

15.0 Lichens and Bryophytes of Niagara Region

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Lichens and bryophytes (mosses and hepatics) are often neglected in regional animal and plant inventories. That is unfortunate. Mosses are usually abundant (sometimes the dominating) plants in a community while lichens are natural indicators of the cleanliness of our atmosphere. By simply observing the presence and abundance of lichens, one can estimate the air quality in a given location. By having access to a distributional record of lichen species over time one can determine trends in the quality of the atmospheric environment. The present study will allow us to establish a baseline of data from which future research will benefit. Hepatics, or liverworts and hornworts, as they are more commonly known, are a comparatively small and usually less conspicuous group of plants but, as anyone who has observed them under a microscope will attest, they are beautiful organisms that should be known and conserved if only for their beauty.

There was considerable interest in plants of all kinds in the Niagara region in the late 19th and early 20th centuries. The Buffalo Society of Natural Sciences put out *The Plants of Buffalo and Its Vicinity* in 1882 (Day 1882). R. Cameron (1895) published a list of plants “which have been found growing without cultivation” in the Niagara gorge area, including those from sites on both sides of the border. John Macoun, the famous Irish-born Canadian explorer and naturalist, visited the area around the same time and collected and cataloged plants, including lichens and bryophytes. His collections were published in 1892 and 1901.

In combination with present floristic studies, these historical records are important, for they tell us how the flora has changed over the last 100 years. For example, Macoun collected the lichen *Sticta pulmonaria*, now called *Lobaria pulmonaria*, or lungwort, in the Niagara Glen. This species requires an old-growth forest type habitat. It has disappeared from the Niagara area, and from much of southern Ontario. *Teloschistes chrysophthalmus*, the gold-eye lichen, was reported in Cameron (1895) to have been collected in Queen Victoria Park at Niagara Falls. Since then, that species has only been sighted in Ontario a few times, the last sighting having been made about 20 years ago in Prince Edward County on the north side of Lake Ontario. It was a small specimen.

In her recently-published *Preliminary Cryptogamic (Moss, Lichen and Liverwort) Flora of the Canadian and American Gorge at Niagara Falls*, Patricia Eckel (2004) presents a very useful summary of both historical records and of recent observations and collections of lichens, mosses and liverworts in that very specific part of the region. Many of the species listed have not been collected or observed in their original localities since the Cameron or Macoun days but that could be due to insufficient collecting. (There aren't many lichenologists or bryologists around!) The localities given by Eckel for some of the lichens, mosses and liverworts thought to have disappeared from the area should be revisited and thoroughly searched.

In the lists to follow, the species names are presented in alphabetical order. The names and authorities for the epithets usually follow Esslinger (2008) for the lichens and the *Bryophyte Names Authority List (Bryotax)*, *Tropicos* and the *USDA Plants Database* for mosses and hepatics. Every attempt was made to convert older names to the currently accepted names. Several lists are included for each of the groups of plants, starting with my own collections. These are followed by lists published by Wong & Brodo (1992) for lichens, Ireland and Ley (1992) for the mosses and by Eckel (2004) for all three plant groups. In the list based on Eckel, species are annotated with either a reference to a report in a previous paper or to collections and sightings made by Eckel or her fellow researcher Richard Zander.

Only a few lichens have widely used common names. (Lichenologists prefer to use the scientific names). Several of the more common mosses also have English or French names but these too are seldom used by bryologists. When reading this report, it would be beneficial to have handy a copy of *Lichens of North America* (Brodo et al, 2001) and/or *Macrolichens of New England* (Hinds & Hinds, 2007) and *Liverworts of New England* (Lincoln, 2008). These books contain excellent colour photographs of most of the species mentioned here.

The Lichens

I started collecting lichens in Niagara Regional Municipality in 1990. At the time there were 32 species reported for the Region in Wong & Brodo (1992). My research through to the present day has confirmed the presence of all but six of the 32 species. The six species not recorded are: *Cladonia subcariosa* (as *C. polycarpoides* in Wong & Brodo), *Lecanora caesiorubella* subsp. *caesiorubella*, *Lobaria quercizans*, *Myelochroa aurulenta*, *Peltigera ponojensis* and *Pertusaria consocians*. More significantly, my research has yielded another 117 species and one variety. In total, based on my collections and reports in Wong and Brodo and Eckel (with the exception of two dubious taxa in list L3) there are, or were, 142 species and 1 variety of lichens in Niagara R.M.

Of my collections, 68 species and 1 variety occur in only one or two of the 12 municipalities in Niagara Regional Municipality. These represent 58% of the total. Some of the species, although rare in the region as a whole, are locally abundant. Examples are *Cladonia caespiticia*, *C. deformis*, *C. incrassata* and *Placynthiella oligotropha*, all fairly common to frequent at the Wainfleet Bog Conservation Area. Other species, mostly microlichens such as *Micarea prasina*, the *Caloplaca*'s and *Verrucaria*'s, are likely quite common throughout the region but are overlooked and consequently undercollected. Some species, such as *Acarospora fuscata*, *Xanthoparmelia cumberlandia* and *X. viriduloumbrina* prefer acid rock surfaces and will only appear where a suitable granitic glacial erratic boulder lies. *Xanthoria elegans* has only been found on gravestones in one cemetery. *Peltigera didactyla* and *Cladonia symphyocarpia* were found once, on the ground in a sandy area in a graveyard in Pelham. The area has been bulldozed over to make way for more plots. Not long ago I returned to the only locality in Niagara in which *Punctelia bolliana*, the Eastern speckled shield lichen, was known to exist, only to find that the host tree had been cut down, probably to make the intersection on which it was located safer for drivers. It is sad to see biodiversity decline before your very eyes.

Some species that are very common in southern Ontario and to the north are barely registered in Niagara. Only two specimens of *Evernia mesomorpha*, the boreal oakmoss lichen, have been collected or observed. One of these two localities has been removed due to urban development. *Usnea subfloridana* is another very common species north of the highly populated areas in Ontario, but in our study area the species is represented by a single plant in the City of Welland. Many of these species are pollution sensitive and therefore will not do well here. Others, however, have adapted nicely to urban conditions and can be found on trees throughout the Region in abundance. These include: *Candelaria concolor*, *Candellariella efflorescens*, *Melanelixia subaurifera*, *Parmelia sulcata*, *Physcia adscendens*, *P.aipolia*, *P. millegrana* (the most common species), *Physconia detersa* and *Xanthoria fallax*. Several species are very common on trees and/or on moss over rocks in forested or rural areas: *Amandinea punctata*, *Candelariella efflorescens*, *Cladonia grayi*, *C. pyxidata*, *C. subulata*, *Flavopunctelia flaventior*, *Graphis scripta*, *Lecanora symmicta*, *Lepraria lobificans*, *Phaeophyscia adiastrata*, *P. pusilloides*, and *P. rubropulchra* fall into this category.

Two species on my list are rare in Ontario. *Trypethelium virens* and *Strangospora pinicola*. The former is a crust found recently at Short Hills Provincial Park. Wong and Brodo (1992) show it as occurring in Northumberland and Hastings Counties and Carlton-Ottawa Regional Municipality. However, except for one recent discovery in Ottawa-Carleton, all of these collections are historical, going back to Macoun's days (1901). Day (1883) includes the species as having been found within the vicinity (defined as 50 miles radius) of Buffalo. For our modern specimen in Niagara, as in the other Ontario localities, the preferred habitat is the bark of the beech tree in undisturbed areas. Beech is now being threatened with a fungal parasite, which can only be more bad news for *Trypethelium*.

Strangospora pinicola is also a crust, albeit a less conspicuous one. It was found on an old fence post in a rural part of the Town of Port Credit. Wong and Brodo (1992) list one Ontario locality for the species – Haldimand & Norfolk Regional Municipality.

One species on the list is new to Ontario – *Parmotrema reticulatum*. It was found during a Natural Heritage Areas Inventory outing on the trunk and branches of trees in the otherwise rather ordinary Wainfleet Wetlands Conservation Area. This is a mainly southeastern United States species with a northern outpost in northern Michigan.

Further intensive searches will no doubt produce additional new or otherwise interesting species to the region.

Lichen Lists

All species collected by me and listed below are backed up by voucher specimens kept in my personal herbarium. Specimens are available for examination upon request.

The taxa are placed in alphabetical order. Following the species, subspecies or variety name and authority are the growth form, substrate and Niagara municipality in which the plants were found.

The meanings of codes used in the main list are as follows:

Growth form:

cru = crustose (thin thallus, firmly attached to substrate at all points)

fol = foliose (leaf-like thallus, distinctly dorsi-ventral)

fru = fruticose (stalked or bush-shaped, no obvious upper and lower surface)

squ = squamulose (scale-like thallus, lifting at the edges)

Substrate:

cor = corticolous (growing on bark)

lig = lignicolous (growing on wood)

mus = muscicolous (growing on mosses)

sax = saxicolous (growing on rocks)

terr = terricolous (growing on soil, sand or peat)

Municipalities:

FE = Town of Fort Erie
GR = Town of Grimsby
LI = Town of Lincoln
NF = City of Niagara Falls
NL = Town of Niagara-on-the-Lake
PC = City of Port Colborne
PE = Town of Pelham
SC = City of St.Catharines
TH = City of Thorold
WA = Township of Wainfleet
WE = City of Welland
WL = Township of West Lincoln

A “-C” following a municipality code indicates that the locality was reported in Wong & Brodo (1992).

“cf.” is an abbreviation derived from the Latin *confer* meaning “compare”. It is used to indicate uncertainty about the identification.



Trypethelium virens

List L1. Lichen species in collections made by R. Olszewski during the period 1990 – 2009.

Acarospora fuscata (Schrader) Arnold cru,sax WA,WE
Acrocordia conoidea (Fries) Körber cru,sax LI

Amandinea punctata (Hoffm.) Coppins & Scheid. cru,cor GR,LI,NF,PC,PE,WA,WL
Anisomeridium polypori (Ellis & Everh.) M.E. Barr cru,lig NL,PE,TH
Arthonia caesia (Flotow) Körber cru,cor FE,PC,PE,TH,WA,
Aspicilia laevata (Ach.) Arnold cru,sax LI
Bacidia coprodes (Körber) Lettau cru,sax NF,TH
Caloplaca cerina (Ehrh. ex Hedwig) Th. Fr. cru,cor WA
Caloplaca citrina (Hoffm.) Th. Fr. cru,sax LI,NF
Caloplaca feracissima H. Magn. Cru,sax NF-C,PC,SC,WA,WE
Caloplaca flavorubescens (Hudson) J.R. Laundon cru,sax PC,WA
Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth. cru,sax LI,NF,NL
Caloplaca holocarpa (Hoffm. ex Ach.) A.E. Wade cru,lig WA,WK
Caloplaca microphyllina (Tuck.) Hasse cru,lig GR
Caloplaca sideritis (Tuck.) Zahlbr. cru,sax NF, LI(cf.)
Candelaria concolor (Dickson) Stein fol,cru FE,GR,LI,NF,NL,PC,PE,SC,TH,WA,WE,WL
Candelariella aurella (Hoffm.) Zahlbr. cru,sax NL,PC,WA,WE
Candelariella efflorescens R.C. Harris & W.R. Buck cru,cor/lig GR,LI,NL,PE,TH,WL
Candelariella xanthostigma (Ach.) Lettau cru,lig WL
Cladonia caespiticia (Pers.) Flörke fru,mus NL,WA
Cladonia cariosa (Ach.) Sprengel fru,mus GR
Cladonia cervicornis subsp. *verticillata* (Hoffm.) Ahti fru,ter/lig PE,TH,WE,WL
Cladonia coniocraea (Flörke) Sprengel fru,cor FE,PC-C,SC,TH,WA,WL
Cladonia cristatella Tuck. fru,mus/lig/ter FE,NF-C,PE,TH,WA,WE
Cladonia deformis (L.) Hoffm. fru,ter/lig WA
Cladonia fimbriata (L.) Fr. fru,ter FE,LI,NF-C,WA,WL
Cladonia furcata (Hudson) Schrader fru,ter LI,NL-C,PE,SC,TH,WL
Cladonia grayi G. Merr. ex Sandst. fru/ter PE,TH,WA
Cladonia humilis (With.) J.R. Laundon fru,mus/ter NF-C,PC,PE,SCWA,WE
Cladonia incrassata Flörke fru,mus/ter WA
Cladonia macilenta var. *bacillaris* (Genth) Schaerer fru,ter FE,NF-C,PC,PE,WA,WL
Cladonia macilenta Hoffm. fru WA
Cladonia multiformis G. Merr. fru FE,WA
Cladonia parasitica (Hoffm.) Hoffm. fru,lig FE,WL
Cladonia peziziformis (With.) J.R. Laundon fru,ter FE
Cladonia phyllophora Hoffm. fru PC
Cladonia pleurota (Flörke) Schaerer fru WA
Cladonia pyxidata (L.) Hoffm. fru,ter FE,GR,LI,NL,WE,WL
Cladonia ramulosa (With.) J.R. Laundon fru FE,NF,PC-C,WE
Cladonia scabriuscula (Delise) Leighton fru PC,PE,WA,WE
Cladonia subulata (L.) F.H. Wigg fru,ter FE,NF-C,PC,PE,SC,TH,WA,WL
Cladonia symphyrcarpia (Flörke) Fr. PE
Collema bachmanianum (Fink) Degel. fol,ter TH
Cyphelium tigillare (Ach.) Ach. cru,lig NF-C,PE,WL
Dermatocarpon luridum (With.) J.R. Laundon fol,sax LI
Diplotomma epipolium (Ach.) Arnold cru,sax NL
Endocarpon pusillum Hedw. squ,sax GR,NF
Evernia mesomorpha Nyl. fru,cor LI,WE
Flavoparmelia baltimorensis (Gyelnik & Főriss) Hale fol,sax LI
Flavoparmelia caperata (L.) Hale fol,cor FE,LI-C,SC,TH,WE,WL
Flavopunctelia flaventior (Stirton) Hale fol,cor/lig FE,GR,LI,PC,PE,TH,WE,WL
Flavopunctelia soledica (Nyl.) Hale fol PE

Graphis scripta (L.) Ach. cru,cor GR,LI,SC,TH,WL
Hypocenomyces scalaris (Ach.) M. Choisy fol LI,NF,PE,TH,WL
Hypogymnia physodes (L.) Nyl. squ,lig FE,NF-C,TH,WE,
Lecania cyrtella (Acharius) Th. Fr. cru NL
Lecania naegelii (Hepp) Diederich & van den Boom cru PC,WA
Lecanora dispersa (Pers.) Sommerf. cru,sax TH,WA,WE
Lecanora hagenii (Ach.) Ach. cru,lig TH
Lecanora polytropa (Hoffm.) Rabenh. cru, sax WE
Lecanora saligna (Schrader) Zahlbr. cru NF-C,PC
Lecanora symmicta (Ach.) Ach. cru,cor FE,LI,NF,PC,PE,WA,WE,WL
Lecanora thysanophora R.C. Harris cru,cor FE,LI,PE,WA
Lecidella stigmatea (Ach.) Hertel & Leuckert cru TH
Lepraria lobificans Nyl. cru,cor/sax,lig/mus FE,GR,LI,NF,NL,PC,PE,SC,TH,WA,WL
Leptogium cyanescens (Rabenh.) Körber fol LI
Leptogium lichenoides (L.) Zahlbr. fol GR,LI,NL
Melanelixia subaurifera (Nyl.) O. Blanco fol,cor FE,GR,NF,PC,PE,TH,WA,WE,WL
Micarea prasina Fr. cru,lig TH
Myxobilimbia sabuletorum (Schreber) Lettau cru,mus GR,LI,NF,SC
Ochrolechia arborea (Kreyer) Almb. cru WL
Parmelia sulcata Taylor fol,cru FE,GR,LI,NF,NL,PC,PE,SC,TH,WA,WE,WL
Parmotrema reticulatum (Taylor) M. Choisy fol,lig WA
Peltigera canina (L.) Willd. fol LI,SC,WL
Peltigera didactyla (With.) J. R. Laundon fol PE
Peltigera elisabethae Gyelnik fol LI
Peltigera evansiana Gyelnik fol,lig GR,WL
Peltigera lepidophora (Nyl. ex Vainio) Bitter fol,lig GR,LI
Peltigera praetextata (Flörke ex Sommerf.) Zopf fol,mus/sax LI,TH
Peltigera rufescens (Weiss) Humb. fol LI
Pertusaria pustulata (Ach.) Duby cru,cor TH
Phaeophyscia adiastrata (Essl.) Essl. fol,mus GR,LI,NF,NL,PE,TH
Phaeophyscia hirtella Essl. fol FE
Phaeophyscia pusilloides (Zahlbr.) Essl. fol,cor FE,GR,LI,NF,NL,PC,PE, SC,TH,WA,WE
Phaeophyscia rubropulchra (Degel.) Essl.) fol,cor FE,GR,LI,NF,NL,PC,PE,SC,TH,WA,
 WE,WL
Physcia adscendens (Fr.) H. Olivier fol,cor FE,GR,LI,NF,NL,PC,PE,SC,TH,WA,WE,WL
Physcia aipolia (Humb.) Fürnr. fol,cor FE,GR,LI,NL,PC,PE,TH,WA,WE,WL
Physcia dubia (Hoffm.) Lettau fol,cor LI,PC-C,PE
Physcia millegrana Degel. fol,cor FE,GR,LI,NF,NL,PC,PE,SC,TH,WA,WE,WL
Physcia stellaris (L.) Nyl. fol,cor TH,WL
Physciella chloantha (Ach.) Essl. fol,cor FE,LI,NL,SC,WA,WL
Physconia detersa (Nyl.) Poelt fol,cor FE,GR,LI,NF,NL,PC,SC,TH,WE,WL
Physconia enteroxantha (Nyl.) Poelt fol,cor GR,PC,WA
Placidium squamulosum (Ach.) Breuss GR,WA
Placynthiella icmalea (Ach.) Coppins & P. James cru,ter WL
Placynthiella oligotropa (J.R. Laundon) Coppins & P. James cru,ter WA
Placynthium nigrum (Hudson) Gray fol,mus/sax LI,NF
Porpidia albocaerulescens (Wulfen) Hertel & Knoph cru,sax GR,NF,SC
Porpidia crustulata (Ach.) Hertel & Knoph cru,sax TH
Protoblastenia rupestris (Scop.) Steiner cru,sax LI,NF,PC,WA,WE
Punctelia bolliana (Müll. Arg.) Krog fol PE

Punctelia rudecta (Ach.) Krog fol,cor GR,LI,NL,SC,TH,WL
Sargogyne regularis Körber cru
Scoliosporum chlorococcum (Stenh.) Vezda cru FE,NF,NL,PC-C
Strangospora pinicola (A. Massal.) Körber cru,lig PC
Thelidium sp. cru LI
Trapelia placodioides Coppins & P. James cru GR,LI,PC,TH,
Trapeliopsis flexuosa (Fr.) Coppins & P. James cru,lig WA
Trypethelium virens Tuck. ex Michener cru,cor TH
Tuckermannopsis americana (Sprengel) Hale fol WE
Usnea subfloridana Stirton fru,cor WE
Verrucaria calkinsiana Servit cru,sax PC,WE
Verrucaria fuscella (Turner) Winch cru,sax NL
Verrucaria muralis Ach. cru,sax LI,NL
Verrucaria nigrescens Pers. cru,sax LI
Xanthomendoza fallax (Hepp ex Arnold) Søchting, Kärnefelt & S. Kondr. fol,cor
FE,NF,NL,PC,PE,WA,WE,WL
Xanthoparmelia cumberlandia (Gyelnik) Hale fol,sax WA,WE
Xanthoparmelia viriduloumbrina fol,sax (Gyelnik) Lendemer fol TH
Xanthoria elegans (Link) Th. Fr. fol,sax(anthropogen) PE

List L2. Other species reported for Niagara in Wong & Brodo (1992) but not collected by R. Olszewski

Cladonia subcariosa Nyl. (as *C. polycarpoides*) PE or TH?
Lecanora caesiorubella Ach. subsp. *caesiorubella* NF
Lobaria quercizans Michaux NF
Myelochroa aurulenta (Tuck.) Elix & Hale PC
Peltigera ponojensis Gyelnik LI
Pertusaria consocians Dibben LI

List L3. Additional Niagara Gorge (on the Canadian side, in NF) species reported in Eckel (2004) but not included in Wong & Brodo (1992) nor collected by R.Olszewski.

Anaptychia crinalis (Schaerer) Vezda (as *A. setifera*) Collected by R.C. Harris in 1985
Bacidia schweinitzii(Fr. ex E. Michener)A. Schneider (as *Biatora schweinitzii*) in Macoun (1901)
Bacidia polychroa (Th. Fr.) Körber (as *B. fusco-rubella*) in Macoun (1901)
Bryoria chalybeiformis (L.) Brodo & D. Hawksw.(as *Alectoria jubata* var. *chalybeiformis*) in
Cameron (1895) . Records in Ontario = *Bryoria furcellata* (Fr.) Brodo & Hawksw. (Brodo, 2009).
Cladonia rangiferina (L.) F.H. Wigg in Cameron (1985)
Dermatocarpon miniatum (L.) W. Mann Collected by P.M. Eckel in 1985
Evernia prunastri (L.) Ach. in Cameron (1985)
Heterodermia speciosa (Wulfen) Trevisan (as *Physcia speciosa*) in Cameron (1895)
Lecanora allophana Nyl. (as *L. subfusca*) in Cameron (1895). Old records under this name
are not necessarily *L. allophana* (Brodo, 2009).
Lecanora pallida (Schreb.) Schaer. in Macoun (1901) = *L. albella* (Pers.) Ach.
Lobaria amplissima (Scop.) Forss (as *Sticta amplissima*) in Cameron (1895)
Lobaria pulmonaria (L.) Hoffm. (as *Sticta pulmonaria*) in Cameron (1895)
Melanelia soledata (Ach.) Goward & Ahti (as *Parmelia olivacea* var. *soledata*) in Cameron

(1895)

Peltigera aphthosa (L.) Willd. in Cameron (1895)

Physcia tenella (Scop.) DC. (as *P. hispida*) in Cameron (1895) Possibly *P. adscendens* but not

tenella (Brodo, 2009).

Physconia distorta (as *P. pulverulenta*) but “misidentifications for North America” Esslinger (2008). Possibly *Physconia subpallida* (Brodo, 2009).

Ramalina americana Hale (as *R. calicaris* var. *fastigiata*) in Cameron (1895)

Ramalina fraxinea (L.) Ach. (as *R. calicaris* var. *fraxinea*) in Cameron (1895) Most likely not *fraxinea* (Brodo, 2009).

Teloschistes chrysoththalmus (L.) Th. Fr. in Cameron (1895)

Tuckermannopsis ciliaris (Ach.) Gyelnik (as *Cetraria ciliaris*) in Cameron (1895)

Usnea barbata var. *hista* but *U. barbata* “misidentifications for North America” Esslinger (2009) Perhaps “hirta” (Brodo, 2009)?

Xanthoria polycarpa (Hoffm.) Th. Fr. ex Rieber (as *Teloschistes polycarpus* in Cameron (1895) Probably *X. hasseana* (Brodo 2009).

List L4. Lichens from eastern Haldimand-Norfolk R.M. – Ruigrock Track (in NHA study area.)

Candelaria concolor (Dickson) Stein

Cladonia cristatella Tuck.

Cladonia humilis (With.) J.R. Laundon

Flavoparmelia caperata (L.) Hale

Parmelia sulcata Taylor

Phaeophyscia rubropulchra (Degel.) Essl.

Physcia millegrana Degel.

Physconia detersa (Nyl.) Poelt

Punctelia rudecta (Ach.) Krog

The Mosses

Most of the mosses represented in my list below are based on collections made incidentally during lichen-hunting outings. I have recently, however, made a more concerted effort at capturing the bryological diversity in a few parks and conservation areas such as Heartland Forest, Short Hills, Louth and Wainfleet Bog. These localities are noted, where applicable, by the species names in the lists of mosses and hepatics collected by me. Many specimen packets await examination and no doubt contain some rarer species or otherwise interesting specimens.

A much more complete listing of moss species, also presented below, is compiled from Ireland and Ley's *Atlas of Ontario Mosses* (1992). This publication provides maps with dots to denote localities for every moss species reported for Ontario. Where it was unclear from the position of a dot as to whether the species was located in the area of this study, the listing by county in *Checklist of the Mosses of Ontario* (Ireland & Cain, 1975) was consulted.

Of the 59 species that I have collected and identified to date, 10 are not shown by a dot for Niagara in Ireland and Ley: *Atrichum angustatum*, *A. crispulum* (= *A. oerstedianum* in Ireland and Ley), *A. undulatum*, *Brachythecium campestre*, *Bryum pallescens*, *Calliergon cordifolium*, *Fissidens fontanus*, *Hygroamblystegium fluviatile* (= *Amblystegium fluviatile* in Ireland and Ley), *Hylocomium pyrenaicum* and *Pylaisiella polyantha*. All but *A. undulatum* and *H. pyrenaicum* are found in adjacent or nearby counties or regional municipalities and so their presence in Niagara is not unexpected.

When the taxa in the three lists below are added we have a total of 198 species and 2 varieties in the Region. However, a quick scan of the distribution maps in Ireland and Ley will reveal numerous other species occurring nearby. It is likely that many of these will be found in Niagara following more intensive searches.

All species collected by me and listed below are backed up by voucher specimens kept in my personal herbarium. Specimens are available for examination upon request.

Moss Lists

List M1. Moss species in collections made by R. Olszewski during the period 1990 – 2009.

Anomodon attenuatus (Hedwig) Hübener Heartland Forest, Louth CA, Short Hills PP
Anomodon rostratus (Hedwig) Schimper Louth CA, Short Hills PP
Anomodon viticulosus ((Hedwig) Hooker & Taylor Balls Falls CA, Louth CA, Short Hills CA
Atrichum altecristatum (Renauld & Cardot) B.B. Smyth & L.C.D. Smyth Paradise Grove
Atrichum angustatum (Bridel) Bruch. & Schimper Paradise Grove
Atrichum crispulum Bescherele Heartland Forest, Louth CA, Wainfleet Bog CA
Atrichum undulatum (Hedwig) Palisot de Beauvois Short Hills PP
Aulacomnium palustre (Hedwig) Schwägrichen Heartland Forest, Wainfleet Bog CA
Brachythecium campestre (C. Müll.er) B.S.G. Paradise Grove
Brachythecium populeum (Hedwig) B.S.G. Paradise Grove, Short Hills PP
Brachythecium rivulare W.P. Schimper in B.S.G. Heartland Forest
Brachythecium rutabulum (Hedwig) Schimper Wainfleet Bog CA
Brachythecium salebrosum (Web & D. Mohr) B.S.G. Beamers Falls CA, Louth CA,
Wainfleet Bog CA, Short Hills CA
Bryum argenteum Hedwig Wainfleet Bog CA
Bryum capillare Hedwig Heartland Forest
Bryum pallescens Scheicher ex Schwägrichen Quarry Road Pits
Callicladium haldanianum (Greville) H. Crum Short Hills PP
Calliergon cordifolium (Hedwig) Kindberg Heartland Forest
Campylium chrysophyllum (Bridel) J. Lange Heartland Forest, Louth CA
Ceratodon purpureus (Hedwig) Bridel Wainfleet Bog CA
Climacium americanum Bridel Heartland Forest, Louth CA
Dicranum scoparium Hedwig Caves Springs CA
Dicranum viride (Sullivant & Lesquereux) Lindberg Heartland Forest
Entodon cladorrhizans (Hedwig) C. Müller Heartland Forest, Wainfleet Bog CA
Eurhynchium hians (Hedwig) Sande-Lac Paradise Grove
Fissidens fontanus (Bachelot de la Pylaie) Steudel Louth CA
Fissidens taxifolius Hedwig Beamers Falls CA, Heartland Forest, Louth CA, Paradise Grove,
Short Hills CA

Hedwigia ciliata (Hedwig) Palisot de Beauvois Louth CA, Paradise Grove
Herzogiella turfacea (Lindberg) Palisot de Beauvois Louth CA
Hygroamblystegium fluviatile (Hedwig) Loeske Louth CA
Hygroamblystegium tenax (Hedwig) Jennings Short Hills PP
Hylocomium pyrenaicum (Spruce) Lindberg Heartland Forest
Hypnum lindbergii Mitten
Hypnum pallescens (Hedwig) Palisot de Beauvois Heartland Forest, Louth CA
Leptodictyum riparium (Hedwig) Warnstorf Heartland Forest
Leucobryum glaucum (Hedwig) Angström Heartland Forest, Louth CA
Mnium marginatum (Withering) Bridel ex Palisot de Beauvois Louth CA
Orthotrichum anomalum Hedwig Louth CA
Orthotrichum pumilum Swartz Wainfleet Bog CA
Physcomitrium pyriforme (Hedwig) Hampe
Plagiomnium cuspidatum (Hedwig) T.J. Kopponen Heartland Forest, Louth CA, Paradise Grove, Short Hills PP, Wainfleet Bog CA
Plagiothecium cavifolium (Bridel) Iwatsuki Short Hills PP
Plagiothecium latebricola B.S.G. Heartland Forest
Platygyrium repens (Bridel) B.S.G. Heartland Forest, Short Hills PP
Pohlia cruda (Hedwig) Lindberg Wainfleet Bog CA
Pohlia nutans (Hedwig) Lindberg Wainfleet Bog CA
Polytrichastrum ohioense (Renault & Cardot) G.L. Smith Heartland Forest, Louth CA, Willoughby Swamp CA
Polytrichum commune Hedwig Paradise Grove
Polytrichum juniperum Hedwig Wainfleet Bog CA
Polytrichum strictum Bridel Wainfleet Bog CA
Pylaisiella polyantha (Hedwig) Grout Heartland Forest, Paradise Grove
Rhodobryum ontariense (Kindberg) Kindberg Louth CA
Rhytidiadelphus triquetrus (Hedwig) Warnstorf Caistorville
Schistidium rivulare (Bridel) Podpera Short Hills CA
Sphagnum fimbriatum Wilson & Hooker Heartland Forest, Wainfleet Bog CA
Sphagnum palustre Linnaeus Wainfleet Bog CA
Taxiphyllum deplanatum (Bruch & Schimper ex Sullivant) Fleischer Louth CA
Tetraphis pellucida Hedwig Heartland Forest, Wainfleet Bog CA
Thuidium delicatulum (Hedwig) Schimper var. *delicatulum* Heartland Forest, Louth CA, Short Hills CA, Wainfleet Bog CA

List M2: Other mosses reported for Niagara Regional Municipality in *Atlas of Ontario Mosses* (Ireland and Lay, 1992).

Abietinella abietinum (Hedwig) Fleischer
Aloina brevirostris (Hooker & Greville) Kindberg
Amblystegium serpens (Hedwig) B.S.G.
Amblystegium serpens var. *juratzkanum* (W.P. Schimper) Renaud & Cardot
Amblystegium varium (Hedwig) Lindberg
Anomodon minor (Hedwig) Fürnröhr
Aulacomnium heterostichum (Hedwig) Bruch & W.P. Schimper
Bartramia pomiformis Hedwig
Brachythecium acuminatum (Hedwig) Rau & Hervey.
Brachythecium laetum (Bridel) Schimper
Brachythecium plumosum (Hedwig) B.S.G.

Brachythecium turgidum (C.J. Hartman) Kindberg
Brachythecium velutinum (Hedwig) B.S.G.
Brotherella recurvans (Michaux) Fleischer
Bryhnia graminicolor (Bridel) Grout
Bryoerythrophyllum recurvirostrum (Hedwig) P.C. Chen
Bryum caespiticium Hedwig
Bryum lisae var. *cuspidatum* (= *creberrimum*?) (Bruch & W.P. Schimper) Margadant
Bryum pseudotriquetrum (Hedwig) P.G. Gartner, B. Meyer & Scherbius
Campylium hispidulum (Bridel) Mitten
Climacium dendroides (Hedwig) Weber & D. Mohr
Conardia compacta (C. Müller) C. Müller
Cratoneuron filicinum (Hedwig) Spruce
Cyrto-hypnum pygmaeum (W.P. Schimper in B.S.G.) W.R. Buck & H. Crum
Desmatodon porteri P. James in Austin
Dicranella heteromalla (Hedwig) Schimper
Dicranella varia (Hedwig) Schimper
Dicranum flagellare Hedwig
Dicranum fulvum Hooker
Dicranum montanum Hedwig
Dicranum polysetum Swartz
Didymodon fallax (Hedwig) R.H. Zander
Didymodon rigidulus Hedwig
Didymodon rigidulus var. *gracilis* (Schleicher ex Hooker & Greville) R.H. Zander
Didymodon tophaceus (Bridel) Lisa
Diphyscium foliosum (Hedwig) D. Mohr
Distichium capillaceum (Hedwig) Bruch & Schimper
Ditrichum pallidum (Hedwig) Hampe
Drepanocladus aduncus (Hedwig) Warnstorf
Encalypta procera Bruch
Entodon seductrix (Hedwig) Müller
Ephemerum spinulosum Bruch & W.P. Schimper in W.P. Schimper
Eucladium verticillatum Bruch & Schimper
Eurhynchium praelongum (Hedwig) Schimper
Eurhynchium pulchellum (Hedwig) Jennings
Fissidens bryoides Hedwig
Fissidens dubius Palisot de Beauvois
Fissidens obtusifolius Wilson
Fontinalis dalecarlica B.S.G.
Fontinalis hypnoides C.J. Hartman
Forsstroemia trichomitria (Hedwig) Lindberg
Funaria hygrometrica Hedwig
Grimmia pilifera Palisot de Beauvois
Grimmia plagiopodia Hedwig
Gymnostomum aeruginosum Smith
Helodium paludosum (Austin) Brotherus
Homomallium adnatum (Hedwig) Brotherus
Hymenostylium recurvirostre (Hedwig) Dixon
Hyophila involuta (Hooker) A. Jaeger
Hypnum fertile Sendtner
Hypnum imponens Hedwig

Hypnum pretense J. Koch ex Spruce
Leptodictyum humile (Palisot de Beauvois) Ochyra
Leptodictyum riparium (Hedwig) Warnstorff
Leskea obscura Hedwig
Leskeella nervosa (Bridel) Loeske
Leucodon brachypus Bridel
Mnium ambiguum H.L.H. Müller
Mnium spinulosum B.S.G.
Myurella sibirica (C. Müller) Reimers
Orthotrichum cupulatum G.F. Hoffmann ex Bridel
Orthotrichum strangulatum Palisot de Beauvois
Oxystegus tenuirostris (W.J. Hooker & Taylor) A.J.E. Smith
Palustriella commutata (Hedwig) Ochyra
Phascum cuspidatum Hedwig
Philonotis fontana (Hedwig) Bridel
Plagiomnium ciliare (C. Müller) T. Koponen
Plagiomnium affine var. *rugicum* (Laurer) Margadant & During = ?
Plagiomnium medium (Bruch & W.P. Schimper) T. Koponen
Plagiomnium rostratum (Schrader) T. Koponen
Plagiothecium denticulatum (Hedwig) W.P. Schimper in B.S.G.
Platydictya confervoides (Bridel) H. Crum
Pohlia wahlenbergii (Weber & D. Mohr) Andrews in Grout
Polytrichum longisetum Swartz ex Bridel
Pottia truncata (Hedwig) Bruch & W.P. Schimper
Ptychomitrium incurvum (Schwägrichen) Spruce
Seligeria recurvata (Hedwig) B.S.G.
Sphagnum capillifolium (Ehrhart) Hedwig
Sphagnum tenerum Sullivant
Sphagnum compactum Lamarck & de Candolle
Sphagnum fuscum (Schimper) H. Klinggräff
Sphagnum papillosum Lindberg
Thamnobryum alleghaniense (C. Müller) Nieuwland
Thelia asprella (B.S.G.) Sullivant & Lesquereux
Thuidium recognitum (Hedwig) Lindberg
Timmia megapolitana Hedwig
Tortella fragilis (Hooker & Wilson) Limpricht
Tortella humilis (Hedwig) Jennings
Tortella tortuosa (Hedwig) Limpricht
Tortula mucronifolia Schwägrichen
Tortula muralis Hedwig
Tortula ruralis (Hedwig) P.G. Gartner, B. Meyer & Scherbius
Weissia controversa Hedwig

List M3: Other taxa included in Eckel's Niagara Gorge mosses

Aloina rigida (Hedwig) Limpricht in Cameron (1895)
Amblystegium trichopodium (Schultz) C.J. Hartman = ? P. Eckel: collection 1998
Amphidium lapponicum (Hedwig) W.P. Schimper in Macoun (1901)
Anomodon rugelii (C.Müller) Keissler P.Eckel & R. Zander: collection 1998
Barbula convoluta Hedwig P. Eckel: collection 1991

Barbula unguiculata Hedwig P. Eckel - several collections
Bryhnia novae-angliae (Sullivant & Lesquereux ex Sullivant) Grout P. Eckel: collection 1998
Bryohaplocladium microphyllum (Hedwig) R. Watanabe & Z. Iwatsuki Eckel: collection 1998
Bryum tortifolium Funck ex Bridel = ? in Macoun & Kindberg (1892)
Campylium stellatum (Hedwig) var. *stellatum* in Cameron (1895)
Desmatodon obtusifolius (Schwägrichen) Schimper C. Peck in Day (1888)
Dicranum fuscescens Turner P. Eckel & R. Zander: collection 1998
Didymodon fallax var. *reflexus* (Bridel) R.H. Zander in Cameron (1895)
Didymodon vinealis (Bridel) R.H. Zander "doubtful record" in Macoun & Kindberg (1892)
Drummondia prorepens (Hedwig) E.G. Britton
Fissidens adianthoides Hedwig observed by R. Zander
Fissidens grandifrons Bridel in Macoun (1901)
Forsstroemia trichomitria (Hedwig) Lindberg R. Zander: collection in 1986
Herzogiella striatella (Bridel) Iwatsuki in Macoun 1901
Hylocomium spendens (Hedwig) B.S.G. in Cameron 1895
Hypnum curvifolium Hedwig in Cameron 1895
Leptobryum pyriforme (Hedwig) Wilson in Cameron 1895
Leskea polycarpa Hedwig var. *polycarpa* Eckel & Zander: collection in 1998
Mnium orthorrhynchum Bruch & Schimper in Crum (1981)
Mnium thomsonii Schimper Eckel – observation
Orthotrichum obtusifolium Bridel in Cameron 1895
Orthotrichum ohioense Sullivant & Lesquereux ex Austin Eckel & Zander: collection in 1991
Orthotrichum speciosum Nees ex Sturm in Cameron 1895
Plagiopus oederiana (Swartz) Limpricht in Cameron 1895
Pleuridium subulatum (Hedwig) Rabenhorst P. Eckel: collection in 1991
Pohlia annotina (Hedwig) Lindberg in Cameron 1895
Pohlia atropurpurea (Wahlenberg) H. Lindberg in Cameron 1895
Pylaisiella intricata (Hedwig) Grout in Cameron 1895
Sanionia uncinata (Hedwig) Loeske in Cameron 1895
Schistidium apocarpum (Hedwig) Bruch & Schimper in Cameron 1895
Seligeria campylopoda Kindberg ex Macoun & Kindberg Zander: collection in 1971
Warnstorfia fluitans (Hedwig) Loeske P. Eckel: collection 1998
Weissia brachycarpa (Nees & Hornschuch) Juratzka Eckel: collection in 1981

The Hepatics (Liverworts)

Based on the two lists below the total current count of species for the Niagara region is 16.

List H1. Species in collections made by R. Olszewski during the period 1990 – 2009.

Conocephalum conicum (Linnaeus) Underwood Louth CA, Caves Springs CA
Lophocolea heterophylla (Schrad.) Dumortier Heartland Forest
Nowellia curvifolia (Dickson) Mitten St. John's CA
Pallavicinia leyellii (Hook) S. Gray Heartland Forest
Plagiochila porelloides (Torrey ex Nees) Lindenberg Louth CA
Porella platyphylla (Linnaeus) Pfeiffer Caves Springs CA, Louth CA, Woodend CA
Ptilidium pulcherrimum (G.H. Weber) Hampe Heartland Forest
Radula complanata (Linnaeus) Dum. Louth CA
Ricciocarpus natans (Linnaeus) Corda = ? Heartland Forest

List H2. Other records of Hepatics from the Niagara Gorge – Canadian side.

Frullania eboracensis Gottsche in Macoun but supported by recent specimen in US gorge.
Marchantia polymorpha Linnaeus observed by R. Zander
Plagiochila asplenioides (Linnaeus) Dumort
Preissia quadrata (Scopoli) Nees in Macoun 1901
Reboulia hemisphaerica (Linnaeus) Raddi in Cameron 1895
Riccia fluitans Linnaeus in Macoun 1901
Trichocolea tomentella Nees in Day 1883

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