

SURVEY OF EPIPHYTIC LICHENS OF LATE SUCCESSIONAL NORTHERN HARDWOODS FORESTS

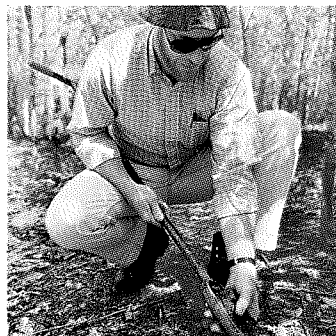
in Northern Cape Breton Island

Steven B. Selva,
M. Paul Edberg and
Matthew Selva

Report 8

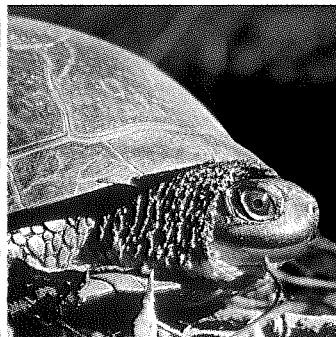
**Parks Canada
Ecosystem Monitoring
and Data Reports**

Maintaining
Ecological Integrity
of our Parks



**Parcs Canada
Rapports de surveillance
et de données relatives
aux écosystèmes**

Maintenir
l'intégrité écologique
de nos parcs



Atlantic Region, Parks Canada is producing three report series in ecosystem science. They are intended to communicate new scientific information, document scientific data, summarize existing knowledge, or offer technical recommendations. The primary function and the intended audience of a report determine the series in which it will be published. Each report series contains scientific and technical information that contributes to existing knowledge but is not in a form suitable for the primary journal literature.

- ***Parks Canada-Technical Reports in Ecosystem Science*** promote a wide distribution of scientific and technical information from Parks Canada's ecosystem investigations. The subject matter, and the series reflect the broad interest and policies of Parks Canada in ecosystem science. This series includes such work as, ecosystem and resource inventories, studies, surveys of species or guilds, and innovative management concepts.
- ***Parks Canada - Ecosystem Science Review Reports*** provides a forum for literature reviews, bibliographies, and reviews of management options that are often prepared for or by Parks Canada. Resource Descriptions and Analyses or chapters thereof will be published in this series.
- ***Parks Canada - Ecosystem Monitoring and Data Reports*** provide a medium for filing and achieving data compilations where little or no analysis is included. Such compilations commonly are prepared in support of primary publications or Technical Reports in Ecosystem Science. Raw data not available in a national data base and considered worth archiving is published as a Parks Canada - Ecosystem Monitoring and Data Report.

Ecosystem Science Reports are printed in the official language chosen by the author to meet the language preference of the likely audience, with an abstract in the second official language.

Objectives

Our objectives for these report series are;

- To communicate the results of ecosystem science research to the scientific and management communities, and to the public interested in Parks Canada environmental and conservation activities;
- To provide credible, accurate, and professional publications through a peer review process,
- To encourage creativity, effectiveness, and teamwork in conducting research and in providing information through publications.

Peer Review

The editor appoints two referees to critically review each manuscript. Referees are found, if possible, from scientific staff within Parks Canada. Due to areas of expertise, available time, and to avoid the potential of 'inbreeding' external reviewers will often be sought. Referees review the manuscript and return it to the editor with their written comments. The editor then returns the paper to the author(s) with the referee's comments. The author(s) consider(s) the referees' comments and incorporates those that they accept, into the report. The author(s) return(s) the revised manuscript to the editor and/or provides a written rationale for any exclusions of the referees' comments considered unacceptable. The editor then sends the revised manuscript to the Chief Park Warden or for the case of Regional Office staff to the author(s) direct supervisor for approval to publish and printing. At the editor's discretion, the appointment of referees may be dispensed with, if the publication is minor in nature. In such instances, the editor and the author's direct supervisor would assume the roles of the referees. In the unlikely event that an author and editor are in disagreement over a manuscript, the matter will be refereed to a Senior Departmental Manager for adjudication.

Directives for Authors

These series are intended for the publication of work in ecosystem science that is conducted in the Atlantic Region. They are available for use by any Parks Canada or Department of Canadian Heritage staff or others working in collaboration with, or on a contract to, the Department of Canadian Heritage.

The author(s) submits one paper copy of the completed draft of their paper and a digital version on a diskette in WordPerfect Windows or DOS format to the regional editor along with three suggested referees. Suggested referees should not have been previously involved with the manuscript.

Detailed instructions to authors can be obtained from:

Neil Munro
Report Series Editor
Parks Canada
Historic Properties
Halifax, Nova Scotia
B3J 1S9
(902) 426-2797
(FAX) 426-2728

Parks Canada - Monitoring and Data Reports
in Ecosystem Science

Report 8

Survey of Epiphytic Lichens of Late Successional Northern Hardwoods Forests in Northern Cape Breton Island

Principal Investigator:

Steven B. Selva, PhD

Professor of Biology & Environmental Studies

University of Maine at Fort Kent

23 University Drive

Fort Kent, Maine 04743 U.S.A.

Accompanied by field assistants:

M. Paul Edberg and Matthew Selva

Prepared for:

Cape Breton Highlands National Park and Parks Canada

Ingonish Beach, Nova Scotia B0C 1L0

January 1, 1999

National Library of Canada cataloguing in publication data

Selva, Steven B.

Survey of epiphytic lichens of late successional northern hardwoods forests in
Northern Cape Breton Island

(Parks Canada – Ecosystems monitoring and data reports,
ISSN 1200-331X ; no. 8)

Includes an abstract in French.

Includes bibliographical references.

ISBN 0-662-34467-7

Catalogue No. R61-2/20-8-2003E

1. Epiphytic lichens – Nova Scotia – Cape Breton Highlands National Park.
 - I. Edberg, M. Paul.
 - II. Selva, Matthew.
 - III. Parks Canada. Atlantic Region.
 - IV. Title.
 - v. Series: Ecosystem monitoring and data reports ; 8.

QK584.E64S44 2003

579.7

C2003-980218-3

Published by authority of the Minister of Canadian Heritage

© Her Majesty the Queen in Right of Canada, represented by the Chief Executive
Officer of Parks Canada, 2004

Contents

Abstract ...	IV
Acknowledgments ...	IV
Introduction and Previous Work ...	1
The Study Area ...	2
Methods ...	3
Results ...	4
Summary of Data and Assessment of Ecological Continuity ...	16
Discussion and Conclusions ...	19
Literature Cited ...	21
Appendices	
Appendix 1	Epiphytic lichens that appear to be faithful to ancient northern hardwoods Forest conditions ...
	22
Appendix 2	List of species, by substrate, recorded at Grande Anse ...
	23
Appendix 3	List of species, by substrate, recorded at Sugarloaf Mountain ...
	28
Appendix 4	List of species, by substrate, recorded at North River ...
	33
Appendix 5	List of species, by substrate, recorded at Corney Brook ...
	38
Appendix 6	List of species, by substrate, recorded at Margaree River ...
	43
Appendix 7	Ranking of these and previously investigated stands according to decreasing Index of Ecological Continuity values ...
	48
Appendix 8	Complete list of the lichens of Cape Breton Island ...
	49

Abstract

One hundred and seventy-five lichens, with comments on substrate preferences and rarity, are recorded in floristic surveys of five northern hardwood stands in the Greater Highlands Ecosystem of Cape Breton Island. At least five of these species, *Chaenotheca sphaerocephala*, *Chaenothecopsis brevipes*, *Phaeocalicium betulinum*, *Phaeocalicium matthewsianum*, and *Stenocybe flexuosa*, are new records for Canada and help raise the known total for the Island to 331. An index of ecological continuity (IEC) based on the percentage occurrence of ancient forest indicator lichen species has been used to assess the continuity of the stands at Grande Anse (IEC = 70), Sugarloaf Mountain (IEC = 100), North River (IEC = 130), Corney Brook (IEC = 20), and Margaree River (IEC = 115). Given that the presence of 20 indicator species (i.e., IEC = 100) indicates a very high probability that the site is an ancient one, the stands at North River, Sugarloaf Mountain and Margaree River are considered ancient. Air pollution is suspected of contributing to the decline of the Grande Anse Natural Area and Corney Brook is confirmed as a secondary forest.

Résumé

Les relevés floristiques de cinq peuplements de bois-francs nordiques de l'écosystème des hautes terres de l'île du Cap-Breton font état de 175 espèces de lichen, y compris des commentaires sur leurs préférences en matière de substrat et leur rareté. Au moins cinq de ces espèces, soit *Chaenotheca sphaerocephala*, *Chaenothecopsis brevipes*, *Phaeocalicium betulinum*, *Phaeocalicium matthewsianum* et *Stenocybe flexuosa*, n'avaient pas encore été signalées au Canada, ce qui porte le nombre total connu pour l'île à 331. Un indice de continuité écologique (ICE) reposant sur l'occurrence en pourcentage d'espèces de lichen indicatrices de forêt ancienne a servi à évaluer la continuité des peuplements de Grande Anse (ICE = 70), du mont Sugarloaf (ICE = 100), de la rivière North (ICE = 130), du ruisseau Corney (ICE = 20) et de la rivière Margaree (ICE = 115). La probabilité est très élevée, d'après la présence de 20 espèces indicatrices (ICE = 100), que les peuplements de la rivière North, du mont Sugarloaf et de la rivière Margaree sont des forêts anciennes. La pollution de l'air contribue probablement au déclin de l'aire naturelle de Grande Anse et le peuplement du ruisseau Corney est confirmé comme étant une forêt secondaire.

Acknowledgments

The author wishes to thank Dr. James Bridgland, Park Ecologist at Cape Breton Highlands National Park, for his generous support, encouragement and hospitality throughout this research project, Art Lynds of the Nova Scotia Department of Natural Resources for his generous and much appreciated work "behind the scenes" providing us with maps, places to stay, and other logistical support, and to my two hard-working field assistants,

M. Paul Edberg and Matthew Selva. Both Paul and Matt did an excellent job searching the nooks and crannies of our study sites for those oft-times elusive indicator species, Paul for the sixth or so year of this sort of thing, Matt for the first time. Finally, I'd like to thank my wife Marcy, who helped buy the groceries, clean the clothes, and keep the home fires burning while we were off gallivanting in the woods.

Introduction and Previous Work

As part of an ongoing effort to assess the ecological continuity of forests in northern New England and Maritime Canada, five northern hardwoods stands in the Greater Highlands Ecosystem of Cape Breton Island were investigated during the summer of 1998. Patterned after a study by Francis Rose (1974, 1976) in Britain, the continuity of 18 northern hardwoods and 15 spruce-fir sites have previously been assessed using indices of ecological continuity that are based upon the percentage occurrence of ancient forest indicator lichen species found at each site (Appendix 1; Selva 1994, 1996). These studies have shown that, not only do epiphytic lichen floras become richer over time—with older stands harboring more rare species, but that the total number and presence of particular calicioid lichens and fungi collected at a site is, itself, an indicator of continuity. As perhaps our most sensitive biomonitors of forest ecosystem health, the calicioid lichens and fungi remain one of the forest's most elusive and poorly known inhabitants: At only 1-2 mm tall, they are frequently overlooked, hence underreported. According to Tibell (1980), these species are “very sensitive to changes in forest climate, and most species indeed seem to depend on the occurrence of mature forests containing trees of different ages and a varied light and humidity regime”. Like Tibell (1980), who noted that, because of clearcutting, the majority of calicioid species “have already been exterminated over vast areas of Scandinavia and are now found only in forest reserves and national parks”, I, too, have recorded similar declines in northern New England and Maritime Canada where many of the rarer taxa are restricted to old-growth and ancient forest sites (e.g., Selva 1988, 1994, 1996). Interestingly, of the 20 lichen index species selected by Tibell (1992) for an Indicator Species Index of Forest Continuity designed for the boreal forests from southern Sweden to Lapland, 10 are calicioid.

While the most ubiquitous lichen species tend to become established early on in forest succession, some species are found only at sites that have contained mature trees for many centuries. By then the forest, as a result of increasing structural heterogeneity, has presumably acquired a full complement of potential microsites suitable for colonization by lichen propagules originating from old-growth forests elsewhere. By concentrating on those taxa that appear to be almost (or entirely) “faithful” to ancient woodland sites, Indices of Ecological Continuity (IEC) have been constructed and used to assess the relative age of a particular stand:

$$IEC = N / 20 \times 100,$$

in which N is the number of ancient forest indicator species present at a site. Because these indicators are not all widespread throughout the region—hence unlikely to occur all together at a site, the presence of 20 indicators ($IEC = 100$) is considered indicative of the very high probability that the site is an ancient one*. The higher the IEC value, the more ancient the site, and vice versa.

*The term “ancient” is used here to describe those old old-growth forests which represent a fourth category of forest succession following pioneer, seral, and young old-growth forests.

The lichen flora of Cape Breton Island was last studied by I. Mackenzie Lamb in the summer of 1952 (Lamb 1954). Drawing heavily on the “excellent collection of lichens made by John Macoun in 1883 and 1898”, and others, the number of species known from the island increased to 199. The only other reports dealing with the lichens of Cape Breton Island are unpublished studies by Scotter (1966), who surveyed species that might serve as a potential food source for reintroduced caribou, and Selva (1998), who conducted a survey of calicioid lichens and fungi. Missing from all of these studies is an analysis of what lichen species

may be rare and demand special management consideration. These concerns will be addressed in the current investigation which represents the first phase of an effort to re-survey the lichen flora of Cape Breton Highlands National Park and the Greater Highlands Ecosystem as well promote the value of old growth forests to the ecology of the region.

The Study Area

Among the twenty issues of highest priority identified by Bridgland (1996) in his Management Guidelines for Cape Breton Highlands National Park was the "promotion of the value of old-growth forests to the ecology of the greater ecosystem" and the "continued development of the forest succession model". Towards that end, and in keeping with another stated goal identified in that same report--namely that "an accurate and complete list of the lichen species growing in the park and the greater ecosystem" be prepared, the following northern hardwoods stands in the Greater Highlands Ecosystem of Cape Breton Island have been investigated:

Grande Anse Natural Area

Recognized as one of the premier mature old-growth stands on the island, this 1619 ha site was described by Lynds and LeDuc (1995) as "a spectacular virgin old-growth deciduous forest". It is located within Cape Breton Highlands National Park along the canyons of the Grande Anse River Valley south of the historic site and Nature Loop Trail at Lone Shieling.

July 26, 1998, Collection Numbers 7434-7458
 July 27, 1998, Collection Numbers 7459-7524
 July 28, 1998, Collection Numbers 7525-7574

Sugarloaf Mountain Protected Area

This 792 ha climax deciduous forest, one of seven protected areas identified in the Greater Highlands Ecosystem by the Nova Scotia Department of Natural Resources, is described by Lynds and LeDuc (1995) as an immature old growth stand. The survey was conducted at the northeastern end of the mountain above the East Big Intervale Road.

July 29, 1998, Collection Numbers 7575-7614
 July 30, 1998, Collection Numbers 7615-7668

North River Protected Area

Another of the protected areas identified in the Greater Highlands Ecosystem by the Nova Scotia Department of Natural Resources, this 1778 ha stand is characterized as a mature old-growth forest by Lynds and LeDuc (1995). The survey was conducted along the forested slopes above the east branch of the North River, located west of the Falls hiking trail, between kilometers 5 and 6, at North River Provincial Park.

July 31, 1998, Collection Numbers 7669-7752

Corney Brook Natural Area

This second growth red oak-dominated stand was surveyed along the southwest-facing slope above Corney Brook, Cape Breton Highlands National Park.

August 17, 1998, Collection Numbers 7753-7815

Margaree River Protected Area

Characterized by Lynds and LeDuc (1995) as an immature old-growth forest, this 6131 ha stand is another of the seven protected areas identified in the Greater Highlands Ecosystem by the Nova Scotia Department of Natural Resources. It was surveyed in its southwestern section, along the north-facing slopes above First Brook Pool.

August 19, 1998, Collection Numbers 7816-7879

Methods

Since many of the potential indicator species are rare even at ancient forest sites, every attempt was made to create as complete an inventory of each site as possible. The Relevé Analysis for Classification approach to sampling (Mueller-Dombois and Ellenberg 1974), a form of "intelligent meander", was employed in an effort to allow the highest sampling intensity and reduce the likelihood of missing localized areas of high species diversity. Numerous replicates increase the probability that potential indicator species--many of which are not visible with the naked eye, let alone identifiable in the field--would be captured.

Each of the stands under investigation were visited once or twice*, depending on its size, by me and one or two field assistants. We spent no fewer than eight hours per visit collecting specimens from the diversity of substrate types present. Epiphytes growing on both bark and wood were collected from standing as well as fallen trees, whether intact or at some stage of decomposition. Specimens on standing trees were collected from as high on the trunk as could be reached, downward to the soil, and from accessible branches. All surfaces and edges of substrate fragments were examined in the lab, where specimens were identified using standard techniques and following nomenclature according to Esslinger (1998).

Once species lists were assembled, the continuity of each of the stands under investigation were assessed using an index of ecological continuity based on the presence of the northern hardwoods ancient forest indicator species identified in Appendix 1. Only those indicators found on angiosperms are used in the calculation of IEC values, making such values readily comparable among the northern hardwoods stands being assessed.

The following tree species abbreviations have been used throughout the text and in the construction of many of the appendices:

A	<i>Acer</i> sp.
AB	<i>Abies balsamea</i>
AP	<i>Acer pensylvanicum</i>
AR	<i>Acer rubrum</i>
AS	<i>Acer saccharum</i>
Asp	<i>Acer spicatum</i>
B	<i>Betula</i> sp.
BA	<i>Betula alleghaniensis</i>
BC	<i>Betula cordifolia</i>
BP	<i>Betula papyrifera</i>
FA	<i>Fraxinus americana</i>
FG	<i>Fagus grandifolia</i>
P	<i>Picea</i> sp.
PB	<i>Populus balsamifera</i>
PG	<i>Picea glauca</i>
PP	<i>Prunus pensylvanicum</i>
PS	<i>Pinus strobus</i>
PT	<i>Populus tremuloides</i>
QR	<i>Quercus rubra</i>
SA	<i>Sorbus americana</i>
TC	<i>Tsuga canadensis</i>
UA	<i>Ulmus americana</i>
US	Unidentifiable species

*One full day and two half days were spent collecting specimens at Grande Anse

Results

A total of 175 species of lichens were recorded in floristic surveys of the northern hardwoods stands at Grande Anse, Sugarloaf Mountain, North River, Corney Brook, and Margaree River. A list of these species, with comments on substrate preferences and rarity, is presented below, followed by a summary of the data and assessment of the ecological continuity of each site.

Acrocordia cavata

Collected at each of the sites under investigation, it has been found on AS, AR, BA, QR, and FA. A new record for Cape Breton Island.

Not common

Amandinea punctata

Collected at each of the stands under investigation, it has been found on AS, AR, AP, Asp, A, BA, BP, FG, QR, FA, PP, PT, AB, and PG. Originally reported by Lamb (1954).

Very common.

Anisomeridium nyssigenum

Collected at Sugarloaf Mountain, North River, Corney Brook, and Margaree River, it has been found on AS, AR, BA, FA, and PB. A new record for Cape Breton Island. **Not common.**

Arthonia byssacea

Collected at North River where it was found on AS and BA. A new record for Cape Breton Island. **Rare.**

Arthonia didyma

Collected at Sugarloaf Mountain and North River. A new record for Cape Breton Island. **Rare.**

Arthonia diffusella

Collected at Grande Anse, North River and Margaree River, it has been found on AS and BA. A new record for Cape Breton Island.

Not common.

Arthonia radiata

Collected at Grande Anse and Sugarloaf Mountain, it has been found on AP and FG.

A new record for Cape Breton Island.

Not common.

Bacidia laurocerasi

Collected at Sugarloaf Mountain and Corney Brook, it has been found on AS and AR. A new record for Cape Breton Island. **Not common.**

Bacidia rosella

Collected at Grande Anse where it was found on UA. A new record for Cape Breton Island. **Rare.**

Bacidia rubella

Collected at Margaree River where it was found on AR. A new record for Cape Breton Island.

Rare.

Bacidia sabuletorum

Collected at Grande Anse and Margaree River, it has been found on AS, UA, and PB. Originally reported by Lamb (1954). **Not common.**

Biatora helvola

Collected at each of the sites under investigation, it has been found on AS, AR, Asp, BA, BC, QR, PP, PT, AB, PG, TC, and US. **Very common.**

Biatora vernalis

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, FG, FA, PT, P, and AB. Originally reported by Lamb (1954).

Common.

Bryoria fuscescens

Collected at Sugarloaf Mountain where it was found on AB. A new record for Cape Breton Island. Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Bryoria nadvornikiana

Collected at North River where it was found on AB and PS. A new record for Cape Breton Island. Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Bryoria trichodes

Collected at North River and Margaree River, it has been found on AB and PS. Originally reported by Scotter (1966), as *Bryoria trichodes* subsp. *americana*. Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Buellia disciformis

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, QR, FA, FG, PT, and AB. Originally reported by Lamb (1954). **Very common.**

Calicium abietinum

Collected at North River where it was found on BA. A new record for Cape Breton Island. **Not common.**

Calicium glaucellum

Collected at Grande Anse, Sugarloaf Mountain, North River and Margaree River, it has been found on BA, B, PS, and US. A new record for Cape Breton Island. **Common.**

Calicium lenticulare

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA, B, PS, and US. A new record for Cape Breton Island. **Common.**

Calicium salicinum

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA, FA, and US. A new record for Cape Breton Island. **Common.**

Calicium viride

Collected at North River and Margaree River, it has been found on AS and BA. A new record for Cape Breton Island. **Not common.**

Caloplaca cerina

Collected at Grande Anse where it was found on FG. A new record for Cape Breton Island. **Not common.**

Caloplaca discolor

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, FG, QR, UA, FA, and PB. A new record for Cape Breton Island. **Common.**

Caloplaca flavorubescens

Collected at Grande Anse where it was found on UA. Originally reported by Lamb (1954). **Not common.**

Candelariella efflorescens

Collected at Grande Anse where it was found on FG. A new record for Cape Breton Island. **Not common,** although in New England it is very common on hardwoods.

Catillaria nigroclavata

Collected at Grande Anse, North River, and Margaree River, it has been found on AR, BA, AB, P, and US. A new record for Cape Breton Island. **Common.**

Catinaria atropurpurea

Collected at North River and Corney Brook, it has been found on AS and FA. A new record for Cape Breton Island. **Not common.**

Cetrelia olivetorum

Collected at North River and Margaree River, it has been found on AS, AR, and BA. A new record for Cape Breton Island. **Not common.**

Chaenotheca brachypoda

Collected at Sugarloaf Mountain where it was found on BA. A new record for Cape Breton Island. **Rare.**

Chaenotheca brunneola

Collected at Grande Anse, Sugarloaf Mountain, North River and Margaree River, it has been found on BA, B, AB (over polypores at Grande Anse), and US. A new record for Cape Breton Island. **Common.**

Chaenotheca chlorella

Collected at North River and Margaree River, it has been found on BA and US. A new record for Cape Breton Island. **Rare.**

Chaenotheca chrysocephala

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on BA, PS, TC, and US. A new record for Cape Breton Island. **Not common.**

Chaenotheca ferruginea

Collected at North River where it was found on TC. A new record for Cape Breton Island. **Not common.**

Chaenotheca furfuracea

Collected at Grande Anse, Sugarloaf Mountain, and North River, it has been found on AR, BA, and PS. It was Saxicolous (on rock) at Grande Anse. A new record for Cape Breton Island. **Common.**

Chaenotheca gracillima

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on BA and AB. A new record for Cape Breton Island. **Not common.**

Chaenotheca hispidula

Collected at North River where it was found on AS. A new record for Cape Breton Island. **Rare.**

Chaenotheca sphaerocephala

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA and US. A new record for Cape Breton Island. **Not common.**

Chaenotheca stemonea

Collected at Sugarloaf Mountain, North River and Margaree River, it has been found on BA. A new record for Cape Breton Island. **Not common.**

Chaenotheca trichialis

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA and B. A new record for Cape Breton Island. **Common.**

Chaenotheca xyloxena

Collected at North River where it was found on US. A new record for Cape Breton Island. **Rare.**

Chaenothecopsis brevipes

Collected at North River where it was found on AS. A new record for Cape Breton Island. **Very rare.**

Chaenothecopsis debilis

Collected at Sugarloaf Mountain, Corney Brook, and Margaree River, it has been found on AR, BA, and QR. A new record for Cape Breton Island. **Common.**

Chaenothecopsis pusilla

Collected at Sugarloaf Mountain where it was found on US. A new record for Cape Breton Island. Very common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Chaenothecopsis pusiola

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA and US. A new record for Cape Breton Island. **Common.**

Chaenothecopsis rubescens

Collected at North River where it was found on AS and BA. A new record for Cape Breton Island. **Rare.**

Chaenothecopsis savonica

Collected at Margaree River where it was found on BA. A new record for Cape Breton Island. **Not common.**

Chaenothecopsis viridireagens

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA and B. A new record for Cape Breton Island. **Not common.**

Cladina rangiferina

Collected at Grande Anse where it was found on BA. Originally reported by Lamb (1954). **Common** throughout the region, though typically terricolous (on soil).

Cladonia caespiticia

Collected at North River and Margaree River, it has been found on AR and BA. Originally reported by Lamb (1954). **Not common.**

Cladonia cenotea

Collected at Margaree River where it was found on BA and US. Originally reported by Lamb (1954). **Not common.**

Cladonia chlorophaea group

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, AR, AP, FA, and PP. Originally reported by Lamb (1954). **Common.**

Cladonia coniocraea

Collected at each of the sites under investigation, it has been found on AS, AR, BA, BP, FG, AB, PS, and US. Originally reported by Lamb (1954). **Very common.**

Cladonia furcata

Collected at Grande Anse and Corney Brook, it has been found on AS, BP, and AB. Originally reported by Lamb (1954). **Not common.**

Cladonia pyxidata

Collected at each of the sites under investigation, it has been found on AS, AR, BA, BP, QR, PB, FG, FA, and AB. Originally reported by Lamb (1954). **Common.**

Cladonia scabriuscula

Collected at Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, BP, and FG. Originally reported by Lamb (1954). **Not common.**

Cladonia squamosa

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AR, BA, AB, and US. Originally reported by Lamb (1954). **Common.**

Collema furfuraceum

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, UA, FG, FA, and PT. A new record for Cape Breton Island. **Common.**

Conotrema urceolatum

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AS, AR, AP, BA, and FG. Originally reported by Lamb (1954). **Common.**

Dendriscoaulon umhausense

Collected at Grande Anse where it was collected on AS. A new record for Cape Breton Island. **Very Rare.**

Dimerella lutea

Collected at Grande Anse and North River, it has been found on AR and QR. A new record for Cape Breton Island. **Rare.**

Dimerella pineti

Collected at Sugarloaf Mountain and Margaree River, it has been found on AR and BA. A new record for Cape Breton Island. **Rare.**

Graphis scripta

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, BP, BC, FG, QR, FA, PT, AB, and US. Originally reported by Lamb (1954). **Very common.**

Hypogymnia physodes

Collected at each of the sites under investigation, it has been found on AR, AP, Asp, A, BA, BP, BC, B, AB, P, PS, TC, and US. Originally reported by Lamb (1954). **Very common.**

Hypogymnia tubulosa

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on BA, BC, AB, P, and US. Originally reported by Scotter (1966). **Not common.**

Hypogymnia vittata

Collected at North River and Margaree River, it has been found on BA and AB. A new record for Cape Breton Island. **Not common.**

Imshaugia aleurites

Collected at Sugarloaf Mountain and Corney Brook, it has been found on PP and AB. A new record for Cape Breton Island. Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Jullela fallaciosa

Collected at Grande Anse, Sugarloaf Mountain, and Corney Brook, it has been found on AS, AP, and FA. A new record for Cape Breton Island. **Not common.**

Lecanactis abietina

Collected at Margaree River where it was found on BA. A new record for Cape Breton Island. **Not common.**

Lecanora caesiorubella

Collected at each of the sites under investigation, it has been found on AS, AR, AP, A, BA, FG, QR, FA, and AB. A new record for Cape Breton Island. **Common.**

Lecanora subfusca group

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, FG, QR, PB, FA, PP, PT, and AB. Originally reported by Lamb (1954). **Very common.**

Lecanora symmicta

Collected at Grande Anse, Sugarloaf Mountain, and Corney Brook, it has been found on AS, AR, BA, BP, B, PP, PT, AB, and PG. Originally reported by Lamb (1954). **Common.**

Lecanora thysanophora

Collected at North River and Margaree River, it has been found on AS, AR, BA, and FG. A new record for Cape Breton Island. **Common.**

Lecidea albofuscescens

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AR, AP, BA, and AB. Originally reported by Lamb (1954). **Common.**

Lepraria spp.

Collected at each of the sites under investigation, it has been found on AS, AR, BA, BP, FG, QR, UA, FA, P, TC, and US. Originally reported by Lamb (1954). **Very common.**

Leptogium cyanescens

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, FG, QR, UA, FA, PB, and PT. Originally reported by Lamb (1954). **Very common.**

Leptogium laceroides

Collected at North River where it was found on AS. A new record for Cape Breton Island. **Rare.**

Leptogium saturninum

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on BA, FG, and UA. Originally reported by Scotter (1966). **Not common.**

Lithothelium macrosporum

Collected at Sugarloaf Mountain where it was found on FG. A new record for Cape Breton Island. **Not common.**

Lobaria pulmonaria

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, FG, QR, UA, FA, and PB. Originally reported by Lamb (1954). **Common.**

Lobaria quercizans

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, FG, QR, UA, FA, and PB. Originally reported by Lamb (1954). **Common.**

Lobaria scrobiculata

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AS, AR, AP, BA, FG, and UA. Originally reported by Lamb (1954). **Not common.**

Lopadium disciforme

Collected at each of the sites under investigation, it has been found on AS, AR, BA, BP, AB, P, PG, and PS. A new record for Cape Breton Island. **Common.**

Loxospora cismonica

Collected at North River, Corney Brook, and Margaree River, it has been found on AB. A new record for Cape Breton Island. Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Loxospora elatina

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AS, BA, AB, PG, and P. A new record for Cape Breton Island. **Not common.**

Loxospora ochrophaea

Collected at North River and Margaree River, it has been found on AR, AB, PS, and P. Originally reported by Lamb (1954). Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Megalania grossa

Collected at Grande Anse and Margaree River, it has been found on AS, AR, and UA. Originally reported by Lamb (1954). **Rare.**

Megalania laureri

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, AR, AP, and FG. Originally reported by Lamb (1954). **Not common.**

Melanelia subaurifera

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, BP, FG, QR, PP, PT, UA, FA, SA, AB, and PG. Originally reported by Lamb (1954).

Very common.

Menegazzia terebrata

Collected at North River where it was found on AR and BA. A new record for Cape Breton Island. **Not common.**

Micarea globulosella

Collected at Sugarloaf Mountain where it was found on AB. A new record for Cape Breton Island. Typically found on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Micarea melaena

Collected at North River where it was found on PS. A new record for Cape Breton Island. Typically found on gymnosperms throughout New England, the data on this species in Maritime Canada is incomplete.

Micarea peliocarpa

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, BP, PB, and US. A new record for Cape Breton Island. **Common.**

Micarea prasina

Collected at Margaree River where it was found on BA. A new record for Cape Breton Island. **Not common.**

Mycocalicium subtile

Collected at each of the sites under investigation, it has been found on AR, BA, QR, FA, AB, P, and US. A new record for Cape Breton Island. **Very common.**

Nephroma bellum

Collected at Margaree River where it was found on AR. Originally reported by Lamb (1954). **Not common.**

Nephroma helveticum

Collected at Sugarloaf Mountain and North River, it has been found on AR and BA. A new record for Cape Breton Island. **Not common.**

Nephroma laevigatum

Collected at Grande Anse, North River, and Corney Brook, it has been found on AS, AR, UA, and FA. Originally reported by Lamb (1954). **Not common.**

Nephroma parile

Collected at Corney Brook where it was found on QR and PT. Originally reported by Lamb (1954). **Not common.**

Normandina pulchella

Collected at Grande Anse and North River, it has been found on AS and BA. A new record for Cape Breton Island. **Very rare.**

Ochrolechia androgyna

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, BP, QR, FA, PP, PT, AB, P, PS, TC, and US. Originally reported by Lamb (1954). **Very common.**

Ochrolechia mexicana

Collected at North River and Corney Brook, it has been found on AP, A, QR, FA, and PT. A new record for Cape Breton Island. **Not common.**

Ochrolechia pseudopallescens

Collected at Corney Brook where it was found on FA. A new record for Cape Breton Island. **Not common**, though it is very common on gymnosperms throughout New England.

Ochrolechia trochophora

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, FG, QR, FA, PT, and PB. **Common.**

Opegrapha niveoatra

Collected at Margaree River where it was found on BA. A new record for Cape Breton Island. **Not common.**

Opegrapha ochrocheila

Collected at Grande Anse, North River, and Margaree River, it has been found on AS and AR. A new record for Cape Breton Island. **Rare.**

Opegrapha varia

Collected at Grande Anse, North River, and Margaree River, it has been found on AS, AR, BA, FG, and UA. A new record for Cape Breton Island. **Not common.**

Pannaria pezizoides

Collected at Sugarloaf Mountain where it was found on AS. Originally reported by Lamb (1954). **Rare.**

Pannaria rubiginosa

Collected at North River and Margaree River, it has been found on AS and PB. A new record for Cape Breton Island. **Not common.**

Parmelia saxatilis

Collected at Corney Brook where it was found on PP. Originally reported by Lamb (1954). **Not common.**

Parmelia squarrosa

Collected at Grande Anse, Sugarloaf, North River, and Margaree River, it has been found on AS, AR, AP, Asp, A, BA, BC, FG, QR, UA, FA, PB, AB, P, PS, and US. A new record for Cape Breton Island. **Very common.**

Parmelia sulcata

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, A, BA, BP, FG, QR, PB, PP, PT, UA, FA, AB, PG, P, TC, and US. Originally reported by Lamb (1954). **Very common.**

Parmeliella triptophylla

Collected at each of the sites under investigation, it has been found on AS, AR, FG, FA, PT, and PB. A new record for Cape Breton Island. **Common.**

Parmeliopsis ambigua

Collected at Sugarloaf Mountain where it was found on AB. Originally reported by Lamb (1954). Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Parmeliopsis hyperopta

Collected at Corney Brook where it was found on PP. Originally reported by Lamb (1954). Not common, though very common on gymnosperms throughout New England.

Peltigera canina

Collected at Grande Anse, North River, and Margaree River, it has been found on AS and AR. Originally reported by Lamb (1954). **Not common.**

Peltigera collina

Collected at North River where it was found on AR. A new record for Cape Breton Island. **Very rare.**

Peltigera degenii

Collected at Grande Anse and Sugarloaf Mountain, it has been found on AS and AR. A new record for Cape Breton Island. **Not common.**

Peltigera elisabethae

Collected at Grande Anse where it was found on AS. A new record for Cape Breton Island.
Not common.

Peltigera evansiana

Collected at Grande Anse, Sugarloaf Mountain and North River, it has been found on AS and FG. A new record for Cape Breton Island.
Not common.

Peltigera leucophlebia

Collected at North River where it was found on AR. Originally reported by Lamb (1954).
Not common.

Peltigera polydactyla

Collected at North River where it was found on AS, AB, and P. Originally reported by Lamb (1954). **Not common.**

Peltigera praetextata

Collected at Sugarloaf Mountain and Margaree River, it has been found on FG and PB. A new record for Cape Breton Island. **Not common.**

Pertusaria alpina

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, AR, AP, BA, FG, UA, QR, FA, and PT. Originally reported by Lamb (1954).
Not common.

Pertusaria amara

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, BP, FG, QR, FA, PB, AB, P, PG, and US. Originally reported by Lamb (1954). **Very common.**

Pertusaria consocians

Collected at Grande Anse, Sugarloaf Mountain, and Corney Brook, it has been found on AS, AR, AP, BA, QR, UA, PB, and AB. A new record for Cape Breton Island. **Common.**

Pertusaria macounii

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, BA, BP, FG, QR, FA, PT, and AB. Originally reported by Lamb (1954). **Very common.**

Pertusaria multipunctoides

Collected at Grande Anse and Margaree River, it has been found on BA. A new record for Cape Breton Island. **Not common.**

Pertusaria ophthalmiza

Collected at Sugarloaf Mountain, North River, Corney Brook, and Margaree River, it has been found on AR, BA, BC, PP, AB, and P. A new record for Cape Breton Island. **Common.**

Pertusaria rubefacta

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, AR, AP, BA, FG, QR, FA, and PT. Originally reported by Lamb (1954). **Common.**

Pertusaria trachythallina

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AR, AP, A, BA, BP, QR, FG, FA, PP, PT, SA, and AB. A new record for Cape Breton Island. **Common.**

Pertusaria velata

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, BP, FG, QR, FA, PT, and PB. Originally reported by Lamb (1954). **Common.**

Pertusaria waghornei

Collected at Grande Anse, Sugarloaf Mountain, and North River, it has been found on AS, AR, AP, BA, and FG. A new record for Cape Breton Island. **Rare.**

Phaeocalicium betulinum

Collected at North River where it was found on BA. A new record for Cape Breton Island. **Not common.**

Phaeocalicium matthewsianum

Collected at Sugarloaf Mountain and Margaree River, it has been found on BA and BC. A new record for Cape Breton Island. **Not common.**

Phaeocalicium polyporaeum

Collected at Sugarloaf Mountain where it was found, over polypores, on AR, BA, and FG. A new record for Cape Breton Island. **Not common.**

Phaeophyscia pusilloides

Collected at Grande Anse and Corney Brook, it has been found on AS, FG, UA, and FA. A new record for Cape Breton Island. **Not common.**

Phaeophyscia rubropulchra

Collected at each of the sites under investigation, it has been found on AS, BA, FG, UA, and FA. Originally reported by Lamb (1954). **Common.**

Phlyctis agelaea

Collected at Grande Anse, North River, and Margaree River, it has been found on AS, AP, BA, and FG. A new record for Cape Breton Island. **Not common.**

Physcia adscendens

Collected at Grande Anse where it was found on FG. Originally reported by Lamb (1954). **Not common.**

Physcia stellaris

Collected at North River where it was found on BA. Originally reported by Lamb (1954). **Not common.**

Physconia detersa

Collected at Grande Anse, Sugarloaf Mountain, and North River, it has been found on AS, AR, and FG. A new record for Cape Breton Island. **Not common.**

Platismatia glauca

Collected at Sugarloaf Mountain, North River, Corney Brook, and Margaree River, it has been found on AS, AR, AP, BA, BP, BC, AB, P, PS, TC, and US. Originally reported by Lamb (1954). **Common.**

Platismatia tuckermanii

Collected at North River where it was found on AB. A new record for Cape Breton Island. Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Polychidium muscicola

Collected at Corney Brook where it was found on FA. A new record for Cape Breton Island. **Rare.**

Pseudocyphellaria crocata

Collected at North River where it was found on AS. Originally reported by Lamb (1954). **Rare.**

Punctelia rudecta

Collected at each of the sites under investigation, it has been found on AS, AR, AP, BA, BP, FG, QR, FA, UA, PB, PP, PT, AB, and PG. Originally reported by Lamb (1954). **Very common.**

Pyrenula laevigata

Collected at North River where it was collected on AS. A new record for Cape Breton Island. **Rare.**

Pyrenula pseudobufonia

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, AR, BA, FG, and QR. A new record for Cape Breton Island. **Common.**

Pyxine soredata

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AS, AR, BA, FG, and QR. Originally reported by Lamb (1954). **Common.**

Ramalina americana

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on AR, BA, and AB. Originally reported by Lamb (1954). **Not common.**

Ramalina dilacerata

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on AR, A, BA, and AB. Originally reported by Lamb (1954). **Not common.**

Ramalina farinacea

Collected at Grande Anse, North River, and Margaree River, it has been found on AS, BA, FG, QR, and AB. Originally reported by Lamb (1954). **Common.**

Ramalina roesleri

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on AS, AR, AP, Asp, BA, AB, PG, and P. Originally reported by Lamb (1954). **Common.**

Ramalina thrausta

Collected at North River and Margaree River, it has been found on AR, BA, and AB. A new record for Cape Breton Island. **Not common.**

Rinodina ascociscana

Collected at Grande Anse, Sugarloaf Mountain and North River, it has been found on AS, BA, and FG. A new record for Cape Breton Island. **Not common.**

Rinodina subminuta

Collected at Grande Anse, Sugarloaf Mountain, North River, and Corney Brook, it has been found on AS, AP, BA, FG, UA, and FA. A new record for Cape Breton Island. **Common.**

Ropalospora chlorantha

Collected at each of the sites under investigation, it has been found on AS, AR, AP, Asp, A, BA, BP, BC, FG, QR, FA, PP, PT, AB, PG, P, and US. Originally reported by Lamb (1954). **Very common.**

Schismatomma pericleum

Collected at Margaree River where it was found on AR. A new record for Cape Breton Island. **Very rare.**

Sclerophora coniophaea

Collected at Margaree River where it was found on BA. A new record for Cape Breton Island. **Rare.**

Sclerophora peronella

Collected at Sugarloaf Mountain and Margaree River, it has been found on AR. A new record for Cape Breton Island. **Rare.**

Scoliciosporum chlorococcum

Collected at Corney Brook where it was found on BA and AB. A new record for Cape Breton Island. Not common, though very common throughout New England.

Sphaerophorus globosus

Collected at North River and Margaree River, it has been found on BA, AB, P, and TC. Originally reported by Lamb (1954). **Not common.**

Sphinctrina turbinata

Collected at Grande Anse, Sugarloaf Mountain, North River, and Margaree River, it has been found on AS (over *Pertusaria macounii*), AR (over *Pertusaria macounii*), AP (over *Pertusaria consocians*), BA (over *Pertusaria macounii*), and FG (over *Pertusaria macounii*). A new record for Cape Breton Island. **Not common.**

Stenocybe flexuosa

Collected at Grande Anse where it was found on PG. A new record for Cape Breton Island. **Rare.**

Stenocybe major

Collected at Sugarloaf Mountain and North River, it has been found on AB. A new record for Cape Breton Island. **Not Common.**

Strangospora microhaema

Collected at North River where it was found on AS. A new record for Cape Breton Island. **Rare.**

Strigula stigmatella

Collected at North River where it was found on AS. A new record for Cape Breton Island. **Not common.**

Thelotrema lepadinum

Collected at Grande Anse, North River, and Margaree River, it has been found on AS, AR, AP, BA, QR, AB and P. Originally reported by Scotter (1966). **Common.**

Tuckermannopsis americana

Collected at North River where it was found on A. A new record for Cape Breton Island. **Not common.**

Tuckermannopsis ciliaris group

Collected at Sugarloaf Mountain where it was found on BC. Originally reported by Lamb (1954). **Not common.**

Tuckermannopsis orbata

Collected at Margaree River where it was found on AB. A new record for Cape Breton Island. **Not common.**

Usnea lapponica

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on AR, BA, and AB. A new record for Cape Breton Island. **Not common.**

Usnea subfloridana

Collected at Sugarloaf Mountain, North River, and Margaree River, it has been found on BA, BC, AB, PS, and US. Originally reported by Lamb (1954). **Not common.**

Vulpicida pinastri

Collected at Grande Anse and North River, it has been found on PS and US. Originally reported by Lamb (1954). Common on gymnosperms throughout New England, the data on this species for Maritime Canada is incomplete.

Summary of Data and Assessment of Ecological Continuity

For each of the stands under investigation, the total number of lichen epiphytes collected, the number of calicioid species collected, the total number of northern hardwoods ancient forest indicator species present, and the assessed IEC index value are provided below. As described in the Methods Section, only those indicators collected on angiosperms (hardwoods) are used to determine the IEC value at northern hardwoods sites. If a potential indicator was collected on a substrate that could not be positively identified as an angiosperm, i.e. those species collected on an unidentifiable species (US), it would not be used to calculate the IEC value. See Appendix 1 for other provisions relating, specifically, to calicioid indicators.

Grande Anse Natural Area (Appendix 2)

A total of 91 lichen species (90 epiphytes) were recorded, 87 of which were collected on angiosperms. The following 12 Caliciales species were recorded here:

Calicium glaucellum
Calicium lenticulare
Calicium salicinum
Chaenotheca brunneola
 **Chaenotheca furfuracea*
Chaenotheca sphaerocephala
Chaenotheca trichialis
Chaenothecopsis pusiola
Chaenothecopsis viridireagens
Mycocalicium subtile
Sphinctrina turbinata
Stenocybe flexuosa

*Collected on rock

The following fourteen northern hardwoods ancient forest indicator species were found here, resulting in an IEC value of 70:

Calicium glaucellum
Calicium salicinum
Chaenotheca sphaerocephala
Chaenothecopsis pusiola
Chaenothecopsis viridireagens
Leptogium saturninum
Lobaria pulmonaria
Lobaria quercizans
Loxospora elatina
Megalania laureri
Normandina pulchella
Pertusaria waghornei
Rinodina ascociscana
Sphinctrina turbinata

Sugarloaf Mountain Protected Area (Appendix 3)

A total of 97 lichen species (97 epiphytes) were recorded, 88 of which were collected on angiosperms. The following 21 Caliciales species were recorded here:

Calicium glaucellum
Calicium lenticulare
Calicium salicinum
Chaenotheca brachypoda
Chaenotheca brunneola
Chaenotheca chrysocephala
Chaenotheca furfuracea
Chaenotheca gracillima
Chaenotheca sphaerocephala
Chaenotheca stemonea
Chaenotheca trichialis
Chaenothecopsis debilis
Chaenothecopsis pusilla
Chaenothecopsis pusiola
Chaenothecopsis viridireagens
Mycocalicium subtile
Phaeocalicium matthewsianum
Phaeocalicium polyporaecum
Sclerophora peronella
Sphinctrina turbinata
Stenocybe major

The following twenty northern hardwoods ancient forest indicator species were found here, resulting in an IEC value of 100:

Arthonia didyma
Calicium glaucellum
Calicium lenticulare
Chaenotheca brachypoda
Chaenotheca chrysocephala
Chaenotheca gracillima
Chaenotheca stemonea
Chaenothecopsis pusiola
Chaenothecopsis viridireagens
Dimerella pineti
Leptogium saturninum
Lobaria pulmonaria
Lobaria quercizans
Loxospora elatina
Megalaria laureri
Pertusaria waghornei
Phaeocalicium matthewsianum
Rinodina ascociscana
Sclerophora peronella
Sphinctrina turbinata

North River Protected Area (Appendix 4)

A total of 124 lichen species (124 epiphytes) were recorded, 110 of which were collected on angiosperms. The following 25 Caliciales species were recorded here:

Calicium abietinum
Calicium glaucellum
Calicium lenticulare
Calicium salicinum
Calicium viride
Chaenotheca brunneola
Chaenotheca chlorella
Chaenotheca chrysocephala
Chaenotheca ferruginea
Chaenotheca furfuracea
Chaenotheca gracillima
Chaenotheca hispidula
Chaenotheca sphaerocephala
Chaenotheca stemonea
Chaenotheca trichialis
Chaenotheca xyloxa

Chaenothecopsis brevipes
Chaenothecopsis pusiola
Chaenothecopsis rubescens
Chaenothecopsis viridireagens
Mycocalicium subtile
Phaeocalicium betulinum
Sphaerophorus globosus
Sphinctrina turbinata
Stenocybe major

The following twenty-six northern hardwoods ancient forest indicator species were found here, resulting in an IEC value of 130:

Arthonia byssacea
Arthonia didyma
Calicium abietinum
Calicium glaucellum
Calicium lenticulare
Calicium viride
Catinaria atropurpurea
Chaenotheca gracillima
Chaenotheca sphaerocephala
Chaenotheca stemonea
Chaenothecopsis brevipes
Chaenothecopsis pusiola
Chaenothecopsis rubescens
Chaenothecopsis viridireagens
Leptogium saturninum
Lobaria pulmonaria
Lobaria quercizans
Loxospora elatina
Megalaria laureri
Normandina pulchella
Pertusaria waghornei
Phaeocalicium betulinum
Pyrenula laevigata
Rinodina ascociscana
Sphinctrina turbinata
Strangospora microhaema

Corney Brook Natural Area (Appendix 5)

A total of 60 lichen species (60 epiphytes) were recorded, 59 of which were collected on angiosperms. The following 2 Caliciales species were recorded here:

Chaenothecopsis debilis
Mycocalicium subtile

The following four northern hardwoods ancient forest indicator species were found here, resulting in an IEC value of 20:

Catinaria atropurpurea
Lobaria pulmonaria
Lobaria quercizans
Megalania laureri

Margaree River Protected Area (Appendix 6)

A total of 100 lichen species (100 epiphytes) were recorded, 90 of which were collected on angiosperms. The following 22 Caliciales species were recorded here:

Calicium glaucellum
Calicium lenticulare
Calicium salicinum
Calicium viride
Chaenotheca brunneola
Chaenotheca chlorella
Chaenotheca chrysocephala
Chaenotheca furfuracea
Chaenotheca gracillima
Chaenotheca sphaerocephala
Chaenotheca stemonea
Chaenotheca trichialis
Chaenothecopsis debilis
Chaenothecopsis pusiola
Chaenothecopsis savonica
Chaenothecopsis viridireagens
Mycocalicium subtile
Phaeocalicium matthewsianum
Sclerophora coniophaea
Sclerophora peronella
Sphaerophorus globosus
Sphinctrina turbinata

The following twenty-three northern hardwoods ancient forest indicator species were found here, resulting in an IEC value of 115:

Bacidia rubella
Calicium glaucellum
Calicium lenticulare
Calicium viride
Chaenotheca chlorella
Chaenotheca chrysocephala
Chaenotheca sphaerocephala
Chaenotheca stemonea
Chaenotheca trichialis
Chaenothecopsis pusiola
Chaenothecopsis savonica
Chaenothecopsis viridireagens
Dimerella pineti
Leptogium saturninum
Lobaria pulmonaria
Lobaria quercizans
Loxospora elatina
Pertusaria waghornei
Phaeocalicium matthewsianum
Sclerophora coniophaea
Sclerophora peronella
Sphaerophorus globosus
Sphinctrina turbinata

Discussion and Conclusions

From a lichenological standpoint, the most impressive of the five northern hardwoods stands surveyed in the current investigation was the stand at North River and not, as had been expected, the stand at Grande Anse. Whether measured in terms of the total number of epiphytes found (124 vs 90), the number of rare and very rare species represented in these totals (16 vs 8), the number of calicioid lichens and fungi (25 vs 12), or the relative age of the stand as measured by the index of ecological continuity (130 vs 70), North River continues to enjoy ancient forest status while Grande Anse is considered to be in decline.

My first impression of the old-growth forest at Grande Anse came in 1995 and was not particularly favorable. We were heading back to Maine after a week of collecting calicioid species and decided to check out the Nature Loop Trail at Lone Shieling. Before too long, the urge to search for calicioid taxa overcame us and we spent about an hour looking for them. Based on unpublished reports we had read about this stand and the size of the trees we encountered, we were expecting to find much more than we did. Something wasn't right but we weren't quite sure what to make of it. When the opportunity arose to revisit Grande Anse as part of the current investigation, we were anxious to conduct a full-blown survey.

What is happening at Grande Anse is similar in some ways to what has happened at another once-premier old-growth northern hardwoods site in eastern North America, namely the stand at Guifford Woods in Vermont. Despite the historical significance of Guifford Woods, Natural Heritage Program documents point out that "its small size, multiple uses, and its roadside location, are all deterrents to the continued health of this forest and to its continued credibility as a natural area" (Selva 1994). Guifford Woods was assessed an IEC ranking of 80. Putting that number into some perspective, Francis Rose (1992) has said that,

while IEC values over 50 may indicate an early medieval origin, "those up to 75 may indicate recent disturbance of an ancient site". It is our interpretation, based on the number of ancient forest indicator species found at Grande Anse, but particularly on the relatively low number (12) and noticeably poor shape we found the calicioid species in, that the stand has been recently disturbed insofar as the lichens are being negatively affected by air pollution.

Another of the lasting "impressions" we have of Grande Anse is the smell of burning brakes that permeates the Nature Loop Trail area and greeted us on our return each day from our treks into the river valley. We were struck by the fact of how far away from the parking lot we were when we started picking up this distinctive smell. Given the role lichens play as biomonitors of air pollution, it is our recommendation that a follow-up survey be conducted in 5 years in an effort to determine if the forest here is continuing to decline or is holding its own.

While we know nothing of the history of the stand at Corney Brook and saw no evidence of cutting, the IEC score of 20 suggests that it is a secondary forest. Of some interest is the fact that the four ancient forest indicator species were all found on either *Fraxinus americana* or *Acer saccharum*, and none were found on *Quercus rubra* which dominated the site or on any of the other 9 tree species that we found there, including the only pioneer species (PP, PT, and SA) we encountered over the course of the investigation. If succession is allowed to run its course, and the stand remains undisturbed, the accompanying increase in microsites should lead to an increase in lichen biodiversity over time.

The protected areas at Sugarloaf Mountain and Margaree River, described by Lynds and LeDuc (1995) as immature old-growth stands, have come in with similar numbers of total epiphytes (97 vs 100), number of rare and very rare species (6 vs 8), number of Caliciales species (21 vs 22), and IEC value (100 vs 115), respectively. Except for the location of the Sugarloaf Mountain site along the East Big Intervale Road--albeit a section of dirt road that appears to be little traveled, we saw nothing at these two sites that raised

concerns for their continued health. Though not as impressive as the protected area at North River (IEC = 130), these two sites have, on the basis of their IEC values of 100 or more, achieved ancient forest status.

To put these five stands into additional perspective, all have been ranked among the 18 northern hardwoods sites in Maine, Vermont, New Hampshire, and New Brunswick that have been previously assessed by Selva (1994, 1996) using the same index of ecological continuity (Appendix 7). While the data on total number of epiphytes and number of epiphytes collected on angiosperms follow similar trends among all sites listed, the total number of calicioid species and calicioid species collected on angiosperms at the Cape Breton Island sites are much higher than those recorded for the sites in New England and New Brunswick. Insofar as many of the calicioid taxa are considered indicators of old-growth and ancient forest conditions, this suggests that the list of indicators used to assess the continuity of northern hardwoods forests may need to be revised. With the heretofore blanket inclusion of all but the most common calicioid lichens and fungi, the data show that we need to be more selective. We are not only picking up more calicioid species per site as we move east from the original study area, but we have also discovered three species, *Calicium viride*, *Sclerophora peronella*, and *Sphaerophorus globosus*, here in Nova Scotia that we have not yet collected at our study sites in New England and New Brunswick. An index of ecological continuity that better reflects the conditions being assessed will evolve with further study.

Finally, one hundred and eight of the 175 species of lichens recorded in the current investigation have not been reported by Lamb (1954), Scotter (1966), or Selva (1998). Twenty-eight of these species are considered rare or very rare and at least 5 species, *Chaenotheca sphaerocephala*, *Chaenothecopsis brevipes*, *Phaeocalicium betulinum*, *Phaeocalicium matthewsianum*, and *Stenocybe flexuosa*, are new records for Canada and help raise the known total for Cape Breton Island to 331 (Appendix 8).

Literature Cited

- Bridgland, J. 1996. Management Guidelines for Cape Breton Highlands National Park. Unpubl. Report, Parks Canada, Ingonish Beach, NS.
- Esslinger, T. L. 1998. A cumulative checklist for the lichen-forming, lichenicolous and allied fungi of the continental United States and Canada. North Dakota State University: <http://www.ndsu.nodak.edu/instruct/esslinge/chcklst/chcklst7.htm> (First Posted on 1 December 1997, Most Recent Update: 18 September 1998), Fargo, North Dakota.
- Lamb, I.M. 1954. Lichens of Cape Breton Island, Nova Scotia. Bulletin No. 132, National Museum of Canada, Ottawa.
- Lynds, A. and J. LeDuc. 1995. Old forests of Nova Scotia. Natural Resources Occasional Papers No. 1 (September 1995). Nova Scotia Department of Natural Resources.
- Mueller-Dombois, D., and H. Ellenberg. 1974. Aims and methods of vegetation ecology. Wiley, New York.
- Rose, F. 1974. The epiphytes of oak, pp. 250-273. In M.G. Morris and F.H. Perring (eds.), *The British oak: Its history and natural history*. Faringdon.
- Rose, F. 1976. Lichenological indicators of age and environmental continuity in woodlands, pp. 279-307. In D. H. Brown et al. (ed.), *Lichenology: Progress and problems*. Academic Press.
- Rose, F. 1992. Temperate forest management: Its effects on bryophyte and lichen floras and habitats, pp. 211-233. In J. W. Bates & A. M. Farmer (eds.), *Bryophytes and Lichens in a Changing Environment*. Oxford.
- Scotter, G. W. 1966. Arboreal lichens as a food source for caribou in Cape Breton Highlands National Park, with some brief notes on terrestrial vegetation. Unpubl. Report, Canadian Wildlife Service, Edmonton.
- Selva, S. B. 1988. The Caliciales of northern Maine. *The Bryologist* 91:2-17.
- Selva, S. B. 1994. Lichen diversity and stand continuity in the northern hardwoods and spruce-fir forests of northern New England and western New Brunswick. *The Bryologist* 97:424-429.
- Selva, S. B. 1996. Using lichens to assess ecological continuity in northeastern forests, pp. 35-48. In M. B. Davis (ed.), *Eastern old-growth forests*. Island Press, Washington D.C.
- Selva, S. B. 1998. The Caliciales of Nova Scotia and Prince Edward Island. Unpubl. report prepared for the National Geographic Society, Washington D. C.
- Tibell, L. 1980. The lichen genus *Chaenotheca* in the Northern Hemisphere. *Symbolae Botanicae Upsaliensis* 23:1-65.
- Tibell, L. 1992. Crustose lichens as indicators of forest continuity in boreal coniferous forests. *Nordic Journal of Botany* 12:427-450.

Appendix 1.

Epiphytic lichens that appear to be faithful to ancient northern hardwoods forest conditions in New England and western New Brunswick. (After Selva 1994, 1996).

Anaptychia palmulata
Arthonia byssacea
Arthonia didyma
Bacidia rubella
Buellia schaereri
Catinaria atopurpurea
Cetrelia chicitae
Collema nigrescens
Collema subflaccidum
Dimerella pineti
Lecanactis chloroconia
Lecidella euphorea
Leptogium saturninum
Lobaria pulmonaria
Lobaria quercizans
Loxospora elatina
Megalania laureri
Myelochroa aurulenta
Normandina pulchella
Pertusaria waghornei
Pyrenula laevigata
Ramalina intermedia
Ramalina pollinaria
Rinodina ascociscana
Strangospora microhaema

Corticolous calicioid taxa: All species except *Chaenotheca furfuracea* and *Phaeocalicium polyporaum*.

Lignicolous calicioid taxa: All species except *Calicium salicinum*, *Calicium trabinellum*, *Chaenotheca brunneola*, *Chaenotheca furfuracea*, *Chaenotheca trichialis*, *Chaenothecopsis debilis*, *Chaenothecopsis pusilla* and *Mycocalicium subtile*.

Appendix 2.

List of epiphytic species, by substrate, recorded at Grande Anse Natural Area (x designates species collected on corticolous, i.e., bark,

substrates; o designates species collected on lignicolous, i.e., wood, substrates). See methods section for key to tree species abbreviations.

	AS	AR	AP	Asp	BA	FG	QR	UA	FA	AB	PG	US
<i>Acrocordia cavata</i>	x								x			
<i>Amandinea punctata</i>	x	x	x		x					x	o	
<i>Anisomeridium nyssigenum</i>												
<i>Arthonia byssacea</i>												
<i>Arthonia didyma</i>												
<i>Arthonia diffusella</i>	x											
<i>Arthonia radiata</i>			x									
<i>Bacidia laurocerasi</i>												
<i>Bacidia rosella</i>								x				
<i>Bacidia rubella</i>												
<i>Bacidia sabuletorum</i>	x							x				
<i>Biatora helvola</i>	x	x		x	x		x			x	x	
<i>Biatora vernalis</i>	x					x						
<i>Bryoria fuscescens</i>												
<i>Bryoria nadvornikiana</i>												
<i>Bryoria trichodes</i>												
<i>Buellia disciformis</i>	x	x	x	x	x	x						
<i>Calicium abietinum</i>												
<i>Calicium glaucellum</i>					o							o
<i>Calicium lenticulare</i>												o
<i>Calicium salicinum</i>					xo				o			o
<i>Calicium viride</i>												
<i>Caloplaca cerina</i>						x						
<i>Caloplaca discolor</i>	x		x		x	x	x	x	x			
<i>Caloplaca flavorubescens</i>								x				
<i>Candelariella efflorescens</i>						x						
<i>Catillaria nigroclavata</i>					x							
<i>Catinaria atropurpurea</i>												
<i>Cetrelia olivetorum</i>												
<i>Chaenotheca brachypoda</i>												
<i>Chaenotheca brunneola</i>										x		o
<i>Chaenotheca chlorella</i>												
<i>Chaenotheca chrysocephala</i>												
<i>Chaenotheca ferruginea</i>												
<i>Chaenotheca furfuracea</i>												

	AS	AR	AP	Asp	BA	FG	QR	UA	FA	AB	PG	US
<i>Chaenotheca gracillima</i>												
<i>Chaenotheca hispidula</i>												
<i>Chaenotheca sphaerocephala</i>					X							
<i>Chaenotheca stemonea</i>												
<i>Chaenotheca trichialis</i>					0							
<i>Chaenotheca xyloxa</i>												
<i>Chaenothecopsis brevipes</i>												
<i>Chaenothecopsis debilis</i>												
<i>Chaenothecopsis pusilla</i>												
<i>Chaenothecopsis pusiola</i>					0							
<i>Chaenothecopsis rubescens</i>												
<i>Chaenothecopsis savonica</i>												
<i>Chaenothecopsis viridireagens</i>					X							
<i>Cladina rangiferina</i>					X							
<i>Cladonia caespiticia</i>												
<i>Cladonia cenotea</i>												
<i>Cladonia chlorophaea group</i>	X											
<i>Cladonia coniocraea</i>					X							
<i>Cladonia furcata</i>	X											
<i>Cladonia pyxidata</i>	X				X	X			X			
<i>Cladonia scabriuscula</i>												
<i>Cladonia squamosa</i>					X							
<i>Collema furfuraceum</i>	X							X	X			
<i>Conotrema urceolatum</i>	X											
<i>Dendroscopulon umhausense</i>	X											
<i>Dimerella lutea</i>							X					
<i>Dimerella pineti</i>												
<i>Graphis scripta</i>	X	X	X		X	X	X			X		
<i>Hypogymnia physodes</i>					X					X		0
<i>Hypogymnia tubulosa</i>												
<i>Hypogymnia vittata</i>												
<i>Imshaugia aleurites</i>												
<i>Jullela fallaciosa</i>	X											
<i>Lecanactis abietina</i>												
<i>Lecanora caesiurubella</i>	X	X	X		X	X			X			
<i>Lecanora subfusca group</i>	X	X	X	X	X	X	X			X		
<i>Lecanora symmicta</i>	X				X						0	
<i>Lecanora thysanophora</i>												
<i>Lecidea albofuscescens</i>		X			X					X		
<i>Lepraria sp.</i>	X				X		X	X	X			
<i>Leptogium cyanescens</i>	X				X	X	X	X	X			
<i>Leptogium laceroides</i>												

	AS	AR	AP	Asp	BA	FG	QR	UA	FA	AB	PG	US
<i>Leptogium saturninum</i>								X				
<i>Lithothelium macrosporum</i>												
<i>Lobaria pulmonaria</i>	X				X	X	X	X	X			
<i>Lobaria quercizans</i>	X				X	X	X	X	X			
<i>Lobaria scrobiculata</i>	X				X			X				
<i>Lopadium disciforme</i>					X							
<i>Loxospora cisionica</i>												
<i>Loxospora elatina</i>					X						X	
<i>Loxospora ochrophaea</i>												
<i>Megalaria grossa</i>	X							X				
<i>Megalaria laureri</i>	X		X			X						
<i>Melanelia subaurifera</i>	X	X	X	X	X	X	X	X	X	X	X	
<i>Menegazzia terebrata</i>												
<i>Micarea globulosella</i>												
<i>Micarea melaena</i>												
<i>Micarea peliocarpa</i>				X	X							0
<i>Micarea prasina</i>												
<i>Mycocalicium subtile</i>					0					0		
<i>Nephroma bellum</i>												
<i>Nephroma helveticum</i>												
<i>Nephroma laevigatum</i>	X							X				
<i>Nephroma parile</i>												
<i>Normandina pulchella</i>					X							
<i>Ochrolechia androgyna</i>		X			X		X					0
<i>Ochrolechia mexicana</i>												
<i>Ochrolechia pseudopallescens</i>												
<i>Ochrolechia trochophora</i>	X		X	X	X	X	X		X			
<i>Opegrapha niveoatra</i>												
<i>Opegrapha ochrocheila</i>	X											
<i>Opegrapha varia</i>	X				0	X		X				
<i>Pannaria pezizoides</i>												
<i>Pannaria rubiginosa</i>												
<i>Parmelia saxatilis</i>												
<i>Parmelia squarrosa</i>	X	X	X		X	X	X	X	X	X		0
<i>Parmelia sulcata</i>	X	X	X		X	X	X	X	X	X	X	0
<i>Parmeliella triptophylla</i>	X								X			
<i>Parmeliopsis ambigua</i>												
<i>Parmeliopsis hyperopta</i>												
<i>Peltigera canina</i>	X											
<i>Peltigera collina</i>												
<i>Peltigera degenii</i>	X											
<i>Peltigera elisabethae</i>	X											

	AS	AR	AP	Asp	BA	FG	QR	UA	FA	AB	PG	US
<i>Peltigera evansiana</i>	X											
<i>Peltigera leucophlebia</i>												
<i>Peltigera polydactyla</i>												
<i>Peltigera praetextata</i>												
<i>Pertusaria alpina</i>	X		X		X	X		X				
<i>Pertusaria amara</i>	X				X	X	X		X	X		
<i>Pertusaria consocians</i>	X						X	X				
<i>Pertusaria macounii</i>	X	X	X	X	X	X			X	X		
<i>Pertusaria multipunctoides</i>					X							
<i>Pertusaria ophthalmiza</i>												
<i>Pertusaria rubefacta</i>	X				X	X						
<i>Pertusaria trachythallina</i>		X										
<i>Pertsaria velata</i>	X		X		X	X						
<i>Pertusaria waghornei</i>	X				X	X						
<i>Phaeocalicium betulinum</i>												
<i>Phaeocalicium matthewsianum</i>												
<i>Phaeocalicium polyporaeum</i>												
<i>Phaeophyscia pusilloides</i>	X					X		X				
<i>Phaeophyscia rubropulchra</i>	X				X	X		X				
<i>Phlyctis agelaea</i>	X		X			X						
<i>Physcia adscendens</i>						X						
<i>Physcia stellaris</i>												
<i>Physconia detersa</i>						X						
<i>Platismatia glauca</i>												
<i>Platismatia tuckermanii</i>												
<i>Polychidium muscicola</i>												
<i>Pseudocyphellaria crocata</i>												
<i>Punctelia rudecta</i>	X		X		X	X	X	X		X	X	
<i>Pyrenula laevigata</i>												
<i>Pyrenula pseudobufonia</i>	X					X						
<i>Pyxine soorediata</i>	X				X	X	X					
<i>Ramalina americana</i>												
<i>Ramalina dilacerata</i>												
<i>Ramalina farinacea</i>	X				X	X	X			X		
<i>Ramalina roesleri</i>												
<i>Ramalina thrausta</i>												
<i>Rinodina ascociscana</i>	X											
<i>Rinodina subminuta</i>	X		X			X		X				
<i>Ropalospora chlorantha</i>	X	X	X	X	X	X				X	X	0
<i>Schismatomma pericleum</i>												
<i>Sclerophora coniophaea</i>												

	AS	AR	AP	Asp	BA	FG	QR	UA	FA	AB	PG	US
<i>Sclerophora peronella</i>												
<i>Scoliciosporum chlorococcum</i>												
<i>Sphaerophorus globosus</i>												
<i>Sphinctrina turbinata</i>						X						
<i>Stenocybe flexuosa</i>											X	
<i>Stenocybe major</i>												
<i>Strangospora microhaema</i>												
<i>Strigula stigmatella</i>												
<i>Thelotrema lepadinum</i>					X		X					
<i>Tuckermannopsis americana</i>												
<i>Tuckermannopsis ciliaris</i> group												
<i>Tuckermannopsis orbata</i>												
<i>Usnea lapponica</i>												
<i>Usnea subfloridana</i>												
<i>Vulpicida pinastri</i>												0

Appendix 3.

List of epiphytic species, by substrate, recorded at Sugarloaf Protected Area (x designates species collected on corticolous, i.e., bark, substrates; o

designates species collected on lignicolous, i.e., wood, substrates). See methods section for key to tree species abbreviations.

	AS	AR	AP	BA	BC	B	FG	AB	US			
<i>Acrocordia cavata</i>	x											
<i>Amandinea punctata</i>		x	x					x				
<i>Anisomeridium nyssigenum</i>	x	x										
<i>Arthonia byssacea</i>												
<i>Arthonia didyma</i>		x										
<i>Arthonia diffusella</i>												
<i>Arthonia radiata</i>							x					
<i>Bacidia laurocerasi</i>		x										
<i>Bacidia rosella</i>												
<i>Bacidia rubella</i>												
<i>Bacidia sabuletorum</i>												
<i>Biatora helvola</i>	x	x			x			x	x			
<i>Biatora vernalis</i>	x	x	x	x			x					
<i>Bryoria fuscescens</i>								x				
<i>Bryoria nadvornikiana</i>												
<i>Bryoria trichodes</i>												
<i>Buellia disciformis</i>		x	x	x								
<i>Calicium abietinum</i>												
<i>Calicium glaucellum</i>				o		o			o			
<i>Calicium lenticulare</i>				o		o			o			
<i>Calicium salicinum</i>				o					o			
<i>Calicium viride</i>												
<i>Caloplaca cerina</i>												
<i>Caloplaca discolor</i>							x					
<i>Caloplaca flavorubescens</i>												
<i>Candelariella efflorescens</i>												
<i>Catillaria nigroclavata</i>												
<i>Catinaria atropurpurea</i>												
<i>Cetrelia olivetorum</i>												
<i>Chaenotheca brachypoda</i>				o								
<i>Chaenotheca brunneola</i>				o		o		o	o			
<i>Chaenotheca chlorella</i>												
<i>Chaenotheca chrysocephala</i>				o					o			
<i>Chaenotheca ferruginea</i>												
<i>Chaenotheca furfuracea</i>		x										
<i>Chaenotheca gracillima</i>				o								

	AS	AR	AP	BA	BC	B	FG	AB	US			
<i>Chaenotheca hispidula</i>												
<i>Chaenotheca sphaerocephala</i>									0			
<i>Chaenotheca stemonea</i>				X0								
<i>Chaenotheca trichialis</i>				0		0						
<i>Chaenotheca xyloxena</i>												
<i>Chaenothecopsis brevipes</i>												
<i>Chaenothecopsis debilis</i>		0		0								
<i>Chaenothecopsis pusilla</i>									0			
<i>Chaenothecopsis pusiola</i>				0								
<i>Chaenothecopsis rubescens</i>												
<i>Chaenothecopsis savonica</i>												
<i>Chaenothecopsis viridireagens</i>				X		0						
<i>Cladina rangiferina</i>												
<i>Cladonia caespiticia</i>												
<i>Cladonia cenotea</i>												
<i>Cladonia chlorophaea group</i>		X	X									
<i>Cladonia coniocraea</i>	X	X		X			X	X				
<i>Cladonia furcata</i>												
<i>Cladonia pyxidata</i>	X	X		X			X					
<i>Cladonia scabriuscula</i>							X					
<i>Cladonia squamosa</i>				X								
<i>Collema furfuraceum</i>							X					
<i>Conotrema urceolatum</i>	X	X	X	X								
<i>Dendriscoaulon umhausense</i>												
<i>Dimerella lutea</i>												
<i>Dimerella pineti</i>		X										
<i>Graphis scripta</i>	X	X	X	X	X		X	X	X			
<i>Hypogymnia physodes</i>			X	X0	X	0		X	X			
<i>Hypogymnia tubulosa</i>					X							
<i>Hypogymnia vittata</i>												
<i>Imshaugia aleurites</i>								X				
<i>Jullela fallaciosa</i>			X									
<i>Lecanactis abietina</i>												
<i>Lecanora caesiorubella</i>	X	X	X					X				
<i>Lecanora subfusca group</i>	X	X	X	X			X	X				
<i>Lecanora symmicta</i>		X		X		0		X				
<i>Lecanora thysanophora</i>												
<i>Lecidea albofuscescens</i>			X					X				
<i>Lepraria sp.</i>		X		X0			X		0			
<i>Leptogium cyanescens</i>	X	X	X				X					
<i>Leptogium laceroides</i>												
<i>Leptogium saturninum</i>							X					

	AS	AR	AP	BA	BC	B	FG	AB	US			
<i>Lithothelium macrosporum</i>							X					
<i>Lobaria pulmonaria</i>	X	X	X	X			X					
<i>Lobaria quercizans</i>	X	X	X				X					
<i>Lobaria scrobiculata</i>	X	X	X	X			X					
<i>Lopadium disciforme</i>								X				
<i>Loxospora cismanica</i>												
<i>Loxospora elatina</i>				X								
<i>Loxospora ochrophaea</i>												
<i>Megalania grossa</i>												
<i>Megalania laureri</i>	X	X					X					
<i>Melanelia subaurifera</i>	X	X	X	X			X	X				
<i>Menegazzia terebrata</i>												
<i>Micarea globulosella</i>								X				
<i>Micarea melaena</i>												
<i>Micarea peliocarpa</i>		0										
<i>Micarea prasina</i>												
<i>Mycocalicium subtile</i>		0						0	0			
<i>Nephroma bellum</i>												
<i>Nephroma helveticum</i>		X										
<i>Nephroma laevigatum</i>												
<i>Nephroma parile</i>												
<i>Normandina pulchella</i>												
<i>Ochrolechia androgyna</i>		X		X					X			
<i>Ochrolechia mexicana</i>												
<i>Ochrolechia pseudopallescens</i>												
<i>Ochrolechia trochophora</i>	X			X			X					
<i>Opegrapha niveoatra</i>												
<i>Opegrapha ochrocheila</i>												
<i>Opegrapha varia</i>												
<i>Pannaria pezizoides</i>	X											
<i>Pannaria rubiginosa</i>												
<i>Parmelia saxatilis</i>												
<i>Parmelia squarrosa</i>	X	X	X	X	X		X	X	X			
<i>Parmelia sulcata</i>	X	X	X	X			X	X				
<i>Parmeliella triptophylla</i>	X						X					
<i>Parmeliopsis ambigua</i>								X				
<i>Parmeliopsis hyperopta</i>												
<i>Peltigera canina</i>												
<i>Peltigera collina</i>												
<i>Peltigera degenii</i>	X	X										
<i>Peltigera elisabethae</i>												
<i>Peltigera evansiana</i>							X					

	AS	AR	AP	BA	BC	B	FG	AB	US			
<i>Peltigera leucophlebia</i>												
<i>Peltigera polydactyla</i>												
<i>Peltigera praetextata</i>							X					
<i>Pertusaria alpina</i>	X	X										
<i>Pertusaria amara</i>	X	X	X	X			X	X	X			
<i>Pertusaria consocians</i>		X		X								
<i>Pertusaria macounii</i>	X	X	X	X			X	X				
<i>Pertusaria multipunctoides</i>												
<i>Pertusaria ophthalmiza</i>								X				
<i>Pertusaria rubefacta</i>	X	X	X	X			X					
<i>Pertusaria trachythallina</i>							X	X				
<i>Pertsaria velata</i>	X	X	X	X			X					
<i>Pertusaria waghornei</i>	X	X	X	X			X					
<i>Phaeocalicium betulinum</i>												
<i>Phaeocalicium matthewsianum</i>					X							
<i>Phaeocalicium polyporaenum</i>		X		X			X					
<i>Phaeophyscia pusilloides</i>												
<i>Phaeophyscia rubropulchra</i>							X					
<i>Phlyctis agelaea</i>												
<i>Physcia adscendens</i>												
<i>Physcia stellaris</i>												
<i>Physconia deterasa</i>	X	X										
<i>Platismatia glauca</i>	X		X	X	X			X	X			
<i>Platismatia tuckermanii</i>												
<i>Polychidium muscicola</i>												
<i>Pseudocyphellaria crocata</i>												
<i>Punctelia rudecta</i>	X	X		X			X	X				
<i>Pyrenula laevigata</i>												
<i>Pyrenula pseudobufonia</i>	X						X					
<i>Pyxine soorediata</i>	X	X					X					
<i>Ramalina americana</i>		X										
<i>Ramalina dilacerata</i>		X										
<i>Ramalina farinacea</i>												
<i>Ramalina roesleri</i>		X						X				
<i>Ramalina thrausta</i>												
<i>Rinodina ascociscana</i>							X					
<i>Rinodina subminuta</i>	X											
<i>Ropalospora chlorantha</i>	X	X	X	X	X		X	X				
<i>Schismatomma pericleum</i>												
<i>Sclerophora coniophaea</i>												
<i>Sclerophora peronella.</i>		X										
<i>Scoliciosporum chlorococcum</i>												

	AS	AR	AP	BA	BC	B	FG	AB	US			
<i>Sphaerophorus globosus</i>												
<i>Sphinctrina turbinata</i>	X	X		X			X					
<i>Stenocybe flexuosa</i>												
<i>Stenocybe major</i>								X				
<i>Strangospora microhaema</i>												
<i>Strigula stigmatella</i>												
<i>Thelotrema lepadinum</i>												
<i>Tuckermannopsis americana</i>												
<i>Tuckermannopsis ciliaris</i> group					X							
<i>Tuckermannopsis orbata</i>												
<i>Usnea lapponica</i>		X										
<i>Usnea subfloridana</i>					X							
<i>Vulpicida pinastri</i>												

Appendix 4.

List of epiphytic species, by substrate, recorded at North River Protected Area (x designates species collected on corticolous, i.e., bark,

substrates; o designates species collected on lignicolous, i.e., wood, substrates). See methods section for key to tree species abbreviations.

	AS	AR	BA	FG	A	AB	P	PS	TC	US		
<i>Acrocordia cavata</i>	x		x									
<i>Amandinea punctata</i>			x	x	x							
<i>Anisomeridium myssigenum</i>	x		x									
<i>Arthonia byssacea</i>	x		x									
<i>Arthonia didyma</i>	x											
<i>Arthonia diffusella</i>			x									
<i>Arthonia radiata</i>												
<i>Bacidia laurocerasi</i>												
<i>Bacidia rosella</i>												
<i>Bacidia rubella</i>												
<i>Bacidia sabuletorum</i>												
<i>Biatora helvola</i>	x	x	x			x			x			
<i>Biatora vernalis</i>	x	x	x				x					
<i>Bryoria fuscescens</i>												
<i>Bryoria nadvornikiana</i>						x		x				
<i>Bryoria trichodes</i>								x				
<i>Buellia disciformis</i>		x	x			x						
<i>Calicium abietinum</i>			o									
<i>Calicium glaucellum</i>			o					o				
<i>Calicium lenticulare</i>			o					x				
<i>Calicium salicinum</i>			xo									
<i>Calicium viride</i>	x		x									
<i>Caloplaca cerina</i>												
<i>Caloplaca discolor</i>	x	x	x	x								
<i>Caloplaca flavorubescens</i>												
<i>Candelariella efflorescens</i>												
<i>Catillaria nigroclavata</i>			x									
<i>Catinaria atropurpurea</i>	x											
<i>Cetrelia olivetorum</i>	x		x									
<i>Chaenotheca brachypoda</i>												
<i>Chaenotheca brunneola</i>			o							o		
<i>Chaenotheca chlorella</i>										o		
<i>Chaenotheca chrysocephala</i>								xo	x			
<i>Chaenotheca ferruginea</i>									x			
<i>Chaenotheca furfuracea</i>			x					x				
<i>Chaenotheca gracillima</i>			o									
<i>Chaenotheca hispidula</i>	x											

	AS	AR	BA	FG	A	AB	P	PS	TC	US		
<i>Chaenotheca sphaerocephala</i>			X									
<i>Chaenotheca stemonea</i>			X									
<i>Chaenotheca trichialis</i>			0									
<i>Chaenotheca xyloxena</i>									0			
<i>Chaenothecopsis brevipes</i>	X											
<i>Chaenothecopsis debilis</i>												
<i>Chaenothecopsis pusilla</i>												
<i>Chaenothecopsis pusiola</i>			0							0		
<i>Chaenothecopsis rubescens</i>	X		X									
<i>Chaenothecopsis savonica</i>												
<i>Chaenothecopsis viridireagens</i>			X									
<i>Cladina rangiferina</i>												
<i>Cladonia caespiticia</i>			X									
<i>Cladonia cenotea</i>												
<i>Cladonia chlorophaea group</i>	X											
<i>Cladonia coniocraea</i>	X	X	X			X		X		X		
<i>Cladonia furcata</i>												
<i>Cladonia pyxidata</i>	X	X	X									
<i>Cladonia scabriuscula</i>	X											
<i>Cladonia squamosa</i>			X									
<i>Collema furfuraceum</i>	X			X								
<i>Conotrema urceolatum</i>	X											
<i>Dendroscopaulon umhausense</i>												
<i>Dimerella lutea</i>		X										
<i>Dimerella pineti</i>												
<i>Graphis scripta</i>	X	X	X	X		X						
<i>Hypogymnia physodes</i>			X		X	X		X	X	0		
<i>Hypogymnia tubulosa</i>			X			X						
<i>Hypogymnia vittata</i>			X									
<i>Imshaugia aleurites</i>												
<i>Jullela fallaciosa</i>												
<i>Lecanactis abietina</i>												
<i>Lecanora caesiurubella</i>	X	X			X							
<i>Lecanora subfusca group</i>	X		X	X		X						
<i>Lecanora symmicta</i>												
<i>Lecanora thysanophora</i>	X	X	X	X								
<i>Lecidea albofuscescens</i>			X			X						
<i>Lepraria sp.</i>	X	X	X				X		X			
<i>Leptogium cyanescens</i>	X	X	X	X								
<i>Leptogium laceroides</i>	X											
<i>Leptogium saturninum</i>				X								
<i>Lithothelium macrosporum</i>												

	AS	AR	BA	FG	A	AB	P	PS	TC	US		
<i>Lobaria pulmonaria</i>	X	X	X	X								
<i>Lobaria quercizans</i>	X	X	X	X								
<i>Lobaria scrobiculata</i>	X	X	X									
<i>Lopadium disciforme</i>	X	X	X			X	X	X				
<i>Loxospora cisonica</i>						X						
<i>Loxospora elatina</i>	X		X			X						
<i>Loxospora ochrophaea</i>						X		X				
<i>Megalaria grossa</i>												
<i>Megalaria laureri</i>	X											
<i>Melanelia subaurifera</i>	X	X	X			X						
<i>Menegazzia terebrata</i>		X	X									
<i>Micarea globulosella</i>												
<i>Micarea melaena</i>								X				
<i>Micarea peliocarpa</i>	X	X										
<i>Micarea prasina</i>												
<i>Mycocalicium subtile</i>			0			0						
<i>Nephroma bellum</i>												
<i>Nephroma helveticum</i>		X	X									
<i>Nephroma laevigatum</i>	X	X										
<i>Nephroma parile</i>												
<i>Normandina pulchella</i>	X											
<i>Ochrolechia androgyna</i>	X	X	X			X	X	X	X			
<i>Ochrolechia mexicana</i>					X							
<i>Ochrolechia pseudopallescens</i>												
<i>Ochrolechia trochophora</i>	X	X	X									
<i>Opegrapha niveoatra</i>												
<i>Opegrapha ochrocheila</i>	X											
<i>Opegrapha varia</i>	X		X									
<i>Pannaria pezizoides</i>												
<i>Pannaria rubiginosa</i>	X											
<i>Parmelia saxatilis</i>												
<i>Parmelia squarrosa</i>	X	X	X	X	X	X	X	X		0		
<i>Parmelia sulcata</i>	X	X	X0		X	X			X			
<i>Parmeliella triptophylla</i>	X	X		X								
<i>Parmeliopsis ambigua</i>												
<i>Parmeliopsis hyperopta</i>												
<i>Peltigera canina</i>	X											
<i>Peltigera collina</i>		X										
<i>Peltigera degenii</i>												
<i>Peltigera elisabethae</i>												
<i>Peltigera evansiana</i>	X			X								

	AS	AR	BA	FG	A	AB	P	PS	TC	US		
<i>Peltigera leucophlebia</i>		X										
<i>Peltigera polydactyla</i>	X					X	X					
<i>Peltigera praetextata</i>												
<i>Pertusaria alpina</i>	X		X	X								
<i>Pertusaria amara</i>	X	X	X	X		X	X					
<i>Pertusaria consocians</i>												
<i>Pertusaria macounii</i>	X	X	X	X								
<i>Pertusaria multipunctoides</i>												
<i>Pertusaria ophthalmiza</i>			X				X					
<i>Pertusaria rubefacta</i>	X	X	X									
<i>Pertusaria trachythallina</i>				X	X							
<i>Pertusaria velata</i>	X	X	X									
<i>Pertusaria waghornei</i>		X		X								
<i>Phaeocalicium betulinum</i>			X									
<i>Phaeocalicium matthewsonianum</i>												
<i>Phaeocalicium polyporaenum</i>												
<i>Phaeophyscia pusilloides</i>												
<i>Phaeophyscia rubropulchra</i>				X								
<i>Phlyctis agelaea</i>	X			X								
<i>Physcia adscendens</i>												
<i>Physcia stellaris</i>			X									
<i>Physconia deterosa</i>	X			X								
<i>Platismatia glauca</i>	X	X	X			X	X	X	X	0		
<i>Platismatia tuckermanii</i>						X						
<i>Polychidium muscicola</i>												
<i>Pseudocyphellaria crocata</i>	X											
<i>Punctelia rudecta</i>	X	X	X									
<i>Pyrenula laevigata</i>	X											
<i>Pyrenula pseudobufonia</i>		X		X								
<i>Pyxine soledata</i>	X		X									
<i>Ramalina americana</i>			X			X						
<i>Ramalina dilacerata</i>					X							
<i>Ramalina farinacea</i>	X		X									
<i>Ramalina roesleri</i>	X	X	X			X	X					
<i>Ramalina thrausta</i>		X	X			X						
<i>Rinodina ascociscana</i>	X		X									
<i>Rinodina subminuta</i>	X		X									
<i>Ropalospora chlorantha</i>	X		X	X	X		X					
<i>Schismatomma pericleum</i>												
<i>Sclerophora coniophaea</i>												
<i>Sclerophora peronella</i>												

	AS	AR	BA	FG	A	AB	P	PS	TC	US		
<i>Scoliciosporum chlorococcum</i>												
<i>Sphaerophorus globosus</i>						X			X			
<i>Sphinctrina turbinata</i>		X										
<i>Stenocybe major</i>						X						
<i>Strangospora microhaema</i>	X											
<i>Strigula stigmatella</i>	X											
<i>Thelotrema lepadinum</i>	X	X	X			X						
<i>Tuckermannopsis americana</i>					X							
<i>Tuckermannopsis ciliaris</i> group												
<i>Tuckermannopsis orbata</i>												
<i>Usnea lapponica</i>			0									
<i>Usnea subfloridana</i>								X				
<i>Vulpicida pinastri</i>								X				

Appendix 5.

List of epiphytic species, by substrate, recorded at Corney Brook Natural Area (x designates species collected on corticolous, i.e., bark,

substrates; o designates species collected on lignicolous, i.e., wood, substrates). See methods section for key to tree species abbreviations.

	AS	AR	AP	BA	BP	QR	FA	PP	PT	SA	AB	PG
<i>Acrocordia cavata</i>	x					x	x					
<i>Amandinea punctata</i>			x	x	xo	x	x	x	x	x		
<i>Anisomeridium nyssigenum</i>							x					
<i>Arthonia byssacea</i>												
<i>Arthonia didyma</i>												
<i>Arthonia diffusella</i>												
<i>Arthonia radiata</i>												
<i>Bacidia laurocerasi</i>	x											
<i>Bacidia rosella</i>												
<i>Bacidia rubella</i>												
<i>Bacidia sabuletorum</i>												
<i>Biatora helvola</i>								x	x			
<i>Biatora vernalis</i>							x		x		x	
<i>Bryoria fuscescens</i>												
<i>Bryoria nadvornikiana</i>												
<i>Bryoria trichodes</i>												
<i>Buellia disciformis</i>	x	x	x	x		x	x		x			
<i>Calicium abietinum</i>												
<i>Calicium glaucellum</i>												
<i>Calicium lenticulare</i>												
<i>Calicium salicinum</i>												
<i>Calicium viride</i>												
<i>Caloplaca cerina</i>												
<i>Caloplaca discolor</i>	x						x					
<i>Caloplaca flavorubescens</i>												
<i>Candelariella efflorescens</i>												
<i>Catillaria nigroclavata</i>												
<i>Catinaria atropurpurea</i>							x					
<i>Cetrelia olivetorum</i>												
<i>Chaenotheca brachypoda</i>												
<i>Chaenotheca brunneola</i>												
<i>Chaenotheca chlorella</i>												
<i>Chaenotheca chrysocephala</i>												
<i>Chaenotheca ferruginea</i>												
<i>Chaenotheca furfuracea</i>												
<i>Chaenotheca gracillima</i>												

	AS	AR	AP	BA	BP	QR	FA	PP	PT	SA	AB	PG
<i>Chaenotheca hispidula</i>												
<i>Chaenotheca sphaerocephala</i>												
<i>Chaenotheca stemonea</i>												
<i>Chaenotheca trichialis</i>												
<i>Chaenotheca xyloxena</i>												
<i>Chaenothecopsis brevipes</i>												
<i>Chaenothecopsis debilis</i>						0						
<i>Chaenothecopsis pusilla</i>												
<i>Chaenothecopsis pusiola</i>												
<i>Chaenothecopsis rubescens</i>												
<i>Chaenothecopsis savonica</i>												
<i>Chaenothecopsis viridireagens</i>												
<i>Cladina rangiferina</i>												
<i>Cladonia caespiticia</i>												
<i>Cladonia cenotea</i>												
<i>Cladonia chlorophaea</i> group							X	X				
<i>Cladonia coniocraea</i>					X						X	
<i>Cladonia furcata</i>					X						X	
<i>Cladonia pyxidata</i>					X	X					X	
<i>Cladonia scabriuscula</i>					X							
<i>Cladonia squamosa</i>												
<i>Collema furfuraceum</i>	X						X		X			
<i>Conotrema urceolatum</i>												
<i>Dendroscopaulon umhausense</i>												
<i>Dimerella lutea</i>												
<i>Dimerella pineti</i>												
<i>Graphis scripta</i>	X	X	X	X	X	X	X		X		X	
<i>Hypogymnia physodes</i>					X							
<i>Hypogymnia tubulosa</i>												
<i>Hypogymnia vittata</i>												
<i>Imshaugia aleurites</i>								X				
<i>Jullela fallaciosa</i>	X						X					
<i>Lecanactis abietina</i>												
<i>Lecanora caesiorubella</i>						X						
<i>Lecanora subfusca</i> group	X	X	X	X		X	X	X	X			
<i>Lecanora symmicta</i>	X			X	XO			X	X			
<i>Lecanora thysanophora</i>												
<i>Lecidea albofuscescens</i>												
<i>Lepraria</i> sp.		X			X	X	X					
<i>Leptogium cyanescens</i>	X	X				X	X		X			
<i>Leptogium laceroides</i>												
<i>Leptogium saturninum</i>												

	AS	AR	AP	BA	BP	QR	FA	PP	PT	SA	AB	PG
<i>Lithothelium macrosporum</i>												
<i>Lobaria pulmonaria</i>							X					
<i>Lobaria quercizans</i>	X						X					
<i>Lobaria scrobiculata</i>												
<i>Lopadium disciforme</i>					X							X
<i>Loxospora cisionica</i>											X	
<i>Loxospora elatina</i>												
<i>Loxospora ochrophaea</i>												
<i>Megalaria grossa</i>												
<i>Megalaria laureri</i>	X											
<i>Melanelia subaurifera</i>	X	X	X	X	X	X	X	X	X	X	X	X
<i>Menegazzia terebrata</i>												
<i>Micarea globulosella</i>												
<i>Micarea melaena</i>												
<i>Micarea peliocarpa</i>					X							
<i>Micarea prasina</i>												
<i>Mycocalicium subtile</i>						0	0				0	
<i>Nephroma bellum</i>												
<i>Nephroma helveticum</i>												
<i>Nephroma laevigatum</i>							X					
<i>Nephroma parile</i>						X			X			
<i>Normandina pulchella</i>												
<i>Ochrolechia androgyna</i>					X	X	X	X	X			
<i>Ochrolechia mexicana</i>			X			X	X		X			
<i>Ochrolechia pseudopallescens</i>							X					
<i>Ochrolechia trochophora</i>	X			X			X		X			
<i>Opegrapha niveoatra</i>												
<i>Opegrapha ochrocheila</i>												
<i>Opegrapha varia</i>												
<i>Pannaria pezizoides</i>												
<i>Pannaria rubiginosa</i>												
<i>Parmelia saxatilis</i>								X				
<i>Parmelia squarrosa</i>												
<i>Parmelia sulcata</i>	X			X	X	X	X	X	X		X	X
<i>Parmeliella triptophylla</i>									X			
<i>Parmeliopsis ambigua</i>												
<i>Parmeliopsis hyperopta</i>								X				
<i>Peltigera canina</i>												
<i>Peltigera collina</i>												
<i>Peltigera degenii</i>												
<i>Peltigera elisabethae</i>												
<i>Peltigera evansiana</i>												

	AS	AR	AP	BA	BP	QR	FA	PP	PT	SA	AB	PG
<i>Peltigera leucophlebia</i>												
<i>Peltigera polydactyla</i>												
<i>Peltigera praetextata</i>												
<i>Pertusaria alpina</i>	X	X				X	X		X			
<i>Pertusaria amara</i>					X	X					X	X
<i>Pertusaria consocians</i>						X						
<i>Pertusaria macounii</i>	X	X	X	X	X	X	X		X			
<i>Pertusaria multipunctoides</i>												
<i>Pertusaria ophthalmiza</i>		X						X				
<i>Pertusaria rubefacta</i>	X					X	X		X			
<i>Pertusaria trachythallina</i>			X	X	X	X	X	X	X	X		
<i>Pertusaria velata</i>	X			X	X	X	X		X			
<i>Pertusaria waghornei</i>												
<i>Phaeocalicium betulinum</i>												
<i>Phaeocalicium matthewsianum</i>												
<i>Phaeocalicium polyporaeum</i>												
<i>Phaeophyscia pusilloides</i>							X					
<i>Phaeophyscia rubropulchra</i>	X						X					
<i>Phlyctis agelaea</i>												
<i>Physcia adscendens</i>												
<i>Physcia stellaris</i>												
<i>Physconia detera</i>												
<i>Platismatia glauca</i>					X							
<i>Platismatia tuckermanii</i>												
<i>Polychidium muscicola</i>							X					
<i>Pseudocyphellaria crocata</i>												
<i>Punctelia rudecta</i>				X	X	X	X	X	X			
<i>Pyrenula laevigata</i>												
<i>Pyrenula pseudobufonia</i>	X			X		X						
<i>Pyxine soledata</i>												
<i>Ramalina americana</i>												
<i>Ramalina dilacerata</i>												
<i>Ramalina farinacea</i>												
<i>Ramalina roesleri</i>												
<i>Ramalina thrausta</i>												
<i>Rinodina ascociscana</i>												
<i>Rinodina subminuta</i>	X						X					
<i>Ropalospora chlorantha</i>	X	X	X	X	XO	X	X	X	X		X	X
<i>Schismatomma pericleum</i>												
<i>Sclerophora coniophaea</i>												
<i>Sclerophora peronella</i>												

	AS	AR	AP	BA	BP	QR	FA	PP	PT	SA	AB	PG
<i>Scoliciosporum chlorococcum</i>				X							X	
<i>Sphaerophorus globosus</i>												
<i>Sphinctrina turbinata</i>												
<i>Stenocybe flexuosa</i>												
<i>Stenocybe major</i>												
<i>Strangospora microhaema</i>												
<i>Strigula stigmatella</i>												
<i>Thelotrema lepadinum</i>												
<i>Tuckermannopsis americana</i>												
<i>Tuckermannopsis ciliaris group</i>												
<i>Tuckermannopsis orbata</i>												
<i>Usnea lapponica</i>												
<i>Usnea subfloridana</i>												
<i>Vulpicida pinastri</i>												

Appendix 6.

List of epiphytic species, by substrate, recorded at Margaree River Protected Area (x designates species collected on corticolous, i.e., bark,

substrates; o designates species collected on lignicolous, i.e., wood, substrates). See methods section for key to tree species abbreviations.

	AR	AP	Asp	BA	BC	FG	PB	AB	PG	P	US	
<i>Acrocordia cavata</i>	x											
<i>Amandinea punctata</i>	x		x	x								
<i>Anisomeridium nyssigenum</i>	x						x					
<i>Arthonia byssacea</i>												
<i>Arthonia didyma</i>												
<i>Arthonia diffusella</i>				x								
<i>Arthonia radiata</i>												
<i>Bacidia laurocerasi</i>												
<i>Bacidia rosella</i>												
<i>Bacidia rubella</i>	x											
<i>Bacidia sabuletorum</i>							x					
<i>Biatora helvola</i>	x		x	x				x	x			
<i>Biatora vernalis</i>				x								
<i>Bryoria fuscescens</i>												
<i>Bryoria nadvornikiana</i>												
<i>Bryoria trichodes</i>								x				
<i>Buellia disciformis</i>	x							x				
<i>Calicium abietinum</i>												
<i>Calicium glaucellum</i>				o								
<i>Calicium lenticulare</i>				o							o	
<i>Calicium salicinum</i>				o							o	
<i>Calicium viride</i>				x								
<i>Caloplaca cerina</i>												
<i>Caloplaca discolor</i>		x				x	x					
<i>Caloplaca flavorubescens</i>												
<i>Candelariella efflorescens</i>												
<i>Catillaria nigroclavata</i>	x			x				x		x	o	
<i>Catinaria atropurpurea</i>												
<i>Cetrelia olivetorum</i>	x											
<i>Chaenotheca brachypoda</i>												
<i>Chaenotheca brunneola</i>				o								
<i>Chaenotheca chlorella</i>				o								
<i>Chaenotheca chrysocephala</i>				xo							o	
<i>Chaenotheca ferruginea</i>												
<i>Chaenotheca furfuracea</i>				xo								
<i>Chaenotheca gracillima</i>								o				

	AR	AP	Asp	BA	BC	FG	PB	AB	PG	P	US	
<i>Chaenotheca hispidula</i>												
<i>Chaenotheca sphaerocephala</i>				X								
<i>Chaenotheca stemonea</i>				XO								
<i>Chaenotheca trichialis</i>				XO								
<i>Chaenotheca xyloxena</i>												
<i>Chaenothecopsis brevipes</i>												
<i>Chaenothecopsis debilis</i>	0											
<i>Chaenothecopsis pusilla</i>												
<i>Chaenothecopsis pusiola</i>				0								
<i>Chaenothecopsis rubescens</i>												
<i>Chaenothecopsis savonica</i>				XO								
<i>Chaenothecopsis viridireagens</i>				XO								
<i>Cladina rangiferina</i>												
<i>Cladonia caespiticia</i>	X											
<i>Cladonia cenotea</i>				X							0	
<i>Cladonia chlorophaea group</i>												
<i>Cladonia coniocraea</i>				XO				X				
<i>Cladonia furcata</i>												
<i>Cladonia pyxidata</i>	X						X	X				
<i>Cladonia scabriuscula</i>												
<i>Cladonia squamosa</i>	X			X				X		X		
<i>Collema furfuraceum</i>												
<i>Conotrema urceolatum</i>	X					X						
<i>Dendriscoaulon umhausense</i>												
<i>Dimerella lutea</i>												
<i>Dimerella pineti</i>				X								
<i>Graphis scripta</i>	X	X	X	X	X			X				
<i>Hypogymnia physodes</i>	X		X	XO				XO		X	0	
<i>Hypogymnia tubulosa</i>										X	0	
<i>Hypogymnia vittata</i>				X				X				
<i>Imshaugia aleurites</i>												
<i>Jullela fallaciosa</i>												
<i>Lecanactis abietina</i>				X								
<i>Lecanora caesiurubella</i>	X							X				
<i>Lecanora subfusca group</i>	X	X		X		X	X	X				
<i>Lecanora symmicta</i>												
<i>Lecanora thysanophora</i>				X								
<i>Lecidea albofuscescens</i>								X				
<i>Lepraria sp.</i>	X			XO						X		
<i>Leptogium cyanescens</i>	X	X					X					
<i>Leptogium laceroides</i>												
<i>Leptogium saturninum</i>				X								

	AR	AP	Asp	BA	BC	FG	PB	AB	PG	P	US	
<i>Lithothelium macrosporum</i>												
<i>Lobaria pulmonaria</i>	X	X		X		X	X					
<i>Lobaria quercizans</i>	X	X				X	X					
<i>Lobaria scrobiculata</i>	X			X								
<i>Lopadium disciforme</i>	X			X				X		X		
<i>Loxospora cismanica</i>								X				
<i>Loxospora elatina</i>				X				X		X		
<i>Loxospora ochrophaea</i>	X							X		X		
<i>Megalaria grossa</i>	X											
<i>Megalaria laureri</i>												
<i>Melanelia subaurifera</i>	X	X		0				X				
<i>Menegazzia terebrata</i>												
<i>Micarea globulosella</i>												
<i>Micarea melaena</i>												
<i>Micarea peliocarpa</i>	X	X		X			X					
<i>Micarea prasina</i>				X								
<i>Mycocalicium subtile</i>								0		0	0	
<i>Nephroma bellum</i>	X											
<i>Nephroma helveticum</i>												
<i>Nephroma laevigatum</i>												
<i>Nephroma parile</i>												
<i>Normandina pulchella</i>												
<i>Ochrolechia androgyna</i>	X	X		X				X		X		
<i>Ochrolechia mexicana</i>												
<i>Ochrolechia pseudopallescens</i>												
<i>Ochrolechia trochophora</i>	X						X					
<i>Opegrapha niveoatra</i>				X								
<i>Opegrapha ochrocheila</i>	0											
<i>Opegrapha varia</i>	X0					X						
<i>Pannaria pezizoides</i>												
<i>Pannaria rubiginosa</i>							X					
<i>Parmelia saxatilis</i>												
<i>Parmelia squarrosa</i>	X	X	X	X			X	X		X		
<i>Parmelia sulcata</i>	X	X	X	X			X	X		X	0	
<i>Parmeliella triptophylla</i>							X					
<i>Parmeliopsis ambigua</i>												
<i>Parmeliopsis hyperopta</i>												
<i>Peltigera canina</i>	X											
<i>Peltigera collina</i>												
<i>Peltigera degenii</i>												
<i>Peltigera elisabethae</i>												
<i>Peltigera evansiana</i>												

	AR	AP	Asp	BA	BC	FG	PB	AB	PG	P	US	
<i>Peltigera leucophlebia</i>												
<i>Peltigera polydactyla</i>												
<i>Peltigera praetextata</i>							X					
<i>Pertusaria alpina</i>												
<i>Pertusaria amara</i>	X	X	X	XO			X	X		X		
<i>Pertusaria consocians</i>		X					X	X				
<i>Pertusaria macounii</i>	X			X		X		X				
<i>Pertusaria multipunctoides</i>				X								
<i>Pertusaria ophthalmiza</i>	X				X			X				
<i>Pertusaria rubefacta</i>												
<i>Pertusaria trachythallina</i>												
<i>Pertusaria velata</i>	X						X					
<i>Pertusaria waghornei</i>		X			X							
<i>Phaeocalicium betulinum</i>												
<i>Phaeocalicium matthewsianum</i>				X								
<i>Phaeocalicium polyporacum</i>												
<i>Phaeophyscia pusilloides</i>												
<i>Phaeophyscia rubropulchra</i>						X						
<i>Phlyctis agelaea</i>				X		X						
<i>Physcia adscendens</i>												
<i>Physcia stellaris</i>												
<i>Physconia deterosa</i>												
<i>Platismatia glauca</i>	X			XO	X			XO		X	O	
<i>Platismatia tuckermanii</i>												
<i>Polychidium muscicola</i>												
<i>Pseudocyphellaria crocata</i>												
<i>Punctelia rudecta</i>	X			X			X					
<i>Pyrenula laevigata</i>												
<i>Pyrenula pseudobufonia</i>												
<i>Pyxine soresdiata</i>	X											
<i>Ramalina americana</i>								X				
<i>Ramalina dilacerata</i>				X				X				
<i>Ramalina farinacea</i>				XO								
<i>Ramalina roesleri</i>	X	X	X	XO				X	X			
<i>Ramalina thrausta</i>								X				
<i>Rinodina ascociscana</i>												
<i>Rinodina magnussonii</i>												
<i>Rinodina subminuta</i>												
<i>Ropalospora chlorantha</i>	X	X	X	X	X			X			O	
<i>Schismatomma pericleum</i>	X											
<i>Sclerophora coniophaea</i>				X								

	AR	AP	Asp	BA	BC	FG	PB	AB	PG	P	US	
<i>Sclerophora peronella</i>	0											
<i>Scoliciosporum chlorococcum</i>												
<i>Sphaerophorus globosus</i>				X						X		
<i>Sphinctrina turbinata</i>	X	X										
<i>Stenocybe flexuosa</i>												
<i>Stenocybe major</i>												
<i>Strangospora microhaema</i>												
<i>Strigula stigmatella</i>												
<i>Thelotrema lepadinum</i>	X	X		X				X		X		
<i>Tuckermannopsis americana</i>												
<i>Tuckermannopsis ciliaris</i> group												
<i>Tuckermannopsis orbata</i>								X				
<i>Usnea lapponica</i>								X				
<i>Usnea subfloridana</i>				X				X			0	
<i>Vulpicida pinastri</i>												

Appendix 7.

Summary of data on epiphytic lichens recorded for each of the forest sites studied in the current investigation, as well as those previously investigated in New England and New Brunswick. Stands are ranked according to decreasing Index of Ecological Continuity

(IEC) value, which are based on the percentage occurrence of ancient forest indicator lichen species (See Appendix 1). Total number of calicioid lichens and fungi are shown in parenthesis (After Selva 1994, 1996)

Lichen Epiphytes

	Total	On Angiosperms Only	IEC
Big Reed Preserve	136 (21)	103(12)	155
Musquacook	105(11)	94(9)	150
North River	124(25)	110(19)	130
Yankeetuladi Hardwoods	97(10)	89(9)	120
Hedgehog Mountain	79(11)	77(9)	120
The Bowl	101(15)	91(13)	115
Mount Bailey	106(11)	101(10)	115
Margaree River	100(22)	90(20)	115
Big Brook	89(14)	85(11)	110
Sugarloaf Mountain	97(21)	88(18)	100
Mountain Pond	82(9)	77(9)	100
The Cape	83(11)	80(8)	90
Lunksoos Mountain	78(5)	78(4)	90
Guifford Woods	80(10)	76(6)	80
Grande Anse	90(12)	87(9)	70
Morrison Mountain	60(7)	60(7)	75
Township 19 Range 11	58(5)	52(2)	45
Township 4 Range 7	46(2)	46(2)	40
Chandler Ridge	53(6)	49(3)	35
Corney Brook	60(2)	59(2)	20
Pennington Pond	48(2)	48(2)	5
Smith Road	41(0)	38(0)	5
Charette Hill	40(4)	36(3)	5

Appendix 8.

The Lichens of Cape Breton Island. A compilation of the species reported by Lamb (1954), Scotter (1966), Selva (1998), and those of the current

investigation. The species names reported by Lamb and Scotter have been synonymized with current, accepted nomenclature.

<i>Acarospora amphibola</i>	<i>Buellia schaereri</i>
<i>Acrodordia cavata</i>	<i>Buellia stillingiana</i>
<i>Acarospora fuscata</i>	<i>Calicium abietinum</i>
<i>Alectoria nigricans</i>	<i>Calicium glacellum</i>
<i>Alectoria sarmentosa</i>	<i>Calicium lenticulare</i>
<i>Amandinea punctata</i>	<i>Calicium parvum</i>
<i>Anisomeridium nyssigenum</i>	<i>Calicium salicinum</i>
<i>Arctoparmelia centrifuga</i>	<i>Calicium viride</i>
<i>Arctoparmelia incurva</i>	<i>Caloplaca cerina</i>
<i>Arthonia byssacea</i>	<i>Caloplaca discolor</i>
<i>Arthonia didyma</i>	<i>Caloplaca flavorubescens</i>
<i>Arthonia diffusella</i>	<i>Caloplaca flavovirescens</i>
<i>Arthonia radiata</i>	<i>Caloplaca fraxinea</i>
<i>Aspicilia cinerea</i>	<i>Caloplaca holocarpa</i>
<i>Aspicilia laevata</i>	<i>Caloplaca scopularis</i>
<i>Bacidia laurocerasi</i>	<i>Caloplaca vitellinula</i>
<i>Bacidia rosella</i>	<i>Candelariella efflorescens</i>
<i>Bacidia rubella</i>	<i>Candelariella vitellina</i>
<i>Bacidia sabuletorum</i>	<i>Catillallaria nigroclavata</i>
<i>Bacidia schweinitzii</i>	<i>Catinaria atropurpurea</i>
<i>Baeomyces rufus</i>	<i>Cetrelia cetrarioides</i>
<i>Biatora helvola</i>	<i>Cetrelia olivetorum</i>
<i>Biatora vernalis</i>	<i>Cetraria aculeata</i>
<i>Bryoria implexa</i>	<i>Cetraria ericetorum</i>
<i>Bryoria lanestris</i>	<i>Cetraria islandica</i>
<i>Bryoria furcellata</i>	<i>Chaenotheca brachypoda</i>
<i>Bryoria fuscescens</i>	<i>Chaenotheca brunneola</i>
<i>Bryoria nadvornikiana</i>	<i>Chaenotheca chlorella</i>
<i>Bryoria trichodes</i>	<i>Chaenotheca chrysocephala</i>
<i>Buellia disciformis</i>	<i>Chaenotheca ferruginea</i>
<i>Buellia griseovirens</i>	<i>Chaenotheca furfuracea</i>

<i>Chaenotheca gracillima</i>	<i>Cladonia turgida</i>
<i>Chaenotheca hispidula</i>	<i>Cladonia uncialis</i>
<i>Chaenotheca sphaerocephala</i>	<i>Cladonia wainioi</i>
<i>Chaenotheca stemonea</i>	<i>Cliostomum griffithii</i>
<i>Chaenotheca trichialis</i>	<i>Collema furfuraceum</i>
<i>Chaenotheca xyloxena</i>	<i>Collema leptaleum</i>
<i>Chaenothecopsis brevipes</i>	<i>Collema nigrescens</i>
<i>Chaenothecopsis debilis</i>	<i>Conotrema urceolatum</i>
<i>Chaenothecopsis pusilla</i>	<i>Degelia plumbea</i>
<i>Chaenothecopsis pusiola</i>	<i>Dendriscoaulon umhausense</i>
<i>Chaenothecopsis rubescens</i>	<i>Dermatocarpon luridum</i>
<i>Chaenothecopsis savonica</i>	<i>Dibaeis baeomyces</i>
<i>Chaenothecopsis viridireagens</i>	<i>Dimerella lutea</i>
<i>Cladina arbuscula</i>	<i>Dimerella pineti</i>
<i>Cladina mitis</i>	<i>Evernia mesomorpha</i>
<i>Cladina portentosa</i>	<i>Flavocetraria nivalis</i>
<i>Cladina rangiferina</i>	<i>Flavoparmelia caperata</i>
<i>Cladina stellaris</i>	<i>Fuscidea recensa</i>
<i>Cladonia boryi</i>	<i>Fuscopannaria praetermissa</i>
<i>Cladonia caespiticia</i>	<i>Graphis scripta</i>
<i>Cladonia cenotea</i>	<i>Hypogymnia physodes</i>
<i>Cladonia cervicornis subsp. verticillata</i>	<i>Hypogymnia tubulosa</i>
<i>Cladonia chlorophaea group</i>	<i>Hypogymnia vittata</i>
<i>Cladonia coniocraea</i>	<i>Icmadophila ericetorum</i>
<i>Cladonia cornuta</i>	<i>Imshaugia aleurites</i>
<i>Cladonia crispata</i>	<i>Jullela fallaciosa</i>
<i>Cladonia cristatella</i>	<i>Lasallia papulosa</i>
<i>Cladonia digitata</i>	<i>Lecanactis abietina</i>
<i>Cladonia ecmocyna</i>	<i>Lecanora albella</i>
<i>Cladonia fimbriata</i>	<i>Lecanora caesiorubella</i>
<i>Cladonia furcata</i>	<i>Lecanora glabrata</i>
<i>Cladonia multiformis</i>	<i>Lecanora hagenii</i>
<i>Cladonia pleurota</i>	<i>Lecanora hypoptoides</i>
<i>Cladonia pyxidata</i>	<i>Lecanora insignis</i>
<i>Cladonia scabriuscula</i>	<i>Lecanora intricata</i>
<i>Cladonia squamosa</i>	<i>Lecanora microbola</i>
<i>Cladonia sulphurina</i>	<i>Lecanora polytropa</i>

<i>Lecanora pulicaris</i>	<i>Menegazzia terebrata</i>
<i>Lecanora subfusca</i> group	<i>Micarea erratica</i>
<i>Lecanora symmicta</i>	<i>Micarea globulosella</i>
<i>Lecanora thysanophora</i>	<i>Micarea melaena</i>
<i>Lecanora xylophila</i>	<i>Micarea peliocarpa</i>
<i>Lecidea albofuscescens</i>	<i>Micarea prasina</i>
<i>Lecidea confluens</i>	<i>Microcalicium arenarium</i>
<i>Lecidea lapicida</i>	<i>Mycoblastus affinis</i>
<i>Lecidea plana</i>	<i>Mycoblastus sanguinarius</i>
<i>Lecidea tessellata</i>	<i>Mycocalicium subtile</i>
<i>Lecidella effugiens</i>	<i>Myelochroa galbina</i>
<i>Lepraria incana</i>	<i>Nephroma arcticum</i>
<i>Lepraria</i> spp.	<i>Nephroma bellum</i>
<i>Leproloma membranaceum</i>	<i>Nephroma helveticum</i>
<i>Leptogium cyanescens</i>	<i>Nephroma laevigatum</i>
<i>Leptogium laceroides</i>	<i>Nephroma parile</i>
<i>Leptogium saturninum</i>	<i>Normandina pulchella</i>
<i>Lichina confinis</i>	<i>Ochrolechia androgyna</i>
<i>Lithothelium macrosporum</i>	<i>Ochrolechia frigida</i>
<i>Lobaria pulmonaria</i>	<i>Ochrolechia mexicana</i>
<i>Lobaria quercizans</i>	<i>Ochrolechia pseudopallescens</i>
<i>Lobaria scrobiculata</i>	<i>Ochrolechia trochophora</i>
<i>Lopadium disciforme</i>	<i>Opegrapha niveoatra</i>
<i>Loxospora cismonica</i>	<i>Opegrapha ochrocheila</i>
<i>Loxospora elatina</i>	<i>Opegrapha varia</i>
<i>Loxospora ochrophaea</i>	<i>Pannaria pezizoides</i>
<i>Massalongia carnosa</i>	<i>Pannaria rubiginosa</i>
<i>Megalaria grossa</i>	<i>Parmelia omphalodes</i>
<i>Megalaria laureri</i>	<i>Parmelia saxatilis</i>
<i>Melanelia disjuncta</i>	<i>Parmelia squarrosa</i>
<i>Melanelia fuliginosa</i>	<i>Parmelia sulcata</i>
<i>Melanelia hepatizon</i>	<i>Parmeliella corallinoides</i>
<i>Melanelia olivacea</i>	<i>Parmeliella triptophylla</i>
<i>Melanelia panniformis</i>	<i>Parmeliopsis ambigua</i>
<i>Melanelia sorediata</i>	<i>Parmeliopsis hyperopta</i>
<i>Melanelia stygia</i>	<i>Peltigera aphthosa</i>
<i>Melanelia subaurifera</i>	<i>Peltigera canina</i>

<i>Peltigera collina</i>	<i>Platismatia glauca</i>
<i>Peltigera degenii</i>	<i>Platismatia tuckermanii</i>
<i>Peltigera didactyla</i>	<i>Polychidium muscicola</i>
<i>Peltigera elisabethae</i>	<i>Polysporina simplex</i>
<i>Peltigera evansiana</i>	<i>Porpidia cinereoatra</i>
<i>Peltigera horizontalis</i>	<i>Porpidia crustulata</i>
<i>Peltigera leucophlebia</i>	<i>Porpidia macrocarpa</i>
<i>Peltigera membranacea</i>	<i>Porpidia tuberculosa</i>
<i>Peltigera polydactylon</i>	<i>Pseudocyphellaria crocata</i>
<i>Peltigera praetextata</i>	<i>Punctelia rudecta</i>
<i>Peltigera rufescens</i>	<i>Pycnothelia papillaria</i>
<i>Peltigera scabrosa</i>	<i>Pyrenula laevigata</i>
<i>Pertusaria alpina</i>	<i>Pyrenula pseudobufonia</i>
<i>Pertusaria amara</i>	<i>Pyrrhospora varians</i>
<i>Pertusaria consocians</i>	<i>Pyxine sorediata</i>
<i>Pertusaria macounii</i>	<i>Ramalina americana</i>
<i>Pertusaria multipunctoides</i>	<i>Ramalina dilacerata</i>
<i>Pertusaria neoscotica</i>	<i>Ramalina farinacea</i>
<i>Pertusaria ophthalmiza</i>	<i>Ramalina pollinaria</i>
<i>Pertusaria rubefacta</i>	<i>Ramalina roesleri</i>
<i>Pertusaria trachythallina</i>	<i>Ramalina thrausta</i>
<i>Pertusaria velata</i>	<i>Rhizocarpon concentricum</i>
<i>Pertusaria waghornei</i>	<i>Rhizocarpon disporum</i>
<i>Phaeocalicium betulinum</i>	<i>Rhizocarpon distinctum</i>
<i>Phaeocalicium matthewsianum</i>	<i>Rhizocarpon eupetraeum</i>
<i>Phaeocalicium compressulum</i>	<i>Rhizocarpon geographicum</i>
<i>Phaeocalicium polyporaenum</i>	<i>Rhizocarpon obscuratum</i>
<i>Phaeocalicium populneum</i>	<i>Rhizocarpon plicatile</i>
<i>Phaeophyscia pusilloides</i>	<i>Rhizocarpon tetramerum</i>
<i>Phaeophyscia rubropulchra</i>	<i>Rimularia furvella</i>
<i>Phlyctis agelaea</i>	<i>Rinodina ascociscana</i>
<i>Physcia adscendens</i>	<i>Rinodina subminuta</i>
<i>Physcia aipolia</i>	<i>Ropalospora chlorantha</i>
<i>Physcia dubia</i>	<i>Sarcogyne privigna</i>
<i>Physcia stellaris</i>	<i>Schaereria fuscocinerea</i>
<i>Physconia detera</i>	<i>Schismatomma pericleum</i>
<i>Placynthiella uliginosa</i>	<i>Sclerophora coniophaea</i>

<i>Sclerophora peronella</i>	<i>Verrucaria acrotella</i>
<i>Scoliciosporum chlorococcum</i>	<i>Verrucaria erichsenii</i>
<i>Sphaerophorus fragilis</i>	<i>Verrucaria umbrinula</i>
<i>Sphaerophorus globosus</i>	<i>Vulpicida pinastri</i>
<i>Sphinctrina turbinata</i>	<i>Xanthoparmelia conspersa</i>
<i>Stenocybe flexuosa</i>	<i>Xanthoria elegans</i>
<i>Stenocybe major</i>	<i>Xanthoria parietina</i>
<i>Stenocybe pullatula</i>	<i>Xanthoria polycarpa</i>
<i>Stereocaulon dactylophyllum</i>	<i>Xylographa opegraphella</i>
<i>Stereocaulon depreatii</i>	<i>Xylographa parallela</i>
<i>Stereocaulon grande</i>	
<i>Stereocaulon paschale</i>	
<i>Stereocaulon pileatum</i>	
<i>Stereocaulon saxatile</i>	
<i>Stereocaulon tomentosum</i>	
<i>Strangospora microhaema</i>	
<i>Thelotrema lepadinum</i>	
<i>Trapelia coarctata</i>	
<i>Trapelia involuta</i>	
<i>Trapeliopsis granulosa</i>	
<i>Tuckermannopsis americana</i>	
<i>Tuckermannopsis ciliaris</i> group	
<i>Tuckermannopsis orbata</i>	
<i>Trypethelium virens</i>	
<i>Umbilicaria deusta</i>	
<i>Umbilicaria hyperborea</i>	
<i>Umbilicaria mammulata</i>	
<i>Umbilicaria muehlenbergii</i>	
<i>Umbilicaria polyphylla</i>	
<i>Umbilicaria vellea</i>	
<i>Usnea fibrillosa</i>	
<i>Usnea filipendula</i>	
<i>Usnea lapponica</i>	
<i>Usnea longissima</i>	
<i>Usnea scabrata</i>	
<i>Usnea subfloridana</i>	
<i>Usnea trichodea</i>	

Parcs Canada, région de l'Atlantique, produira trois séries de rapports en sciences des écosystèmes afin de communiquer de nouvelles données scientifiques, de consigner des données scientifiques, et de résumer les connaissances existantes ou de formuler des recommandations d'ordre technique. La fonction principale et le public visé détermineront la série dans laquelle un rapport sera publié. Chaque série contiendra des informations scientifiques et techniques qui viendront enrichir les connaissances existantes, mais ne pourraient être publiées dans les revues professionnelles en raison de leur présentation.

- **Les Rapports techniques en sciences des écosystèmes - Parcs Canada** favoriseront la diffusion à grande échelle d'information scientifique et technique tirée des études spéciales effectuées par Parcs Canada. La matière traitée et la série reflètent l'intérêt et les politiques de Parcs Canada dans de nombreux aspects des sciences des écosystèmes. La série comprendra des inventaires d'écosystèmes, des inventaires de ressources, des études diverses, des relevées sur des espèces ou des guildes et des concepts innovateurs de gestion.
- **Les Rapports d'études en matière de sciences des écosystèmes - Parcs Canada** permettront la publication de comptes rendus, de bibliographies et d'études d'options en matière de gestion faites par Parcs Canada. Les descriptions et les analyses de ressources sont aussi publiées dans cette série, en entier ou en partie.
- **Les Rapports de surveillance et de données relatives aux écosystèmes - Parcs Canada** offriront un moyen de présenter des compilations de données sans analyse détaillée. En général, ce genre de compilation sert à appuyer des publications scientifiques ou des rapports techniques en sciences des écosystèmes. Parcs Canada publiera dans cette série des données brutes qui ne sont pas incluses dans une banque de données nationale et qui méritent l'archivage.

Rapports en sciences des écosystèmes sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé, avec un résumé dans la deuxième langue officielle.

Objectifs

Ces séries de rapports serviront à :

- communiquer les résultats des recherches effectuées en sciences des écosystèmes aux scientifiques et aux gestionnaires, ainsi qu'aux membres du public que les activités entreprises par Parcs Canada en écologie et en conservation intéressent.
- offrir des publications professionnelles, crédibles et précises qui seront soumises à l'évaluation par les pairs.
- favoriser la diffusion de l'information, la créativité, l'efficacité et le travail d'équipe dans les projets de recherche.

Évaluation par les pairs

Le rédacteur nommera deux lecteurs choisis, dans la mesure du possible, parmi le personnel scientifique de Parcs Canada, qui seront chargés de faire une critique de chaque manuscrit. On fera appel à des lecteurs de l'extérieur en raison de l'expertise exigée, du temps disponible et de l'objectivité nécessaire. Les lecteurs renverront le manuscrit au rédacteur en y joignant leurs commentaires par écrit. Le rédacteur renverra le manuscrit à son ou à ses auteurs avec les commentaires des lecteurs. L'auteur prendra connaissance des commentaires et tiendra compte de ceux avec lesquels il est d'accord, puis il retournera le manuscrit révisé au rédacteur en lui expliquant par écrit pourquoi il n'a pas tenu compte de certains commentaires. Le rédacteur enverra ensuite le manuscrit au garde de parc en chef, ou, s'il s'agit d'employés du bureau régional, au superviseur immédiat de l'auteur, pour faire approuver la publication et l'impression du manuscrit. Dans le cas de publications de moindre importance, le rédacteur peut, à sa discrétion, décider de ne pas avoir recours à des lecteurs; lui-même et le superviseur immédiat de l'auteur serviront alors de lecteurs. En cas de désaccord entre l'auteur et le rédacteur au sujet du manuscrit, c'est le gestionnaire ministériel principal qui tranchera.

Directives à l'intention des auteurs

Ces séries de rapports seront consacrées à la publication de travaux effectués dans la région de l'Atlantique en science des écosystèmes et seront mises à la disposition de tous les employés de Parcs Canada, du ministère du Patrimoine canadien, de leurs collaborateurs ou de toute personne qui travaille pour le compte de Patrimoine canadien.

Les auteurs soumettront au rédacteur régional une copie de leur manuscrit sur support en papier, une version sur disquette en WordPerfect Windows ou DOS et le nom de trois lecteurs éventuels qui ne connaissent pas le manuscrit.

Pour de plus amples renseignements, communiquez avec :

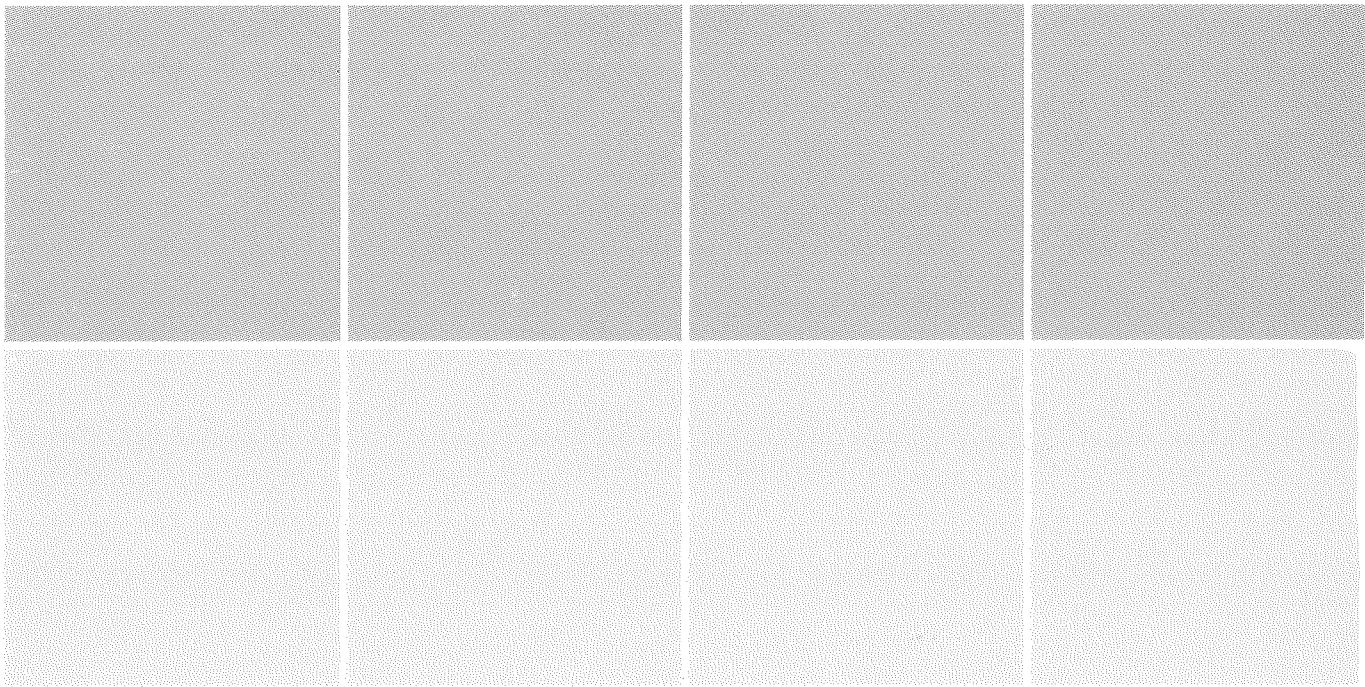
Neil Munro
Rédacteur des séries de Rapports

Parcs Canada
Historic Properties
Halifax (Nouvelle-Écosse)

B3J 1S9

(902) 426-2797

(FAX) 426-2728



Parks Canada
Ecosystem Monitoring
and Data Reports

ISSN 1200-331X

Parcs Canada
Rapports de surveillance
et de données relatives
aux écosystèmes

ISSN 1200-331X