Integrating Past, Present, and Future Biodiversity Data, and Related Information, to Improve Conservation Decision-Making in New Brunswick

Atlantic Canada Conservation Data Centre

Dr. R.A. Lautenschlager, Executive Director, Atlantic Canada Conservation Data Centre, PO Box 6416, Sackville, NB E4L 1G6 (506-364-2661; rlautenschlager@mta.ca)

Introduction

Although **Biodiversity** is a vague all-inclusive term, unheard of 25 years ago (Lautenschlager 1995, 1997), it continues to be used in local, provincial (New Brunswick Biodiversity Strategy, 2009), national (The State of Biodiversity Information in Canada), and international documents (Convention on Biological Diversity, 1992; Global Biodiversity Outlook, 2010), and in this report.

The key to the usefulness of that term is clearly defining the specifics of interest or being considered (Lautenschlager**,** 1998). The New Brunswick Biodiversity Strategy (2009) states that, Biodiversity *refers to life in all its forms and the ecosystems and natural processes that support* (that) *life*. That strategy goes on to identify the following key components of biodiversity: genetic, species, and ecosystem diversity.

However, when it comes to understanding, working with, and/or managing biodiversity, in most instances species are the focus, although ecological communities are sometimes considered. To a degree the species focus recognizes that genetic diversity is both the cause of and imbedded within species; and that species interact with others around them in ecological communities and ecosystems. Therefore, although genetic, species, and ecosystem diversity are recognized as components of biodiversity, the focus, is commonly on species data and the related information (e.g., habitat) required to understand the distribution, conservation status, and other specifics related to species and potential interactions with development and natural resource management.

Unfortunately, surveys/inventories for species [even those designated as Species at Risk (SAR) federally or provincially] are commonly inadequate. A 2004 survey of Conservation Data

Centres (CDCs) across Canada found that they believed they had adequate observational data for only about one third of the federally and provincially listed SAR (Lautenschlager and Anions 2004). Our understanding of biodiversity anywhere (backyard, province, region, or nation) is only as good as the surveys/inventories that identify what and where biodiversity components have been found.

Still, even if surveys/inventories were complete, to be valuable that information would have to be accurate, geo-referenced, quality controlled, maintained through time, and available to potential users. Essentially, potential users must know where to go to get that information. It is hoped that the information collected, while working on this project and provided in this report, will, by identifying key sources of data and associated contact information: 1) help fill that gap; and 2) direct individuals in the future to general and specific biodiversity information from fine- to broad-scales in New Brunswick. It is also hoped that if those interested in this area collect valuable biodiversity data or related information, in the future they will make it available to the key data holding groups, identified in this report, so that their data will be available to a broader community of interest.

Materials and Methods

With the help of many (acknowledgements), potential sources of biodiversity data and information for New Brunswick (~160 groups and/or individuals) were identified. At the same time, I developed a "cover letter" explaining the project (Appendix I) and worked with Stefen Gerriets (Sr. Data Manager with the Atlantic Canada Conservation Data Centre) designing a "check-list" (Appendix II) that could be completed quickly by data/information holders.

After drafts of the cover letter and check-list were completed they were reviewed by staff with the New Brunswick Department of the Environment, modified based on their comments and then sent to relevant institutions, groups, and individuals. In addition to being asked to complete the check-list, those contacted were also asked to identify additional sources of biodiversity data and/or individuals that I missed. The initial "call for additional sources" led to a significant increase in the number of individuals contacted. However several of those indicated that they were inappropriate. Therefore, the final list provided in this report (Appendix III)[1] consists of those who maintain biodiversity data plus those who are planning to collect and maintain that data in the future.

Results & Discussion

Approximately 160 cover letters and check-lists were sent to potential New Brunswick biodiversity data holders including 26 selected (because we knew or suspected they conducted natural history related field work) members of the New Brunswick Environmental Industry

[1] Although contacted, those who do not maintain or do not plan to maintain biodiversity data (e.g., the bulk of members of the New Brunswick Environmental Industry Association) are not included in Appendix III.

Association. However, only four responses were received from that group, and only one (from Rod Currie of R.A. Currie Ltd, Fredericton) included a completed check-list. However, John Sims, with ADI Limited, Tara Daggett with Sweeney International Management Corp., and Garrett Bell with AMEC sent very helpful comments.

Specifically, John noted that ADI does not maintain biodiversity databases. That they rely mainly on services, like those provided by the Atlantic Canada Conservation Data Centre (which he praised), related established data sources, and conduct limited biological work when that is required for specific projects. Tara reported that Sweeney International does not maintain any biodiversity databases or related information rather they prepare reports including flora and fauna observed during field work. Garrett noted that AMEC collects *detailed information on a wide variety of locations throughout Atlantic Canada,* (but that) *the data is not searchable in any way and would only be available* (to others) *through the involvement of* (AMEC) *staff personally aware of site specific studies. Also, because we gather information for clients (at their expense), field data is considered proprietary until it becomes public domain through publication in a report to regulators.*

The return percentage from most other groups and individuals was much greater that the ~15% return from members of the New Brunswick Environmental Industry Association. By contacting members of the New Brunswick Environmental Industry Association repeatedly I believe I could have improved the return percentage significantly. However, after receiving responses from John, Tara, and Garrett (above), I stopped trying to gather information from that group. I suspected that most had views similar to those outlined by the few from that industry who responded.

Although I received some completed check-lists, or related information from others contacted initially, I continued to pursue (emails and phone calls) those that did not respond to my initial email request. Therefore, by the time data was analyzed, there was a ~73% return (although many were brief statements, appropriately without a completed check-list). Still, it is clear that more than 40 groups and individuals maintain biodiversity data and related information for New Brunswick. Appendix III (which, along with Appendix IV, may be the most important parts of this document) provides an overview of those holding New Brunswick specific biodiversity data and contact information for them. [Please note that although every attempt was made to identify and communicate with biodiversity data holders, and I believe most are represented in Appendix III, some may have been missed while others may no longer be interested in biodiversity. In addition, through time those maintaining biodiversity data (especially for those maintaining limited amounts of data or those with a narrow focus) are likely to change. **Therefore, information presented in this report should be viewed as a starting point for those seeking New Brunswick specific biodiversity information in the future.**]

Although many groups and individuals hold biodiversity data for New Brunswick, their interests, mandates, and therefore the data and amounts of data maintained differ significantly.

Appendix III identifies the individuals and groups that maintained biodiversity data in 2011, however, many of those maintain limited or very specific types of data (e.g., Atlantic Dragonfly Inventory Project). Some groups (e.g., Canadian Museum of Nature) maintain massive amounts of biodiversity data, gathered during the last two centuries, with a broad taxonomic focus; but only a fraction is applicable to New Brunswick; and much remains to be digitized.

The New Brunswick Museum also maintains massive amounts of biodiversity data, gathered during the last two centuries, for species, subspecies, and varieties, with a focus on the Atlantic Region in general and New Brunswick in particular. (As with the national museum, however, much of their data remains to be digitized.) The Atlantic Canada Conservation Data Centre (AD CDC – an NGO that charges when answering data requests) maintains significant amounts of biodiversity data, most gathered during the last several decades, although it includes some records that go back over 100 years. The AC CDC focuses on species (taxa) of conservation concern (including: Rare, Threatened, Endangered, and Special Concern), although they have also started to focus more on invasive species and ecological communities.

To some degree there is overlap among groups with major biodiversity data holdings. For instance, the AC CDC now has a significant number of observational records (plants and animals) that were provided by the New Brunswick Museum, as well as all of the data gathered by Bird Studies Canada during the first three years of the Maritime Breeding Bird Atlas. (The AC CDC plans on including all five years of that Atlas when that data becomes available in the near-future.)

Although I received ~75 helpful responses[2], only 44 check-lists were completed (two from Connell Herbarium – one for the Saunders' algal collection, and one I could not view). Information provided in completed check-lists is summarized in Tables 1 – 5 (below). Those tables provide an overview of: the kinds of organizations maintaining biodiversity data plus their biological, and taxonomic focus; their spatial and temporal scope; data format and access restrictions (if any); and their taxonomic scope. (Please note that more than one response was possible/question, so both numbers and percentages are commonly greater than might be expected. For instance, when it comes to Biological Focus (Table 1 - centre), one group could easily reply that it focuses on Conservation, Taxonomy (including Genetics), Ecology, and Field Inventory); four responses from one group.

[2] Some responses were a simple, "we do not maintain biodiversity data".

Table 1. Summary of responses regarding Organization Level, Biological Focus, and Taxonomic Focus.

Organization Level			**Biological Focus**			**Taxonomic Focus**		
#	**%**	**Focus**	**#**	**%**	**Focus**	**#**	**%**	**Focus**
3	7	International	5	12	Regulatory	10	24	Family (or higher)
12	29	National	17	41	Conservation	9	22	Genus
18	44	Regional	10	24	Taxonomy	27	66	Species
10	24	Provincial	3	7	Curatorial	7	17	Sub-species, varieties
19	46	Non-government	14	34	Ecology (landscape)	11	27	Populations
5	12	Academic	19	46	Ecology (site)	8	20	Communities
0	0	Corporate	25	61	Field Inventory	2	5	other
2	5	Individual	2	5	Genetics			
2	5	Other	5	12	Other			

Interestingly, 46% of the check-lists returned came from non-government organizations, with another 12% from academics. Most (61% of those who completed a check-list) are engaged, at least to some degree, in Field Inventory; seemingly focusing on Ecology (46%) and Conservation (41%). The bulk (66%) of respondents focused on species while other taxonomic areas receive significantly less attention.

Table 2. Summary of responses regarding Spatial and Temporal Scope.

Spatial Scope			**Temporal Scope**		
#	**%**	**Focus**	**#**	**%**	**Focus**
4	10	Global	0	0	Millennia
0	0	Continental	6	15	Centuries
6	15	Canadian	16	39	Decades
15	37	Atlantic Canada	20	49	Years
19	46	New Brunswick	8	20	Seasonal
8	20	County	2	5	Days
9	22	Other	1	2	Other

The spatial focus of respondents, by design, was on New Brunswick (46%), with a significant focus (37%) on Atlantic Canada. Their temporal focus was primarily on years (49%), although a longer focus (decades) was fairly common.

Table 3. Summary/overview of responses regarding Data Format and Access Restrictions.

Data Format			**Access Restrictions**		
#	**%**	**Focus**	**#**	**%**	**Focus**
23	56	Geospatial data (mapped)	14	34	Freely available – internet
24	59	Relational data (database)	12	29	Freely available
19	46	Flat data (spreadsheet)	1	2	Restricted – on net
14	34	Hardcopy (tables)	19	46	Subject to approval
19	46	Hardcopy (text)	2	5	Available for a fee
14	34	Field Notes (handwritten)	4	10	Unavailable till published
14	34	Specimens	2	5	Regulatory use only
2	5	Other	3	7	Other

Respondents maintain data in a wide variety of forms, ranging from nearly 60% with mapped geospatial and relational databases, to 34% maintaining specimens. Although there seems to be a large amount of data, that data is freely available from only about one third of the respondents. However, it is available, subject to approval, from 46% of respondents.

Table 4. Summary/overview of responses regarding the animal (Vertebrate, and Invertebrate) focus.

Vertebrate			**Invertebrate**		
#	**%**	**Focus**	**#**	**%**	**Focus**
32	78	VERTEBRATE	22	54	INVERTEBRATE
17	41	Birds	1	2	Uniramia (minus insects)
13	32	Mammals	16	39	Insects
8	20	Reptiles	5	12	Crustacea
9	22	Amphibians	3	7	Chelicerata
12	29	Fish (marine)	7	17	Mollusca
20	49	Fish (fresh water)	4	10	Annelida
			4	10	Cnidarians
			3	7	Aschelminths
			4	10	Nemerteans
			4	10	Platyhelminthes
			4	10	Porifera
			1	2	Placozoa
			2	5	Protozoans
			6	15	Other

As might be expected, most (78%) of respondents maintain data for vertebrates, while only 54% maintain data for invertebrates. The vertebrate data being kept, by nearly half the respondents, is for fresh water fish and birds. However, significant amounts of data for mammals, marine fish, amphibians, and reptiles is also being kept. (I expect that if check-lists had been completed by the DFO groups contacted[3], the overall focus on marine fish would have

[3] DFO is presently reviewing all of its datasets and hopes to have them available, "on-line" by 2013.

increased to that for fresh-water fish and birds.) Relative to invertebrates, insects are the primary focus for many (39%), but mollusks, crustacean, and a variety of other invertebrate groups have also received considerable attention.

Table 5. Overview/summary of responses regarding plant (Vascular, and Non-Vascular) focus.

Vascular			**Non-Vascular**		
#	**%**	**Focus**	**#**	**%**	**Focus**
16	39	VASCULAR	16	39	NON-VASCULAR
10	24	Dicots	8	20	Algae
8	20	Monocots	7	17	Bryophytes
7	17	Pteridophytes	9	22	Lichens
10	24	Gymnosperms	6	15	Fungi (minus lichens)

Thirty-nine percent of respondents maintain data for vascular and non-vascular plants. The focus for vascular plants seems divided, more-or-less equally, among gymnosperms, dicots, and monocots, with slightly less of a focus on ferns (pteridophytes). The focus for non-vascular plants seems greatest for lichens, slightly lower but similar for algae and bryophytes, and slightly lower still for fungi.

Because I thought that many readers would be interested in more specifics than are provided above, I included 44 (including one I could not view and both submitted by the Connell Memorial Herbarium) completed check-lists in Appendix IV. **The first spreadsheet in Appendix IV provides a respondent specific overview of the kinds of biodiversity data each respondent maintains.** Using Appendix IV, an interested reader can quickly see exactly what kinds of biodiversity information held by individual groups.

In addition to the groups identified in Appendix III and Appendix IV, and the summary information provided above, some biodiversity data and related information can be found in reports prepared for the New Brunswick Wildlife Trust Fund and the Environmental Trust Fund. Both groups are planning to have those reports available on-line in the future.

Certainly significant amounts of biodiversity data and information could also be extracted from a variety of scientific reports and publications. Indeed, groups like the AC CDC commonly examine those and extract data for species of conservation concern. Relative to data in reports and publications, David MacLean (University of New Brunswick) suggested that someone should compile a list of biodiversity related publications for this region, ideally with an indexing system and hyperlinks to locations of available publications. He thought that such a product would complement this project nicely.

Researchers new to in this area would do well to consult experts in areas of interest to them [e.g., provincial employees, university faculty, staff with major data holding institutions, and other specialists (e.g., Rod Currie – for non-game freshwater fish and aquatic macro-

invertebrates and Dr. Reggie Webster – for insects)] before launching into any biodiversity related project.

Conclusions

This report makes it clear that New Brunswick has a wealth of biodiversity data, related information, and expertise, primarily focused on species. Some, like that held by the New Brunswick Museum and the Atlantic Canada Data Centre, is held in very large databases. Other significant data is held in much smaller, more taxonomically focused, databases. This report provides those interested in biodiversity generalities and specifics with an overview of the data and information presently held, plus contact information required to meet their biodiversity related data and information needs. Although few completed check-lists came from First Nation communities, notes from some of those indicated that although biodiversity data, as such, was unavailable, related information might be available from community elders. Clearly, DFO maintains massive data sets for marine biodiversity. DFO also likely maintains significant amounts of data for fish that use fresh and brackish water. Unfortunately, this survey was conducted before DFO organized the data they have, so they were unable to complete the check-lists.

In addition, Nature NB surely maintains data that would have helped inform this project. Unfortunately, although they returned what I assume was a completed checklist it was not in a form that could be used in the analysis. Future users of this report, interested in aquatic systems for which DFO has an interest or responsibility, should communicate with DFO. In addition, they should communicate with the New Brunswick Department of Natural Resources, the World Wildlife Fund (Halifax office), Faye Cowie (ardw@nbnet.nb.ca; 506-365-8972) at the Aquatic Data Warehouse, and faculty and students at the University of New Brunswick working in that area.

It should be remembered that sustainable land use (including development) and natural resource related decisions depend on quality data, and as noted in the Introduction that data, even for federally and provincially listed Species at Risk, is commonly inadequate. In addition, Species at Risk are only the "tip of the iceberg" when it comes to species of conservation concern. Therefore, everything possible should be done to improve surveys/inventories for species of conservation concern in New Brunswick, the Atlantic Region, and across Canada. Although seemingly expensive, it could save money over time, by informing land-use planning and environmental assessments - before workers go to the field. Finally, readers can help by providing biodiversity data they believe is valuable to any of the groups maintaining biodiversity information identified in this report.

Acknowledgements

This project would have been impossible without the contributions (often extensive) from those contacted initially when requesting information about biodiversity data that they might

have. I thank every one who: completed the check-list, sent comments, talked with me, and others, even if they did not respond, for their time and in many instances their outstanding input and suggestions. I thank staff with the Environmental Trust Fund (David Schellenberg and Levis Thériault and proposal reviewers). Their support made this project possible. In addition, I thank: other staff with the New Brunswick Department of the Environment - Jane Tims for suggesting this project; Peter McLaughlin for overseeing project delivery, providing a variety of helpful suggestions, and for working closely with me; Krista Mackenzie for her input and providing contact information for NB Watershed Groups; Paul Jordan for early input and Dan Beaudette (NB DNR) for the same; AC CDC staff in general, and especially Stefen Gerriets for designing the check-list, organizing input, analyzing results, and developing summary tables, plus Sarah Robinson and Cindy Spicer for various significant contributions; Warren Coleman who provided suggestions early in the project, Tony Diamond (University of New Brunswick) who provided a variety of helpful suggestions and contacts, Geoff Giffin (Atlantic Salmon Federation) who provided contact information for angling/salmon/watershed conservation groups affiliated with the NB Salmon Council; and Raissa Marks (NB Environmental Network) who organized two biodiversity workshops where I made additional contacts that helped as I worked on this project.

Literature Cited:

Convention on Biological Diversity, 1992. International ("Rio") Biodiversity Convention.

Global Biodiversity Outlook 3, 2010. Secretariat of the Convention on Biological Diversity, Montreal, 94 pages.

Hyde, D., Herrmann, H., and Lautenschlager, R.A. 2010. The State of Biodiversity Information in Canada. NatureServe Canada (www.natureserve.ca) 53 pages.

Lautenschlager, R.A. 1995. Biodiversity conservation research needs. (Obstacles to biodiversity research). Forest Research Info. Paper No. 129. Ontario Minsitry of Natural Resources, Ontario Forest Research Institute, Sault Ste. Marie. 24pp.

Lautenschlager, R.A. 1997. Biodiversity is dead. Wildl. Soc. Bull. 25(3):679-685.

Lautenschlager, R.A. 1998. From rhetoric to reality: Using specific environmental concerns to identify critical sustainability issues. Ecosystems 1(2):176-182.

Lautenschlager, R.A., and M. Anions. 2004. Survey of the NatureServe Canada Network of Conservation Data Centres for Data and Expertise Critical for Federal Species at Risk Needs. NatureServe Canada. Report to Canadian Wildlife Service. 116p.

New Brunswick Biodiversity Strategy, 2009. Conserving biodiversity and using biological resources in a sustainable manner. New Brunswick Department of Natural Resources, Fredericton, New Brunswick 25 pages.

Appendix I. Cover letter sent (late in 2010 and early in 2011) to known and potential New Brunswick specific biodiversity data holders.

Greetings - Date

I am in the process of gathering references for inclusion in a report[4] titled "Integrating Past, Present, and Future Biodiversity Data and Information to Augment/Enhance New Brunswick Provincial Decision-Making". The report will use the *New Brunswick Biodiversity Strategy's* definition of biodiversity ("Life in all its forms and the ecosystems and natural processes that support this life, including: genetic, species, and ecosystem diversity"). When completed, it will be available to those seeking biodiversity data or information and others with a general interest in the subject.

You have been identified as an individual or member of a group which might maintain biodiversity data or related information which should be referenced in the planned report. Therefore, I, but more importantly those interested in biodiversity in NB, would appreciate it if you would:

1. Examine Appendix I (below) and tell me of any key individuals or groups which I have missed that you believe should be included.

2. Provide any other information you believe will be helpful as I attempt to develop this report. In particular if you maintain data, who else maintains the same, or similar data (either you got it from them, or they got it from you).

3. If you do maintain one or more databases, please complete the attached template and provide the name(s) and general description(s) of your database(s), and check number/ category where requested so they can be included in the report.

4. Assuming you or your institution maintain biodiversity information (including data), please complete the attached simple form (template - it should take no more than 10 minutes) and return it and answers to the four questions (above and this one) to me before mid-February, 2011.

Thank you for your help (input)! If you have any questions, please contact me. If you would like a copy of the final report, please let me know. It should be available in early April 2011.

Sincerely,

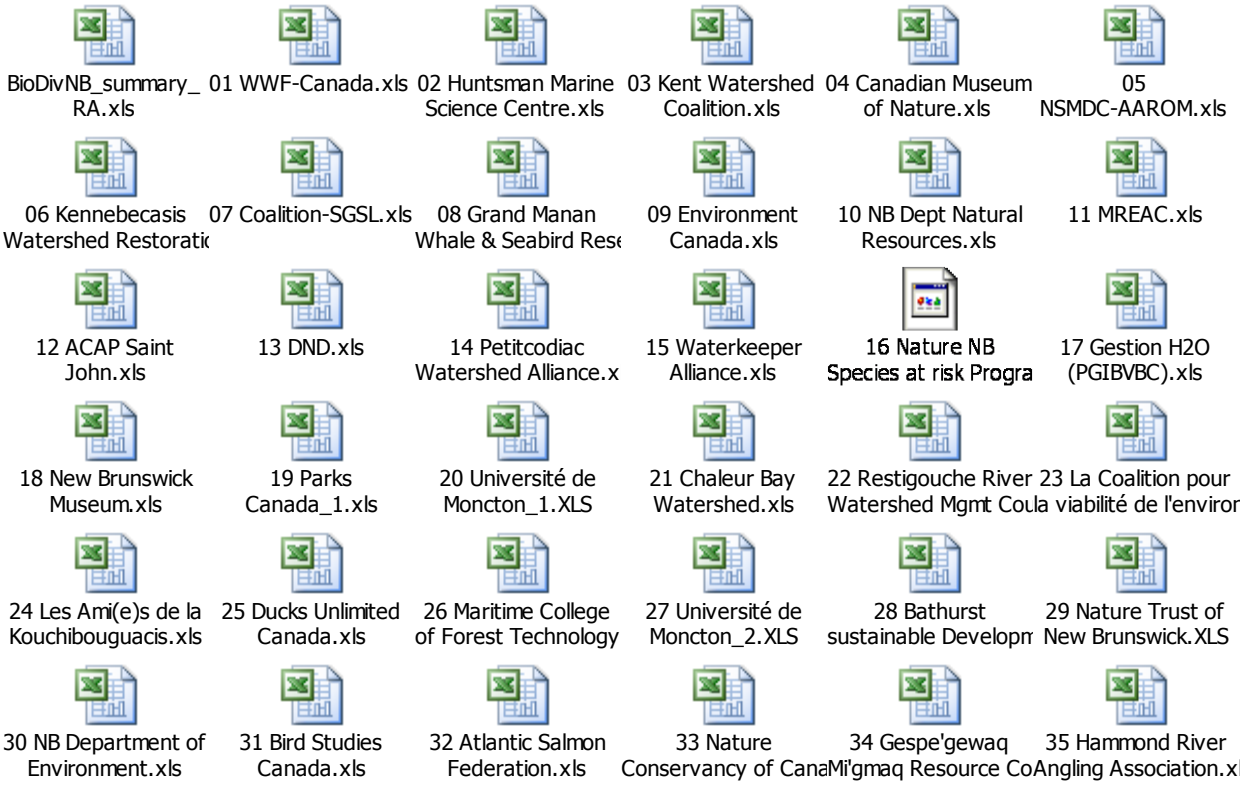
R.A. Lautenschlager, Executive Director
Atlantic Canada Conservation Data Centre
PO Box 6416, Sackville, NB E4L 1G6
rlautenschlager@mta.ca
506-364-2661

[4] Funded by the New Brunswick Environmental Trust Fund

Appendix II. Biodiversity Data Check-list sent (late in 2010 and early in 2011) to known and potential New Brunswick specific biodiversity data holders.

Appendix III. Individuals and groups (names, contact information, etc.) who were contacted during this work. This list does not include those who were contacted that indicated that they had nothing to offer.

Appendix IV. General summary/overview of the kinds of biodiversity data held by those who responded ("BioDivNB_Summary" - upper left corner) to this survey; plus completed biodiversity check-lists received from various groups and individuals (cross-referenced by number). (Number 16 was not an xls file, and therefore it is different than the others provided below).




36 Connell Memorial Herbarium_1.xls


37 Atlantic Dragonfly Inventory Program.xl


38 Natural History Resources.xls


39 Connell Memorial Herbarium_2.xls


40 Parks Canada_2.xls


41 Atlantic Canada CDC.xls


42 R.A. Currie Ltd.xls


43 NB Power.xls


44 NRCan_CFS.xls