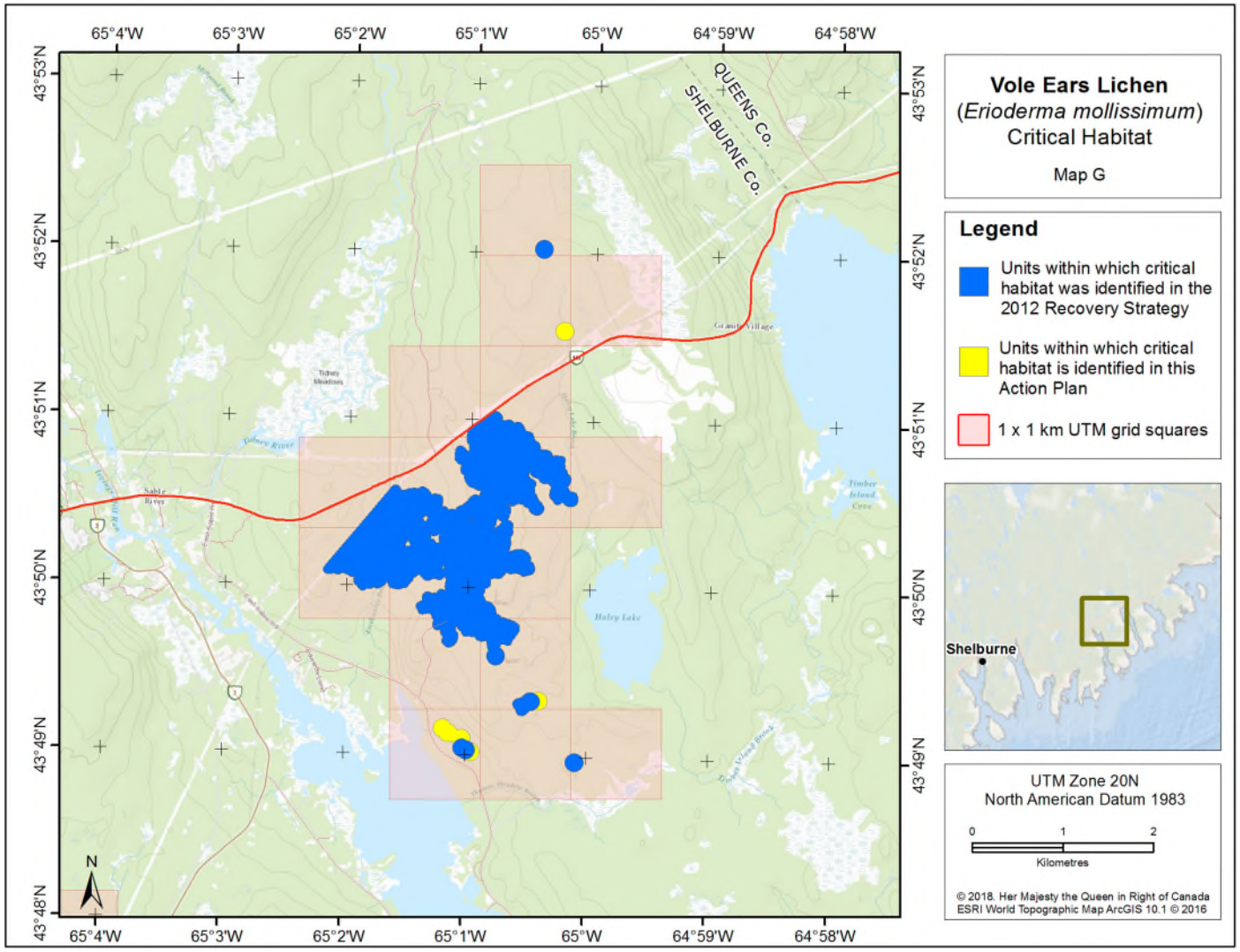

Figure 8. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area G) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

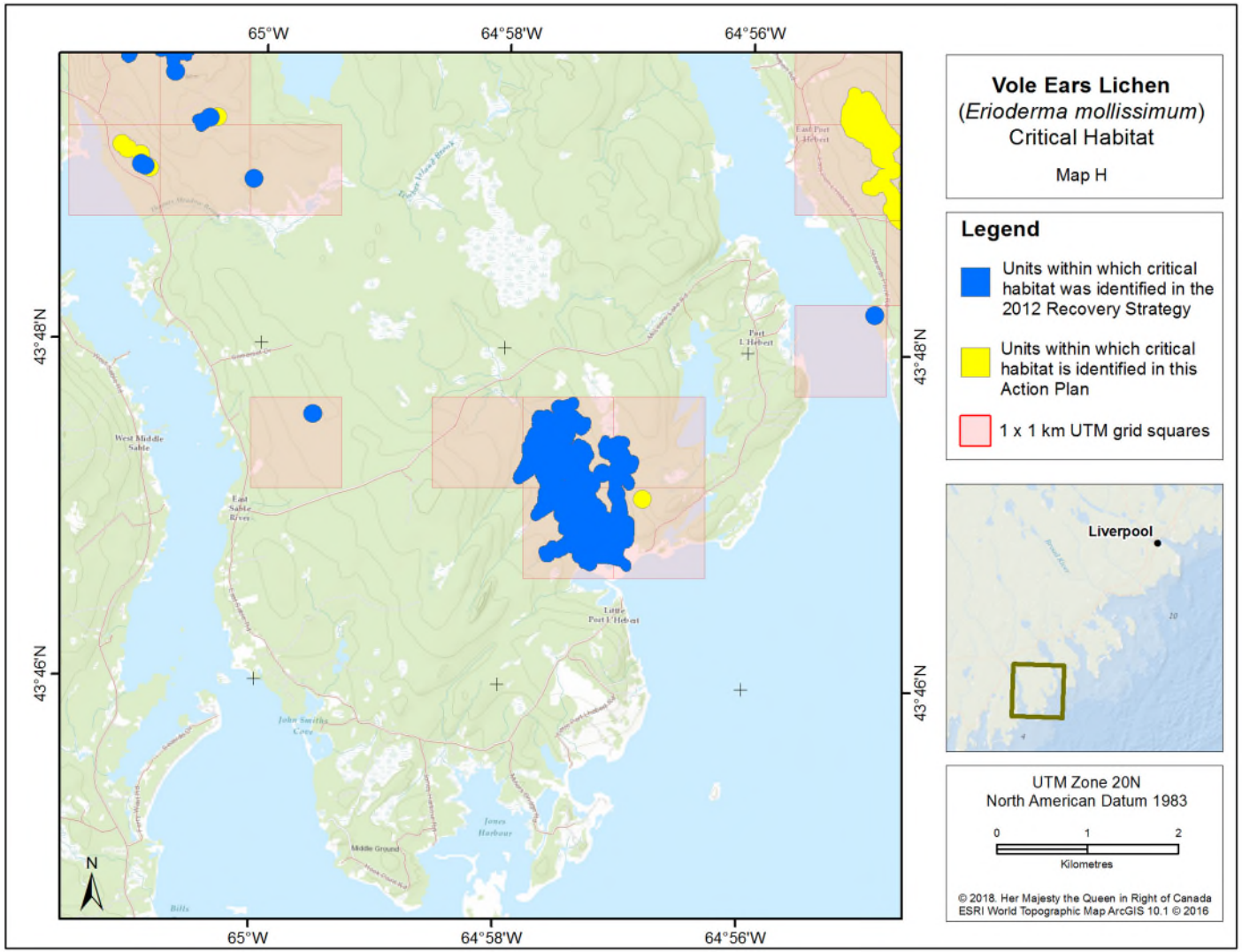

Figure 9. Critical habitat for Vole Ears Lichen in Queens County (see Nova Scotia overview map area H) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

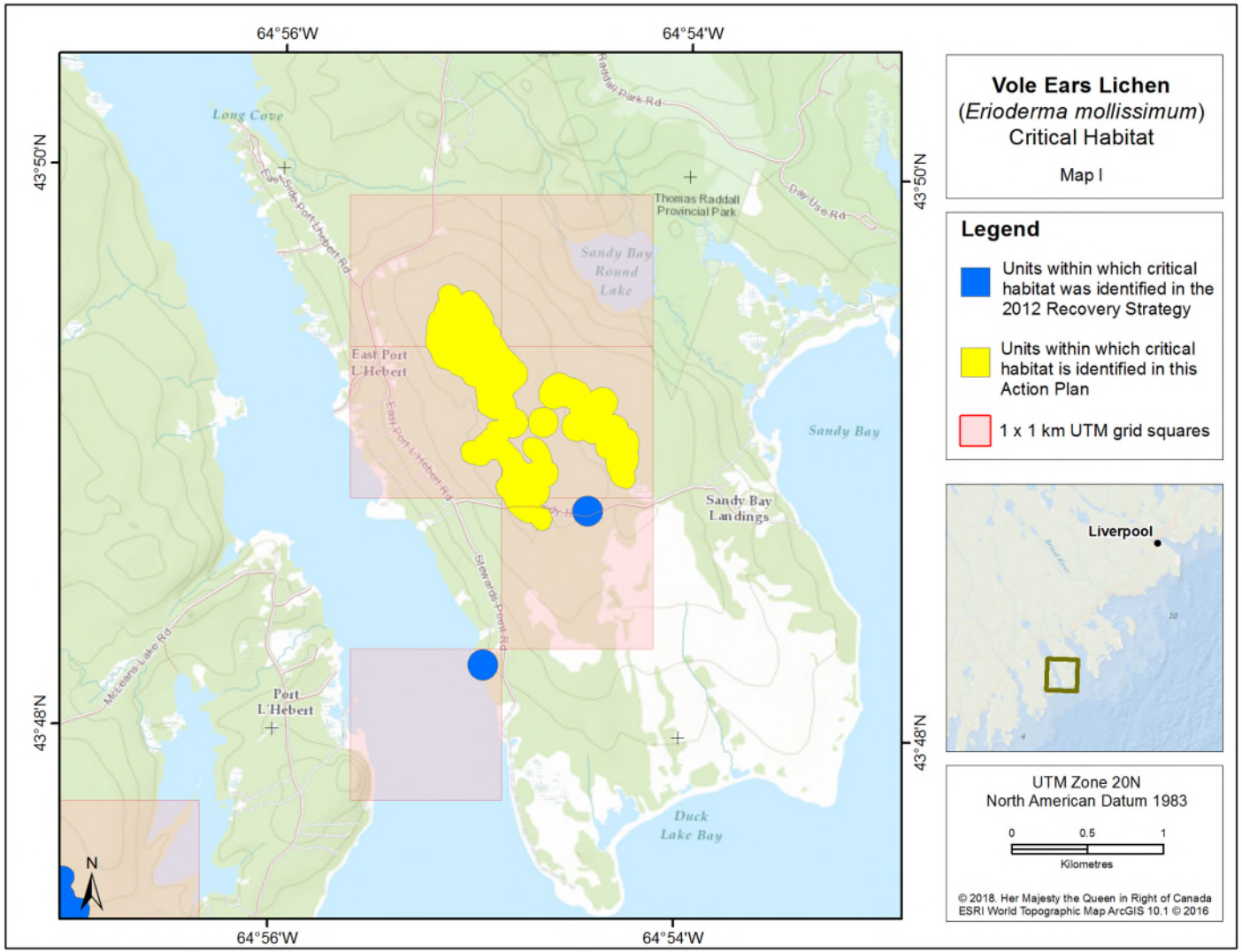

Figure 10. Critical habitat for Vole Ears Lichen in Queens County (see Nova Scotia overview map area I) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

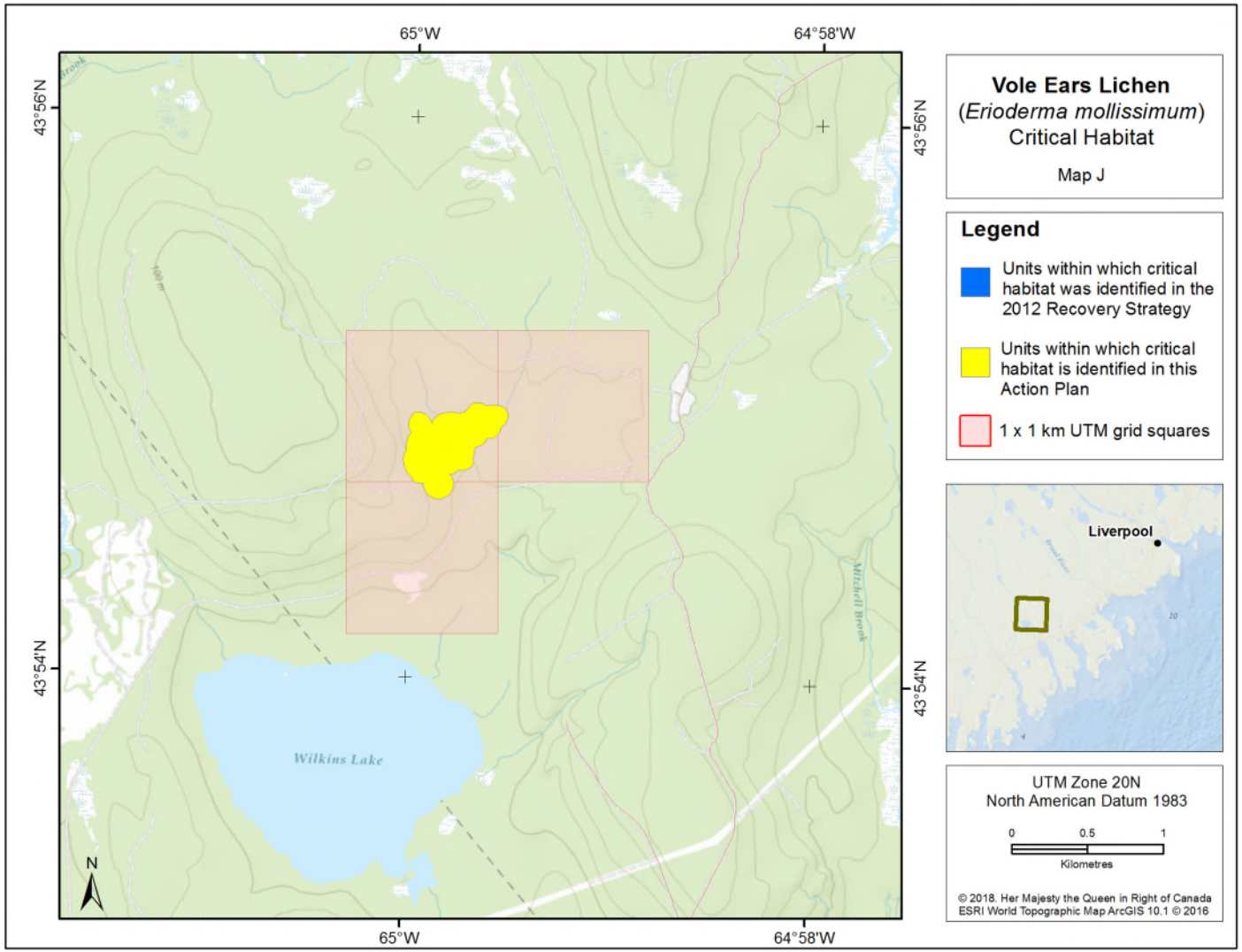

Figure 11. Critical habitat for Vole Ears Lichen in Queens County (see Nova Scotia overview map area J) is represented by the yellow shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

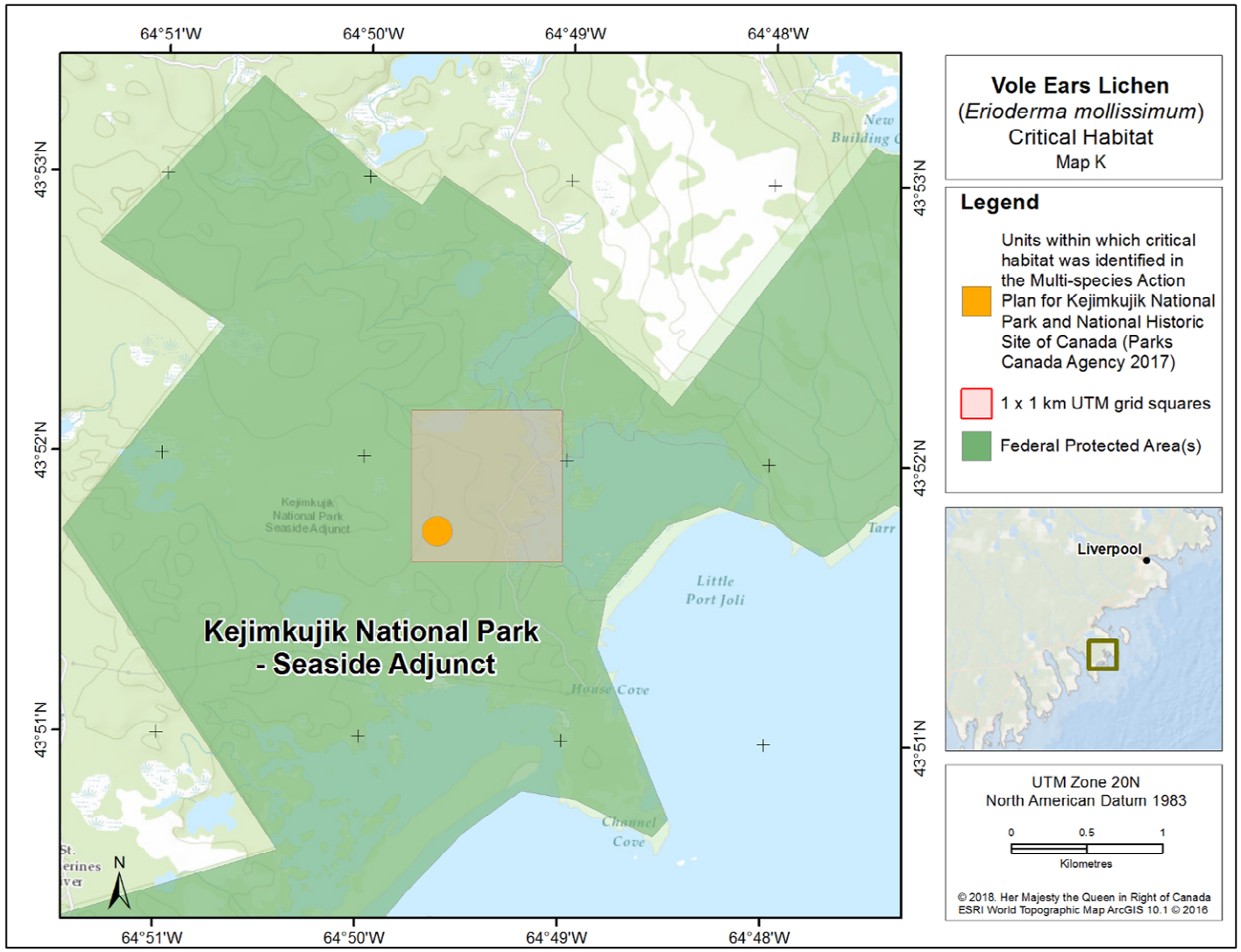

Figure 12. Critical habitat for Vole Ears Lichen in Kejimkujik National Park Seaside, Queens County (see Nova Scotia overview map area K) is represented by the orange shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

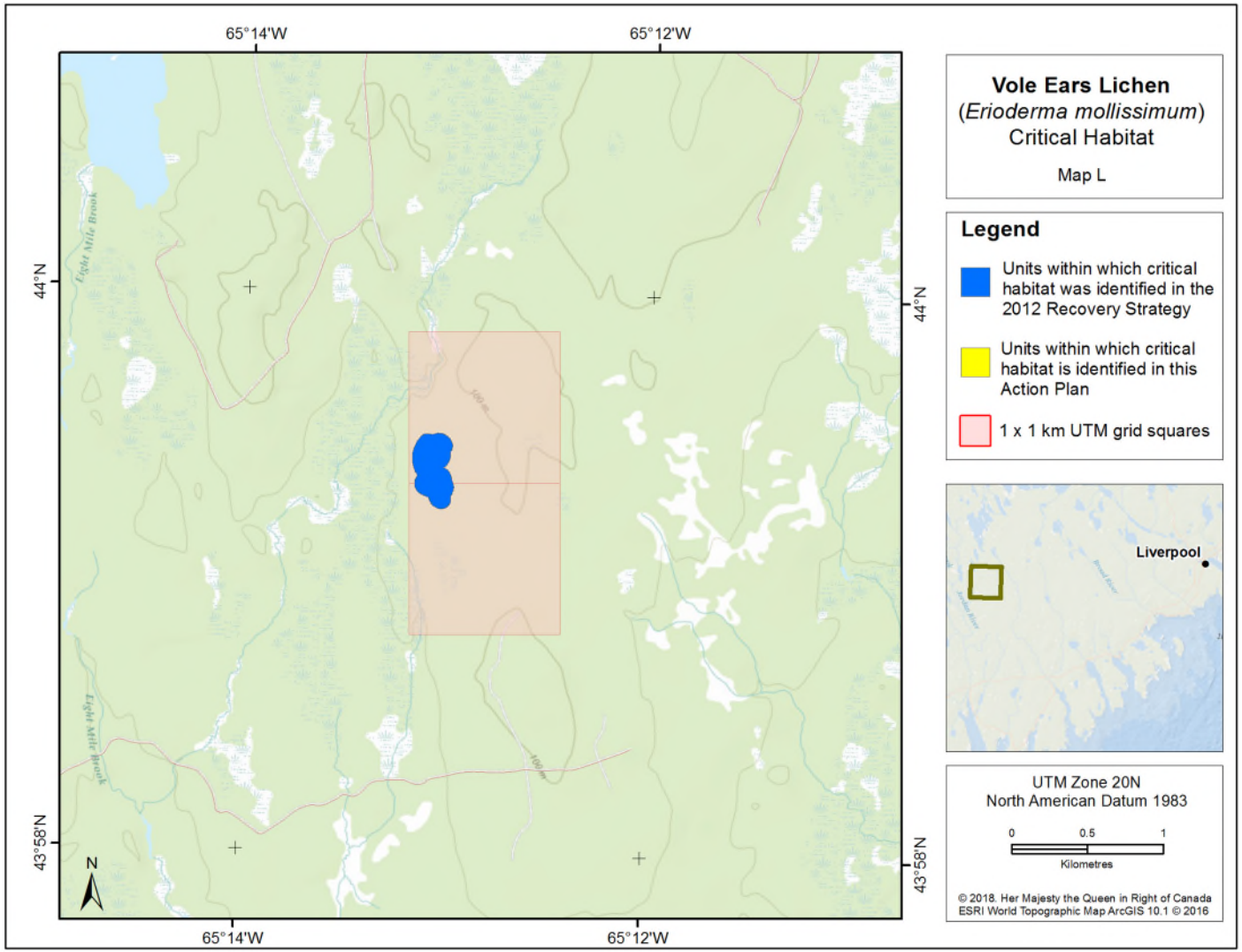

Figure 13. Critical habitat for Vole Ears Lichen in Shelburne County (see Nova Scotia overview map area L) is represented by the blue shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

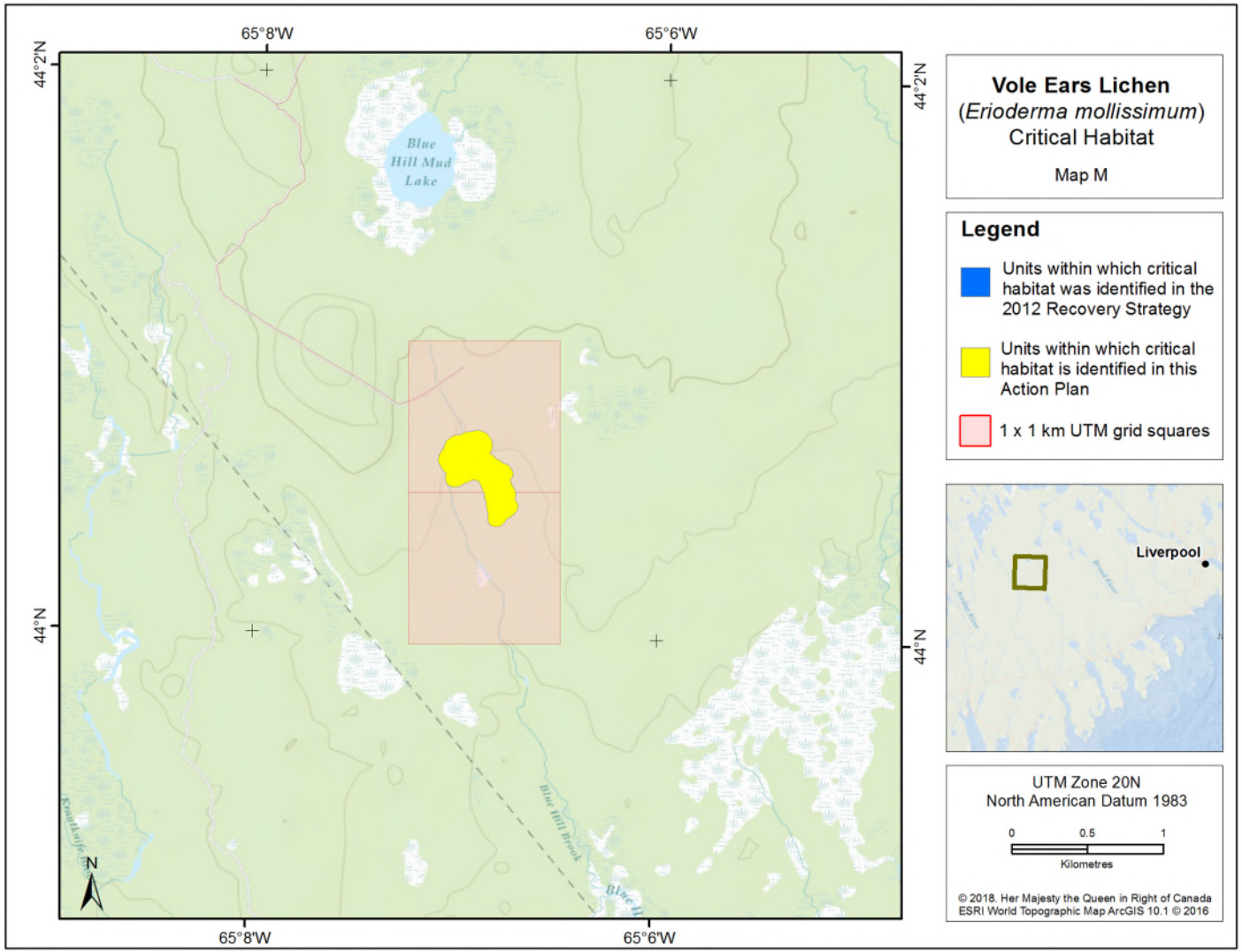

Figure 14. Critical habitat for Vole Ears Lichen in Queens County (see Nova Scotia overview map area M) is represented by the yellow shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

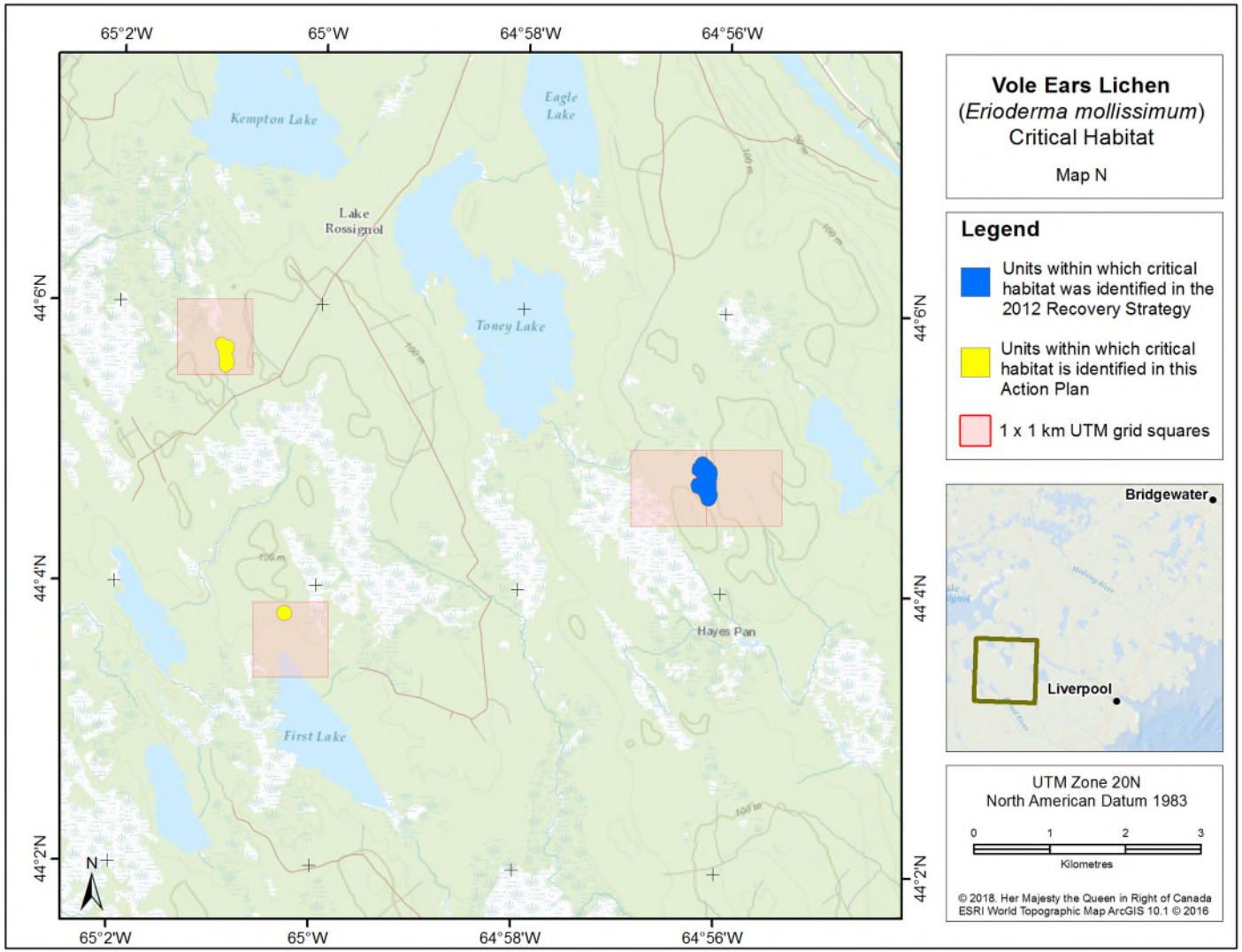

Figure 15. Critical habitat for Vole Ears Lichen in Queens County (see Nova Scotia overview map area N) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

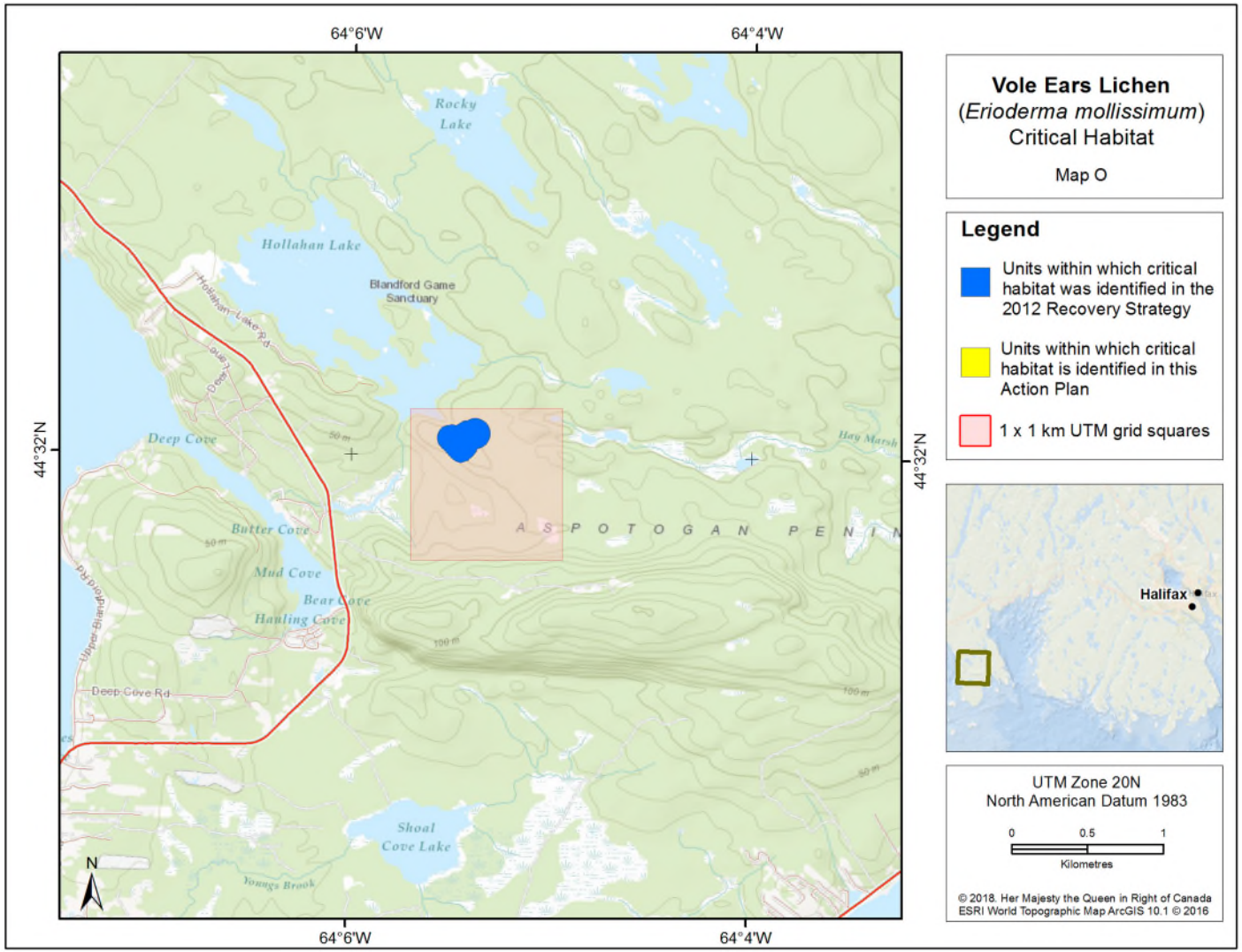

Figure 16. Critical habitat for Vole Ears Lichen in Halifax County (see Nova Scotia overview map area O) is represented by the blue shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

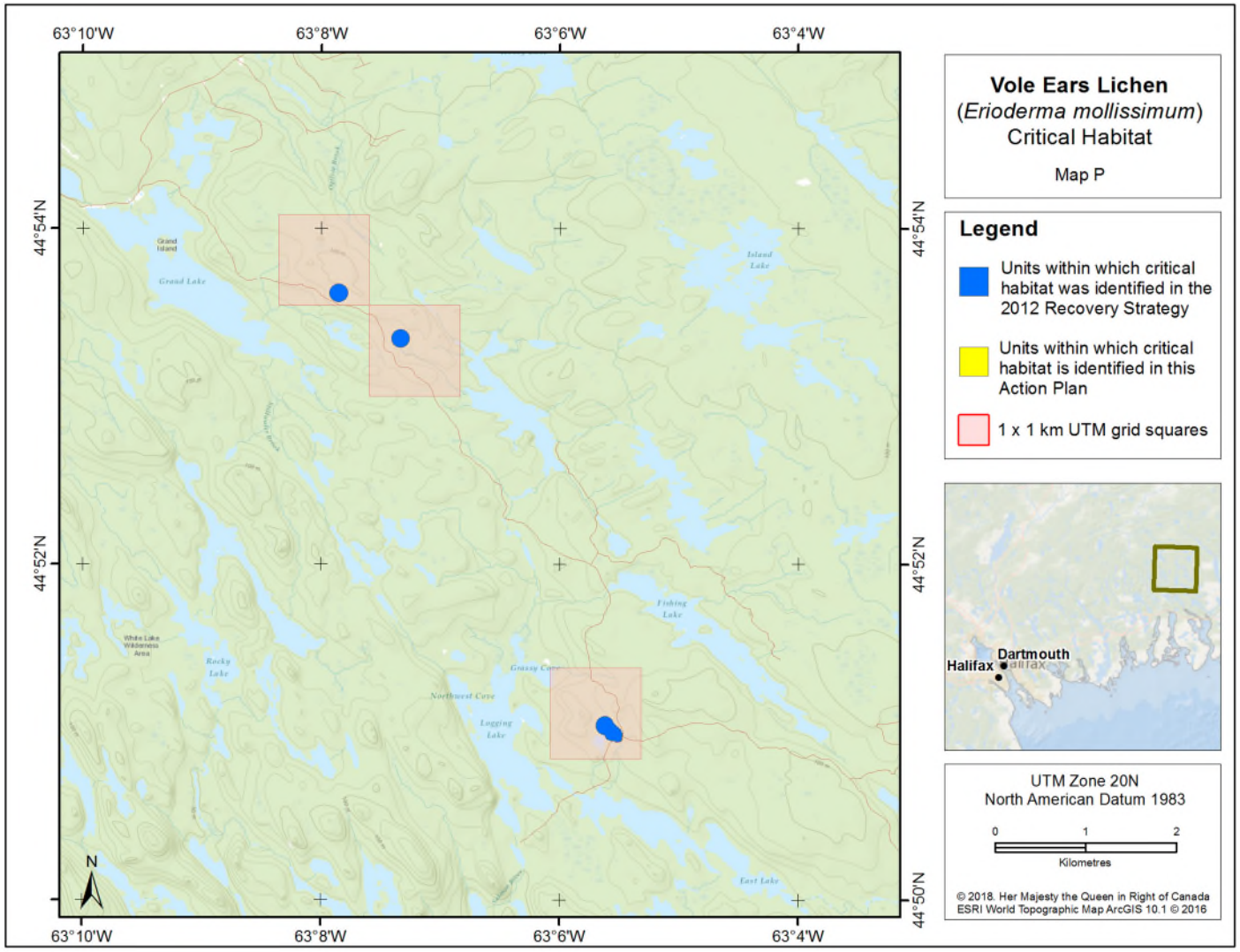

Figure 17. Critical habitat for Vole Ears Lichen in Halifax County (see Nova Scotia overview map area P) is represented by the blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

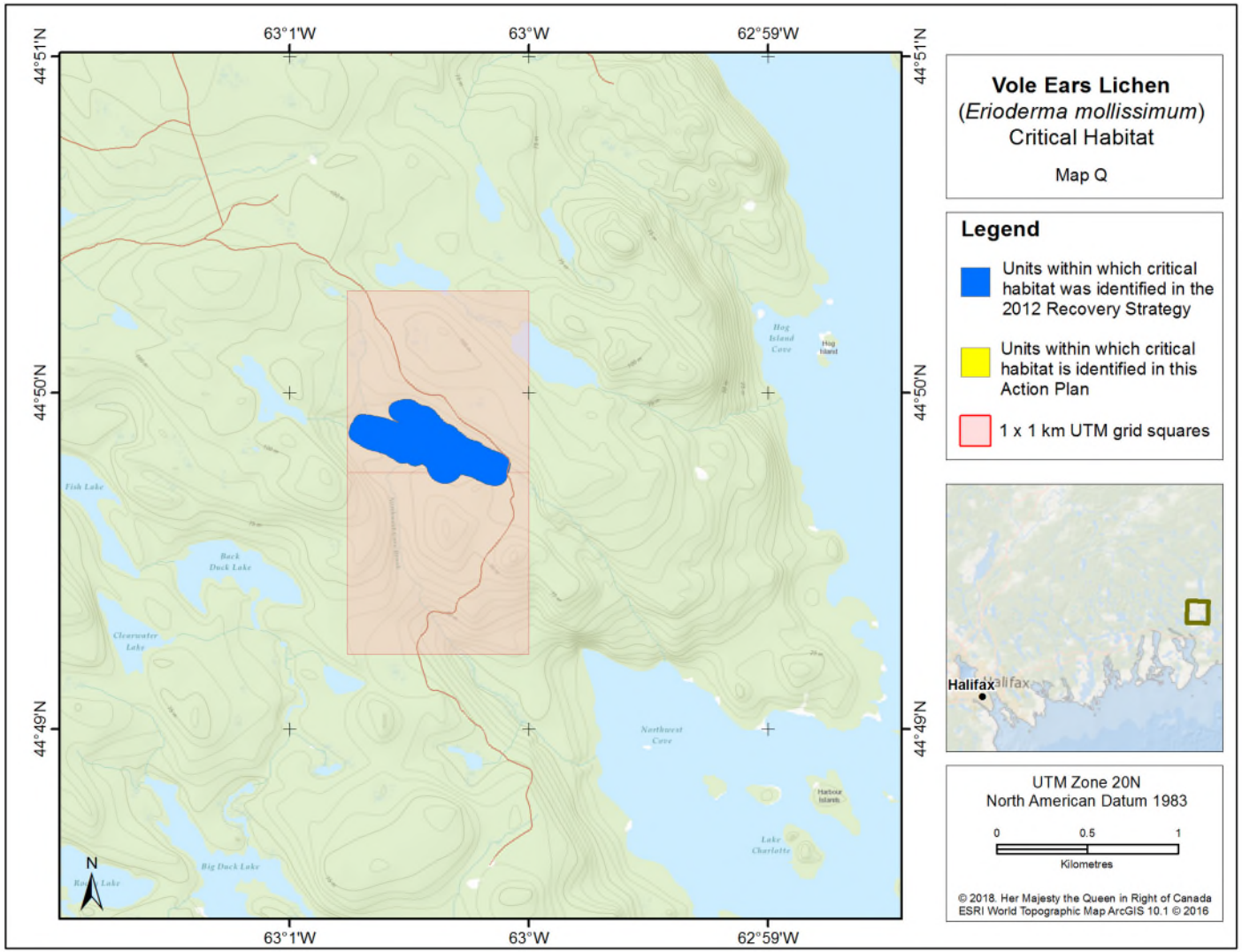

Figure 18. Critical habitat for Vole Ears Lichen in Halifax County (see Nova Scotia overview map area Q) is represented by the blue shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

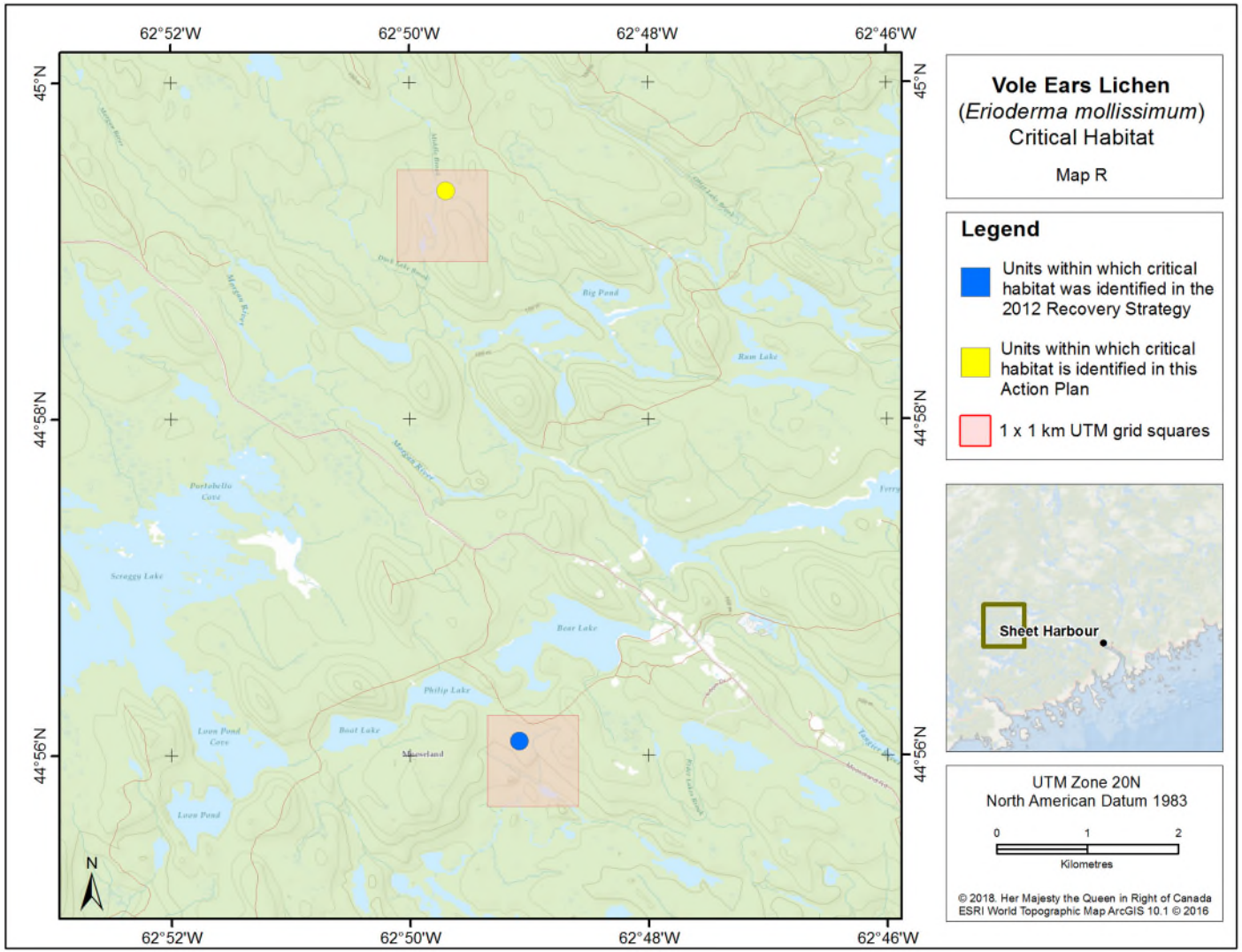

Figure 19. Critical habitat for Vole Ears Lichen in Halifax County (see Nova Scotia overview map area R) is represented by the yellow and blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

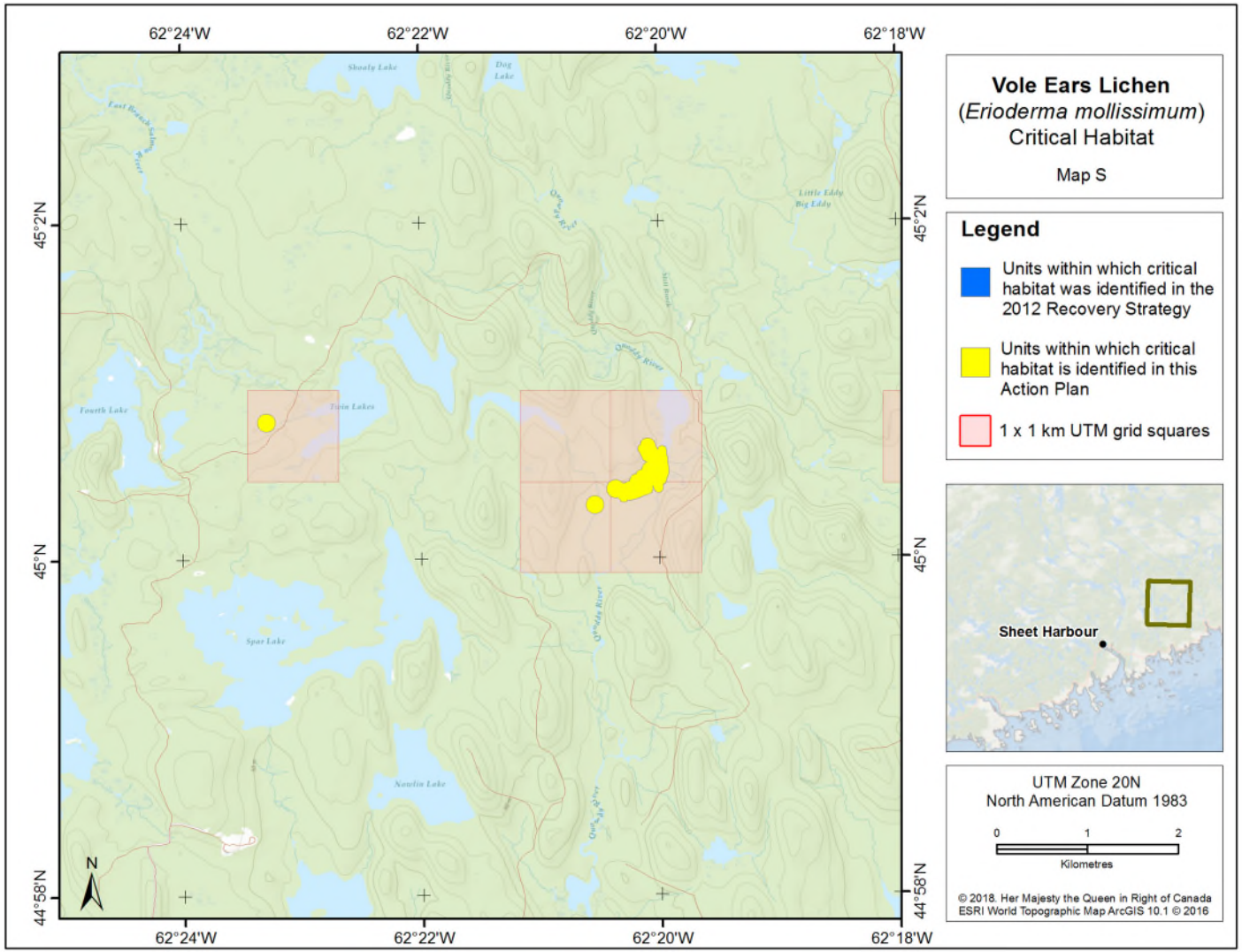

Figure 20. Critical habitat for Vole Ears Lichen in Halifax County (see Nova Scotia overview map area S) is represented by the yellow shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

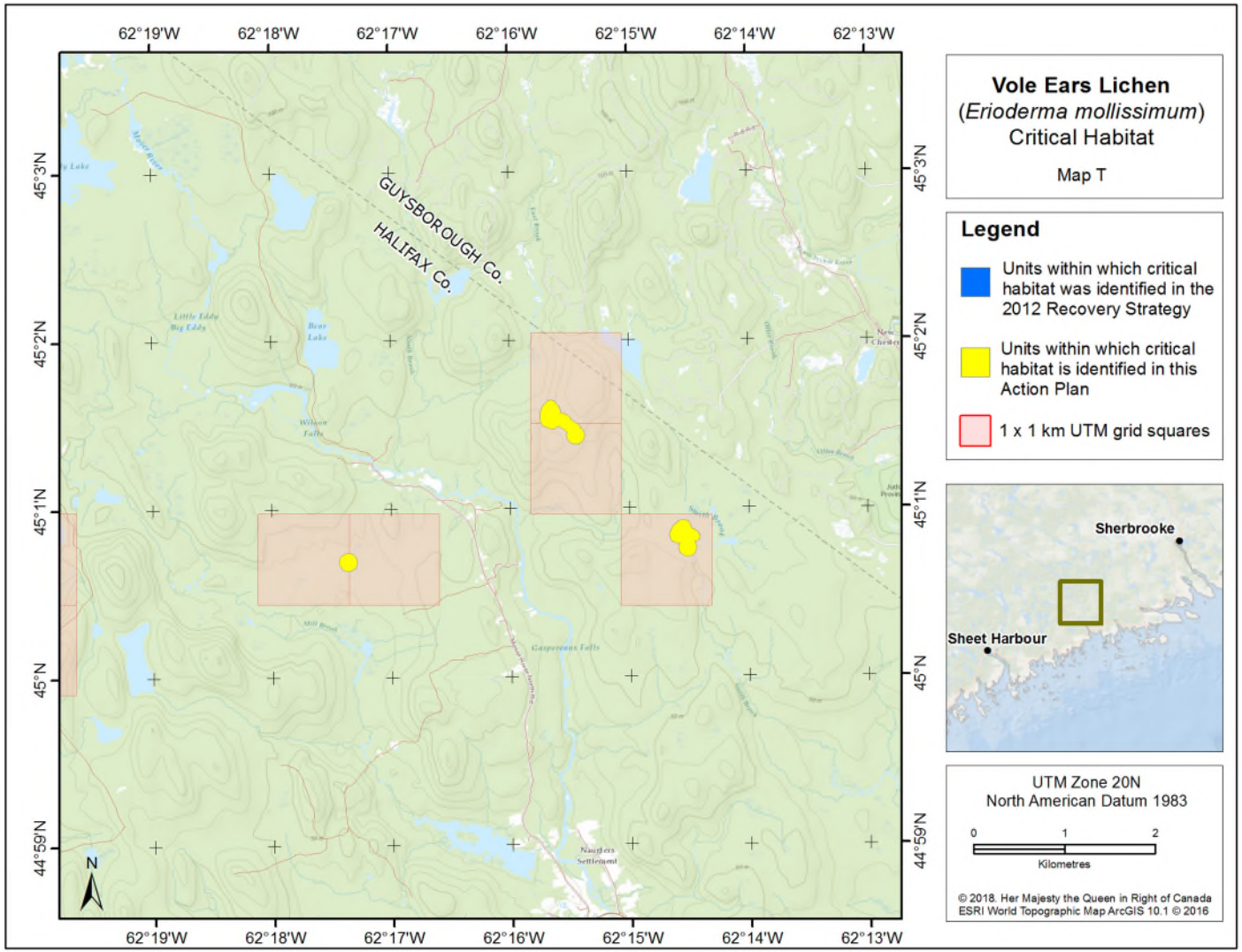

Figure 21. Critical habitat for Vole Ears Lichen in Halifax County (see Nova Scotia overview map area T) is represented by the yellow shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

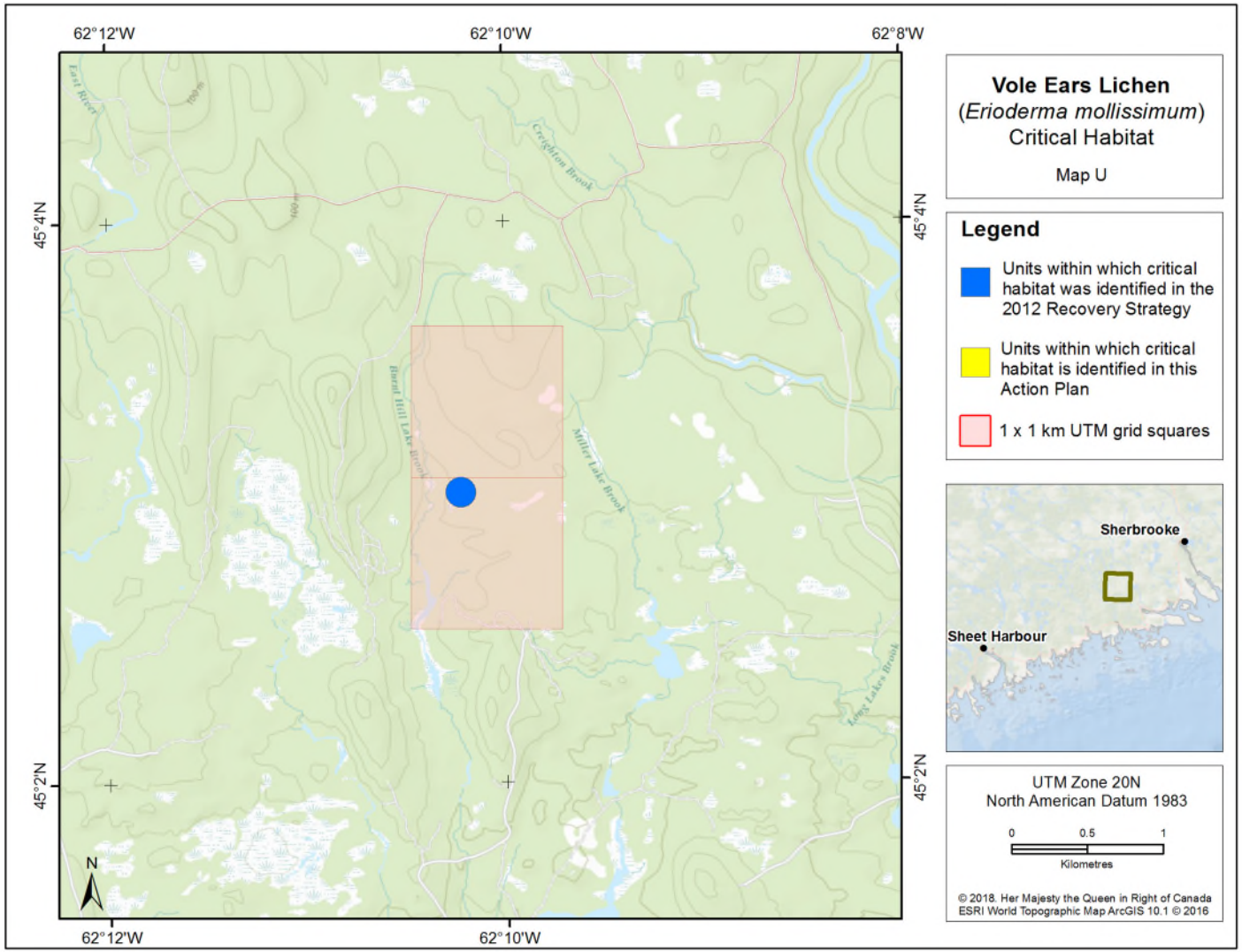

Figure 22. Critical habitat for Vole Ears Lichen in Guysborough County (see Nova Scotia overview map area U) is represented by the blue shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

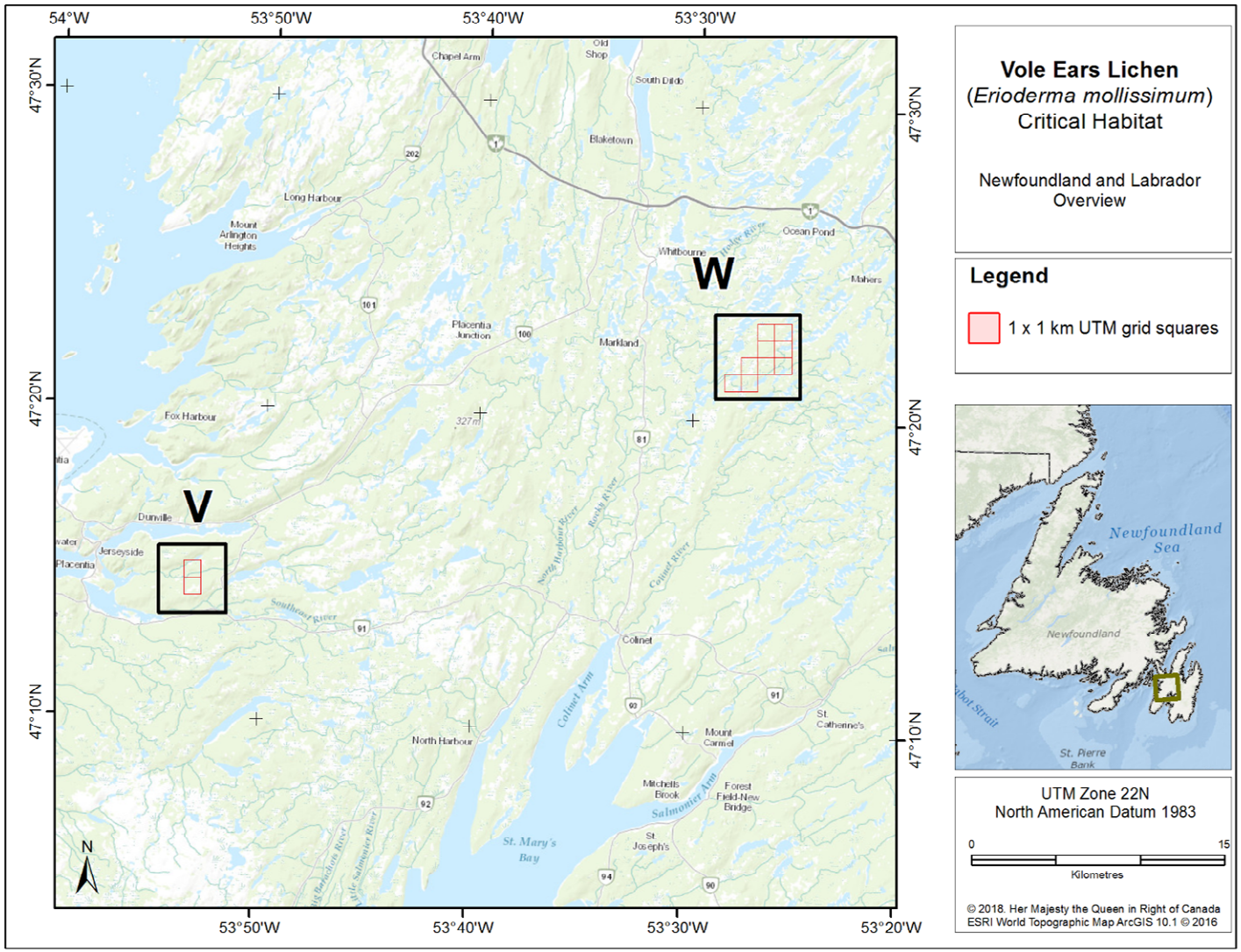

Figure 23. Overview map of critical habitat for Vole Ears Lichen in Newfoundland and Labrador. Refer to Figures 24-25 for detailed representations of critical habitat.

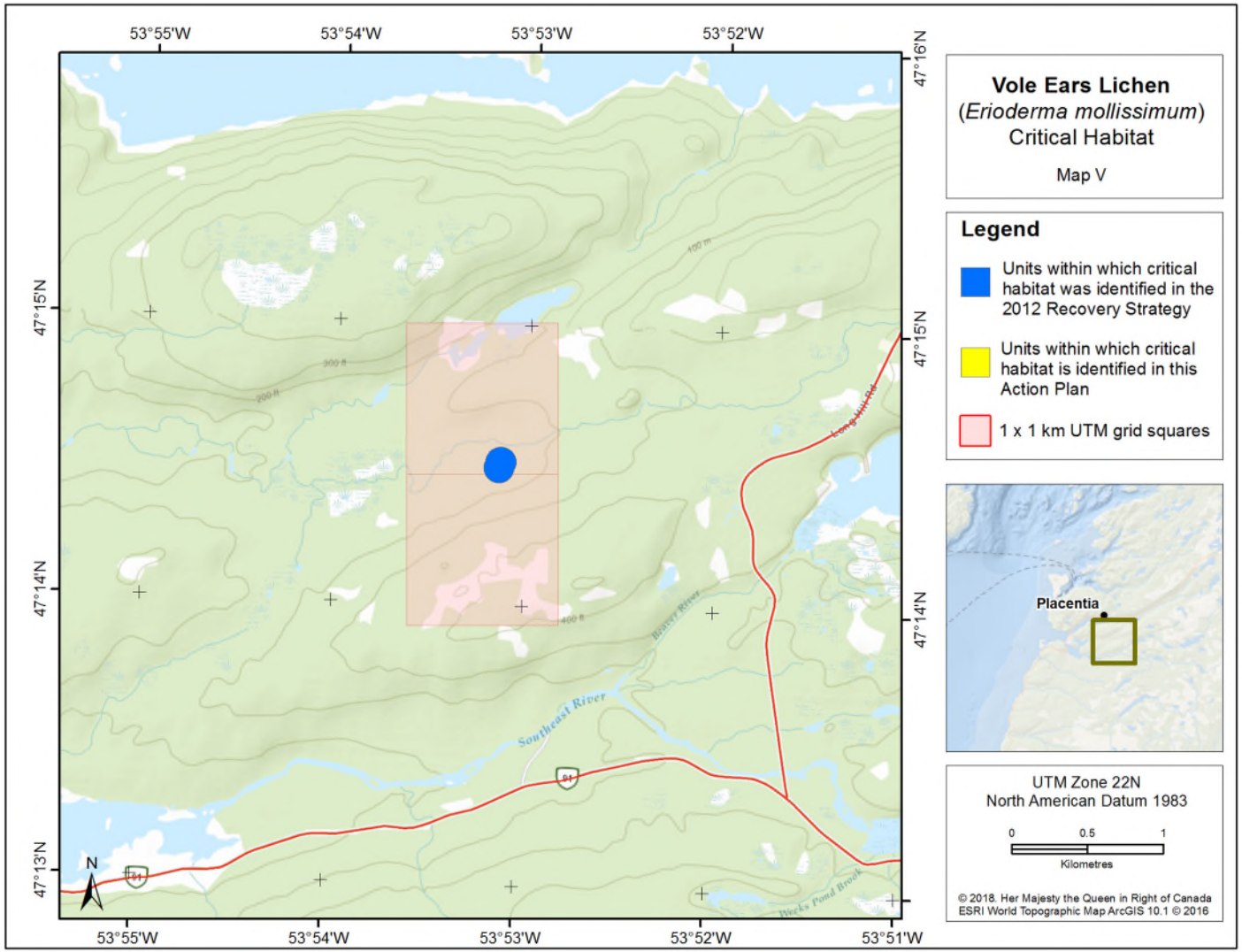

Figure 24. Critical habitat for Vole Ears Lichen on the Avalon Peninsula (see Newfoundland and Labrador overview map area V) is represented by the blue shaded polygon where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygon do not contain critical habitat.

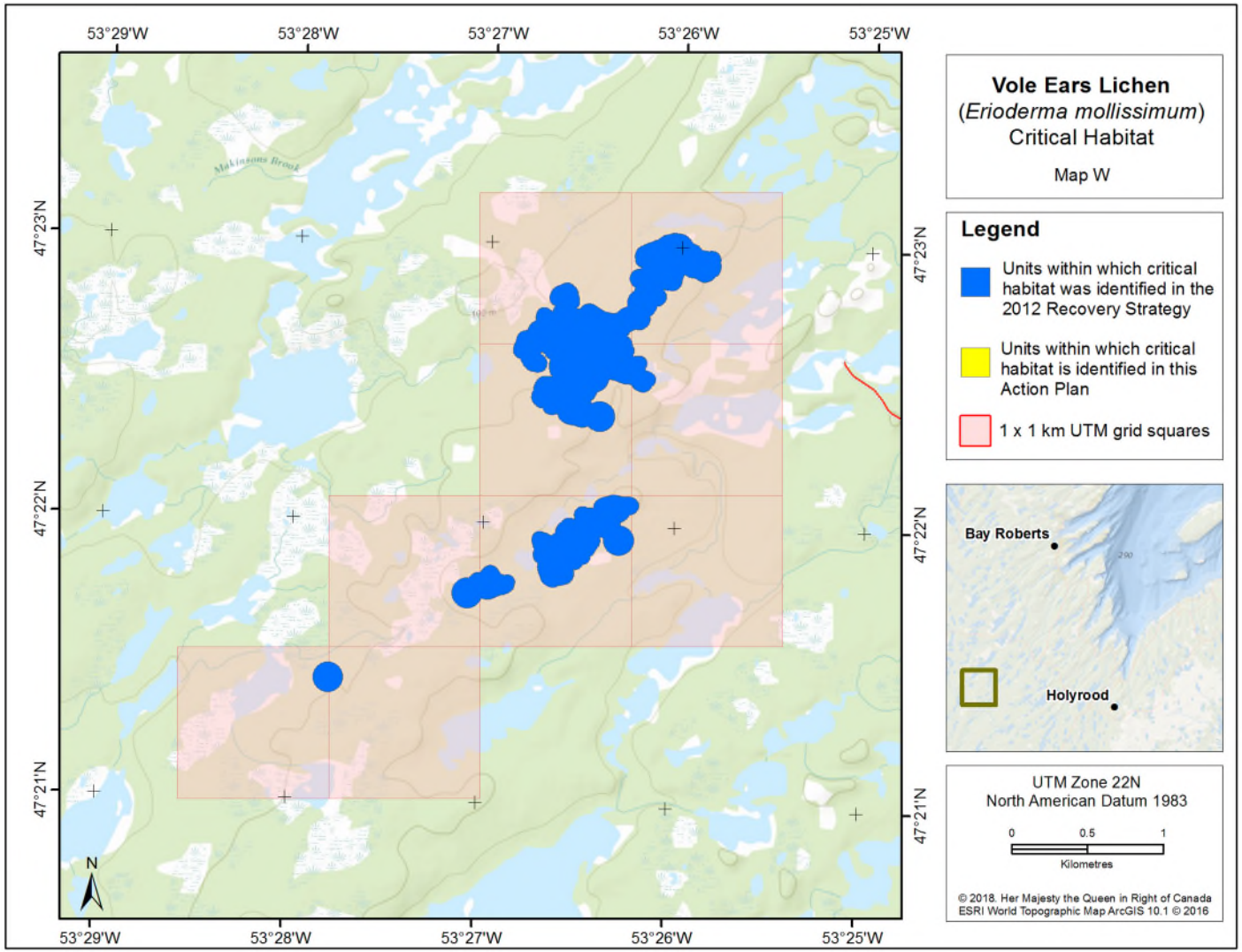

Figure 25. Critical habitat for Vole Ears Lichen on the Avalon Peninsula (see Newfoundland and Labrador overview map area W) is represented by the blue shaded polygons where the criteria and methodology set out in section 7.1 of the recovery strategy are met. The 1 km × 1 km UTM grid overlay shown in this figure is a standardized national grid system that indicates the general geographic area within which critical habitat is found. Areas outside of the shaded polygons do not contain critical habitat.

1.3.2 Examples of activities likely to result in destruction of critical habitat

Examples of activities likely to result in destruction of critical habitat for Vole Ears Lichen may be found in section 7.3 of the recovery strategy for the Vole Ears Lichen.

1.4 Proposed Measures to Protect Critical Habitat

The information below outlines the measures proposed to be taken to protect critical habitat for Boreal Felt Lichen and Vole Ears Lichen.

1.4.1 Measures proposed to protect critical habitat on federal lands

As required under SARA, a description of the portions of critical habitat found in federally protected areas[4] are published in the Canada Gazette Part 1. This critical habitat will then be protected under subsection 58(1) of SARA. Gazette statements are available on the Species at Risk Public Registry. In March 2017, a gazette statement associated with the Multi-species Action Plan for Kejimkujik National Park and National Historic Site of Canada (Parks Canada Agency 2017) describing critical habitat for Vole Ears Lichen in Kejimkujik Seaside was posted on the Species at Risk Registry. This critical habitat was protected under s.58(1) of SARA.

1.4.2 Measures proposed to protect critical habitat on non-federal lands

With regard to the portions of critical habitat on non-federal lands, Environment and Climate Change Canada will assess the protection currently in place. This involves first working with the Governments of Nova Scotia and Newfoundland and Labrador to determine which provincial laws and legal instruments are in place to prevent destruction of critical habitat. If there are gaps in the protection of critical habitat, provisions or measures in place under SARA or other federal legislation will be reviewed to determine whether they prevent destruction of critical habitat. The laws and legal agreements in place that protect critical habitat will be monitored for efficacy at least every five years. Conservation measures, including stewardship initiatives, that contribute to preventing critical habitat destruction will also be considered and monitored.

If it is determined that any portions of critical habitat are not protected, and steps are being taken to protect those portions, those steps will be communicated via the Species at Risk Public Registry through the reports referred to in section 63 of SARA.

[4] 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.

2. Evaluation of Socio-Economic Costs and of Benefits

SARA requires that an action plan include an evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation (SARA 49(1)(e), 2002). This evaluation addresses only the incremental socio-economic costs of implementing this action plan from a national perspective as well as the social and environmental benefits that would occur if the action plan were implemented in its entirety, recognizing that not all aspects of its implementation are under the jurisdiction of the federal government. It does not address cumulative costs of species recovery in general nor does it attempt a cost-benefit analysis. Its intent is to inform the public and to guide decision making on implementation of the action plan by partners.

The protection and recovery of species at risk can result in both benefits and costs. The Act recognizes that "*wildlife, in all its forms, has value in and of itself and is valued by Canadians for aesthetic, cultural, spiritual, recreational, educational, historical, economic, medical, ecological and scientific reasons*" (SARA 2002). Self-sustaining and healthy ecosystems with their various elements in place, including species at risk, contribute positively to the livelihoods and the quality of life of all Canadians. A review of the literature confirms that Canadians value the preservation and conservation of species in and of themselves. Actions taken to preserve a species, such as habitat protection and restoration, are also valued. In addition, the more an action contributes to the recovery of a species, the higher the value the public places on such actions (Loomis and White 1996; DFO 2008). Furthermore, the conservation of species at risk is an important component of the Government of Canada's commitment to conserving biological diversity under the *International Convention on Biological Diversity*. The Government of Canada has also made a commitment to protect and recover species at risk through the Accord for the Protection of Species at Risk. The specific costs and benefits associated with this action plan are described below.

2.1 Policy Baseline

The provinces of Nova Scotia and Newfoundland and Labrador have access to many legislative, regulatory, and management tools for the conservation and stewardship of Boreal Felt Lichen and Vole Ears Lichen. For example,

in Nova Scotia:

- *Endangered Species Act:* requires recovery planning which must identify areas of habitat to be considered for designation as core habitat. Once core habitat has been designated the Minister may create regulations controlling, restricting or prohibiting access to or activities in the habitat.

- *Parks Act:* preserves unique, rare, representative, or otherwise significant elements of the natural environment and historic resources of Nova Scotia and prevents the willful destruction of park property (including trees and other natural

resources). In addition, the Minister may take such measures as the Minister deems necessary to protect flora and fauna within a provincial park.

- *Crown Lands Act*: enables the Minister to set aside special areas on Crown lands for habitat protection and requires the Minister to integrate appropriate protective measures in forest-management planning for Crown lands to respect wildlife habitats.

- *Environment Act*: protects the environment including biological diversity, requires many activities to undergo an approval process that may incorporate consideration of habitat, and requires environmental assessments for designated undertakings. The Minister can reject an undertaking or place conditions on an undertaking including conditions to protect habitat.

- *Forests Act*: maintains or enhances wildlife and wildlife habitats, and water quality. The intent and purpose of this Act is to ensure that wildlife, wildlife habitats, and the long term diversity and stability of the forest ecosystems, water supply watersheds, and other significant resources are maintained or enhanced. In addition, under the *Wildlife Habitat and Watercourse Protection Regulations,* buffers are maintained around the associated wetland.

- *Special Places Protection Act*: preserves ecological sites containing rare or endangered species in their natural habitats, enables designation of land as ecological sites. The Minister may develop a management plan for an ecological site and the Minister may issue ecological research permits.

- *Nova Scotia Wetland Conservation Policy*: prevents the net loss of wetlands in Nova Scotia through wetland conservation practices that integrate the need for wetland protection with the need for sustainable economic development.

- *Wilderness Areas Protection Act*: provides for the establishment, management, protection, and use of wilderness areas; maintains and restores the integrity of natural processes and biodiversity; and protects representative examples of natural landscapes and ecosystems.

- *Special Management Practices*: this policy requires surveys for the presence of endangered lichens (specifically for Boreal Felt Lichen) on all provincial Crown lands where forest harvesting and silviculture operations are proposed in areas with suitable habitat biophysical attributes (as determined by the predictive habitat model (Cameron and Neily 2008) and enacts forested buffers around phorophytes.

in Newfoundland and Labrador:

- *Endangered Species Act*: prohibits the disturbance or destruction of a designated species' residence, provides further protection for 'critical habitat' and 'recovery' habitat.

- *Environmental Protection Act*: protects the environment through regulation. Prohibits certain activities (refer to regulations) unless the appropriate approvals are in place and requires environmental assessments for certain projects involving endangered species and their habitats.

- *Forestry Act*: requires the proponent to submit a management plan that addresses the impacts to wildlife habitat.

- *Lands Act*: allows for the designation of special management areas to protect wildlife habitat.

- *Water Resources Act*: requires permits for development activities in, and affecting, wetlands.

- *Wilderness and Ecological Reserves Act*: provides the Minister with broad authority to prohibit or control activities within protected areas.

2.2 Socio-economic Profile and Baseline

The forestry industry is primarily affected by the protection of these lichen species and their critical habitat. Stakeholders include the Government of Canada, the governments of Nova Scotia and Newfoundland and Labrador, and private landowners.

Many recovery measures are undertaken with the assistance of federal or provincial species at risk funding programs, in-kind contributions by recovery biologists, or research by universities.

2.3 Socio-economic Costs of Implementing this Action Plan

Implementation of the recovery measures identified in Table 1 may generate direct costs as well as societal costs. These costs are reported in this section only if they result in incremental expenditures or constraints in land uses (including foregoing or modifying current and future activities; e.g., forest harvesting activities) compared to measures already in place (see ongoing measures in Table 1).

A special management practice is already in place on crown lands in Nova Scotia for Boreal Felt Lichen which places restrictions on forestry activities in the vicinity of the species' critical habitat.

For Boreal Felt Lichen and Vole Ears Lichen, the direct and societal costs are expected to be low (i.e., between $0 and $5 million) over the short term (five years). Costs at the regional or provincial scale are expected to be minimal and include salary, volunteer time, travel, materials, equipment, and other related costs. Indirect costs are those resulting from implementing the action plan, which may have an impact on various stakeholders. Impacts to stakeholders include foregoing or modifying current and future activities.

Costs would only be incurred locally as the species occupy a limited geographic area in Nova Scotia and Newfoundland and Labrador. Costs at the regional or provincial scale are expected to be minimal.

2.4 Benefits of Implementing this Action Plan

Nearly half (46%) of respondents to the 2012 Canadian Nature Survey (Federal, Provincial, and Territorial Governments of Canada 2014) reported taking some form of direct action to assist in the recovery of species at risk. Care for the environment is consistently ranked as one of Canada's top priorities in public opinion polls (Environment Canada 2009). A recent opinion poll found that three quarters of Canadian respondents feel that preserving natural areas and the variety of native plant and animal life in Canada is important to them (Ipsos Reid Opinion Poll 2011).

Wetlands are designated by international convention (The Ramsar Convention) specifically to foster conservation because they provide a myriad of essential ecosystem services and fresh water. Among others, wetlands filter sediments and toxins, serve as groundwater recharge areas, supply food and habitat for wildlife and humans, and provide areas for outdoor recreational activities such as bird watching, fishing, and hunting.

Forest ecosystems provide a number of goods and services such as: provisional goods (e.g., fishing, hunting and gathering forest plants, fresh water), regulating services (e.g., air quality maintenance, climate and atmospheric regulation, water regulation and supply, water purification, pollination, erosion control and sediment retention), cultural services (e.g., recreation and ecotourism, aesthetic cultural heritage) and supporting services (e.g., soil formation, nutrient cycling, habitat refugium, primary production).

Cyanolichens such as the Boreal Felt Lichen and Vole Ears Lichen contribute to forest ecosystem services through nutrient cycling including converting biologically inactive nitrogen gas into forms usable for other plant species. Cameron and Richardson (2006) show that cyanolichens can contribute significant amounts of nitrogen to ecosystems. Cyanolichens give humans the ability to detect fluctuations in local air quality due to the lichen's sensitivity to pollution. This makes cyanolichens valuable indicators of environmental and ecosystem health. Given that Nova Scotia receives air pollution from industrialized areas of the eastern United States and central and eastern Canada, Nova Scotia lichens can provide an early warning system for the ecosystem effects of pollutants (Cameron 2004).

By focusing on increasing protection measures, as well as improved public outreach, education and stewardship, it is expected that the recovery approaches outlined in the action plan will benefit the larger ecological community as well. Achieving the goal of this action plan will have a positive impact for Canadians.

2.5 Distributional Impacts

Although Boreal Felt Lichen and Vole Ears Lichen both occur on private properties, landowners are not expected to bear the brunt of the responsibility for the species' recovery. Non-governmental organizations are active in Nova Scotia and Newfoundland and Labrador where the species occur, and an approach of this action plan is to foster cooperative relationships with landowners and others to maintain critical habitat.

Indirect incremental costs resulting from the impacts of implementing some recovery measures may be absorbed by the forestry industry through increased operating costs.

3. Measuring Progress

The performance indicators presented in the associated recovery strategies provide a way to define and measure progress toward achieving the population and distribution objectives.

Reporting on *implementation* of the action plan (under s. 55 of SARA) will be done by assessing progress towards implementing the broad strategies.

Reporting on the ecological and socio-economic impacts of the action plan (under s. 55 of SARA) will be done by assessing the results of monitoring the recovery of the species and its long term viability, and by assessing the implementation of the action plan.

4. References

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Species at Risk Act (SARA) (S.C. 2002, c. 29)
http://laws-lois.justice.gc.ca/eng/acts/s-15.3/FullText.html

Appendix A: 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*[5]. 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's[6] (FSDS) goals and targets.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that implementation of action plans 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 action plan itself, but are also summarized below in this statement.

This action plan will clearly benefit the environment by promoting the recovery of the Boreal Felt Lichen and Vole Ears Lichen. The potential for the plan to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this plan will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to relevant sections in the recovery strategies (e.g., effects on other species; and the recommended approaches for recovery).

The effects on other species were also considered. Boreal Felt Lichen and Vole Ears Lichen are part of a suite of rare cyanolichens, all of which occur in similar habitats within the humid Atlantic forest region of Nova Scotia and Newfoundland and Labrador. In fact, the habitat suitability mapping algorithm for Boreal Felt Lichen in Nova Scotia is much more effective at identifying habitats that support one or more of these species (approx. 50% accuracy) than it is at identifying habitat that supports Boreal Felt Lichen (approx. 7% accuracy). Survey work directed towards locating new Boreal Felt Lichen and Vole Ears Lichen sites has produced many new records for members of this larger group of species (Cameron and Neily 2008). Furthermore, since all of these species share similar habitat requirements, actions directed towards better understanding ecosystem-level associations and securing habitat for Boreal Felt Lichen and Vole Ears Lichen will almost certainly result in the protection of populations of other rare cyanolichens, such as Blue Felt Lichen *(Pectania plumbea* (special concern) Frosted Glass-whiskers (*Sclerophora peronella*) (special concern) and other rare cyanolichens not yet assessed by COSEWIC. At a regional level, any progress in reducing air pollution will benefit not only Boreal Felt Lichen and Vole Ears Lichen, but most (if not

[5] www.canada.ca/en/environmental-assessment-agency/programs/strategic-environmental-assessment/cabinet-directive-environmental-assessment-policy-plan-program-proposals.html
[6] www.fsds-sfdd.ca/index.html#/en/goals/

all) of the flora and fauna of New Brunswick, Nova Scotia, and Newfoundland and Labrador as well.

Appendix B: Identification of the Species' Critical Habitat

*This section is reproduced in its entirety from the Recovery Strategy for the Vole Ears Lichen (*Erioderma mollissimum*) in Canada – 2014*

Vole Ears Lichen habitat characteristics

The existing Vole Ears Lichen sites share the following habitat characteristics:

In northeastern North America, Vole Ears Lichen is found within 30 km of the coast where winters are warm (mean temperature −4.5 °C) and summers are cool (mean temperature of 16.4 °C). Over 80 % of the precipitation in these sites falls as rain and fog frequency is high. Vole Ears Lichen is limited to elevations of less than 200 m in Atlantic Canada and occurs at sites with high precipitation, often exceeding 1400 mm (COSEWIC 2009[7], Davis and Browne 1996[8]).

All trees on which Vole Ears Lichen has been found have been mature or old. Stand tree ages average 65 years in Nova Scotia and 73 years in Newfoundland and Labrador. Dead trees are found at all occurrences and make up as much as 50% of the forest composition in several stands.

Cinnamon Fern *(Osmunda cinnamomea)* dominates the herb layer at all occurrences and *Sphagnum* species are present at all occurrences with a total ground cover of 70% or more at each location. Other species of moss are present in smaller amounts (5 to 15% of the ground cover). In Newfoundland, Vole Ears Lichen is frequently found growing alongside or on liverworts, particularly *Frullania* species and Bryophyte ground cover is high at all sites (dominated by *Hylocomium, Pleurozium, Sphagnum, Rhytidiadelphus, Ptilium,* and *Bazzania).*

The Nova Scotia and Newfoundland Vole Ears Lichen habitats are highly humid coastal forests. Host trees are almost always located in, or within 80 m of, a wetland or peatland (COSEWIC 2009). In other respects the habitats are different. In Newfoundland, Vole Ears Lichen is found in mature to overmature coniferous forest patches dominated by Balsam Fir of even ages with characteristically varying tree diameters. These patches occur on flat to gently sloping, imperfectly- to poorly-drained sites in close proximity to wetlands as part of a fragmented landscape which include coniferous stands in different age classes. In Nova Scotia, Vole Ears Lichen habitat is typically in poorly drained depressions with mature coniferous or mixed forests dominated by Balsam Fir and/or Red Maple.

[7] COSEWIC. 2009. COSEWIC assessment and status report on the Vole Ears *Erioderma mollissimum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 51 pp.
[8] Davis, D.S. and S. Browne. 1996. Natural History of Nova Scotia. Nimbus Publishing and Nova Scotia Museum, Halifax.

Vole Ears Lichen is found on a variety of substrata. In Newfoundland and Labrador it has been found only on Balsam Fir, while in Nova Scotia it occurs on Balsam Fir as well as Red Maple and Yellow Birch. In New Brunswick one historical record was from a moss–covered rock.

One of the most important habitat requirements for cyanolichens is the presence of precipitation free of acidifying contaminants. Nutrient enrichment from the upper branches of nearby hardwoods may counter the low buffering capacity of coniferous bark in areas with highly acidic precipitation, thus allowing the lichen to survive (Richardson and Cameron 2004[9]). As a result, there may be a critical threshold for the proportion of Red Maple needed for an area to support Vole Ears Lichen in Nova Scotia. This requires further study.

Critical habitat description

Critical habitat for Vole Ears Lichen is identified as the substrata (at present only known from trees), the wetland (which is defined as land that either periodically or permanently has a water table at, near, or above the land's surface and includes marsh, swamp, fen, bogs, and other shallow open water areas) in which the substrata occurs, or is adjacent to, and a critical function zone. The critical function zone is believed to be necessary to maintain microhabitat characteristics, especially moisture attributes, required for the survival of the lichen and to allow for colonization. The critical function zone is identified as 100 m around the lichen and its substratum and an area around the wetland in which it occurs, or is adjacent to, dependent on wetland size as follows: for wetlands smaller than 100 m^2, a critical function zone of 100 m radius surrounding the wetland is identified and for wetlands greater than 100 m^2, a critical function zone of 50 m surrounding the wetland is identified.

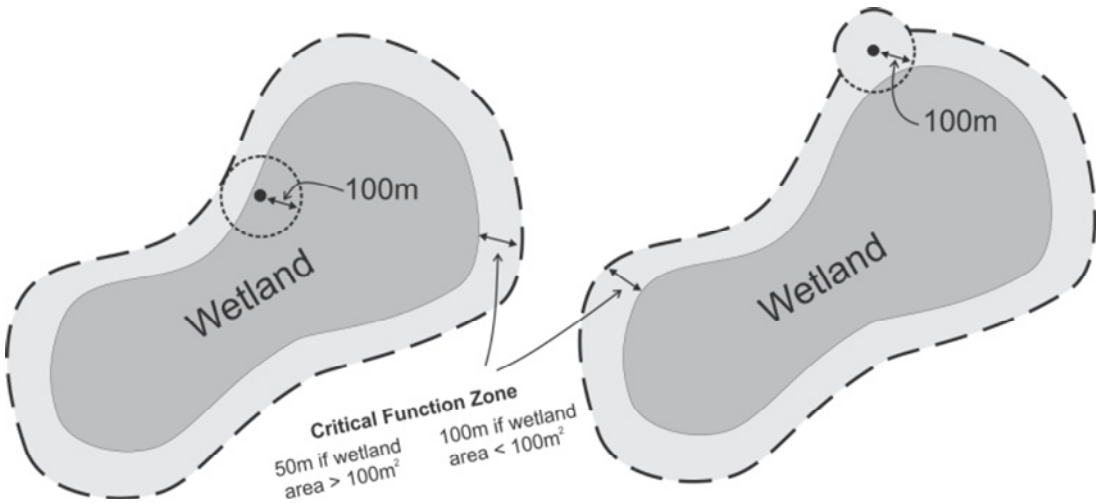

Figure B1. Examples of critical habitat; all areas within the dashed line are included as critical habitat.

[9] Richardson, D.H.S. and Cameron, R.P. 2004. Cyanolichens: their response to pollution and possible management strategies for their conservation in Northeastern North America. Northeastern Naturalist 11: 1-22.