

Cartouche

Number 93/94, Summer/Autumn 2017

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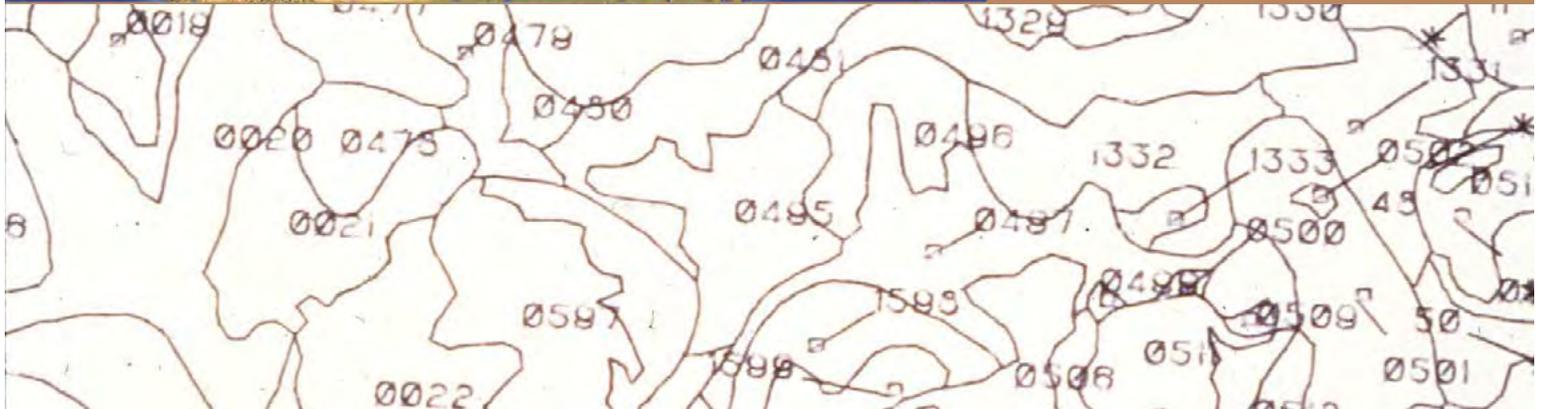
Where Do Narwhals Live?

All of the world's narwhals live near the Arctic Circle. This area, called the Arctic, includes the Arctic Ocean and nearby seas, as well as parts of Canada, Iceland, Norway, Greenland (Denmark), Sweden, Finland, and Russia.

- MAP KEY** Nearly all the world's narwhals live in just a few places.
- Narwhal Population Range
 - Narwhal Population Range (rare sightings)
 - Summer Sea Ice Range
 - Winter Sea Ice Range

Other ways to define the Arctic:

- Area where average daily temperatures in July do not rise above 50°F (10°C)
- Area north of the tree line—where tall, upright trees are replaced with shrubs, mosses, and lichens.



Top image: Where do Narwhals Live? Is a panel included in the National Museum of Natural History display entitled *Narwhal: Revealing an Arctic Legend*.

Full article *Exhibiting the Interconnections between Inuit, Narwhals, and Climate Change* found on page 26.

Bottom image: *CGIS Legacy Mapping*. Full article *CGIS + 50 - Origins and Legacy* found on page 19.



PRESIDENT'S MESSAGE

Julia Siemer
University of Regina

Julia Siemer is the President of the Canadian Cartographic Association and an Associate Professor of Geography at the University of Regina.



Dear fellow cartographers

I am pleased to share with you the latest edition of Cartouche. This edition includes several articles based on presentations from our meeting at Carleton University in Ottawa this past May. They range from the beginnings of the Canadian GIS (see Ian Crain's article based on his keynote speech presented at the annual meeting) to the latest publication of NRCan's Circumpolar Map in 2017 (see Scott Tweedy and James Fairlie's article on NRCan's geospatial product offerings). If you missed the conference in Ottawa

you can capture a bit of its atmosphere by reading Roger Wheate's summary of the meeting. A big thank-you to Steve Prashker and John Milton from Carleton University for organizing another interesting and fun meeting!

Next year's meeting will take place at COGS in Lawrencetown, Nova Scotia from May 30 to June 2, 2018. Our local contact and CCA Vice President, Monica Lloyd, is working hard to organize another interesting meeting which will include hands-on sessions. Check our email-list or the website (www.cca-acc.org) for updates. A call for papers will be sent out soon, so stay tuned.

I am also pleased to welcome two new young members to our Executive Committee. Jonathan Eaton and Tanner Kaunisviita, who are both currently enrolled at COGS, have expressed interest in representing the younger generation of CCA members. We are happy to see more involvement by the future generation of cartographers who will undoubtedly experience very different opportunities and challenges during their careers than we have had.

The last meeting in Ottawa also marked the end of Margaret Schweitzer's role as chair of the interest group 'Mapping Technology and Spatial Data'. I would like to thank Margaret for her past contributions to CCA as interest group chair as well as her regular Cartouche contributions and wish her all the best for her current PhD research.

If you would like to get involved in CCA, there are many options available to you. For example, please check out the ad for a new technical editor for Cartographica in this edition, or let us know about any other ways in which you would like to get involved. If you are interested in chairing an interest group—even one that is not currently listed on our website—please let us know.

And finally, if you are teaching a cartography course this academic year, please make your students aware of CCA's annual student mapping competitions; a submission form is available in this edition of Cartouche and on our website (www.cca-acc.org).

Have a peaceful and merry Christmas and a very happy 2018!
Julia

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VICE PRESIDENT'S MESSAGE

Monica Lloyd

**Centre of Geographic Sciences,
Nova Scotia Community College**

Monica Lloyd is the Vice-President of the Canadian Cartographic Association and faculty at the Centre of Geographic Sciences (COGS) campus of the Nova Scotia Community College. She teaches in the two year Diploma in Geographic Sciences Program focusing in Cartography and GIS.



This edition of the Cartouche newsletter is both editions 93 & 94 wrapped up into one. Over the past two years I have taken over the role of assembling Cartouche and think I have finally found the rhythm for putting it together amidst other daily responsibilities. This newsletter would not be possible without editing and organization from Roger Wheate. Thanks Roger for your assistance with Cartouche and I would also like to say a big “thank-you” to all the Cartographers who submitted content. It is our hope to get on track with two editions in 2018. Please send along content for Cartouche’s 95th edition (winter/spring) to Roger Wheate.

This past October, I had the opportunity to attend my first NACIS (North American Cartographic Information Society) meeting held in Montréal, Québec. If you have ever attended a NACIS conference the term “NACIS is nicest” is used to describe their meeting. Cartographers from across the US, Canada and beyond gathered to speak the world of maps. There was so much content packed into the four day conference and so refreshing to talk with fellow cartographers. Attending this meeting really helped rejuvenate one’s creative mapping spirit. Speaking of creative spirits, Antone Thomas (<http://www.antonthomasart.com/>) presented the spark behind his hand drawn maps and his method to their creation. If you have not seen his amazing work, take a minute to check out sketch work at his site. His talks at NACIS can also be found there. John Nelson from Esri also presented interesting approaches to creative mapping using ArcGIS Pro. John blogs at adventuresinmapping.com (<https://adventuresinmapping.com/>) and also for Esri (<https://blogs.esri.com/esri/arcgis/>) if you are interested in learning more about his digital and hand drawn techniques. NACIS 2017 presentations can be found at <http://bit.ly/2phnDID>, check them out and prepare to be inspired.

As Julia mentioned, the 2017 conference in Ottawa was an insightful meeting full of excellent presentations and good cheer. Steve and his team did a fabulous job hosting at Carleton

University. Mark your calendars for the 2018 conference to be held May 30 – June 2nd at COGS (Centre of Geographic Sciences) in Lawrencetown, Nova Scotia. COGS is located in the beautiful Annapolis Valley rich in viticulture and warm maritime hospitality. The organizing committee is planning a technical day, two days of presentations and a visit to Grand-Pré and the local wine region. Our theme this year is Community Mapping: Place- Making Through Maps. This theme speaks to the teaching and learning done at COGS. Learners engage with community members to help map out assets important to them. This practice has been an integral component of all programs at COGS. We invite you to present your mapping project this May. Watch for a call for presentations to be sent out in early January. Details about the conference will also be hosted here and updated in the coming weeks.

Let this be an opportunity to bring together all those who make and love maps. We are looking forward to seeing many COGS alumni and to host guests from far and wide.



Monica Lloyd & Roger Wheate - Montréal NACIS 2017 - Mont Royal Sunrise

HISTORY of CARTOGRAPHY INTEREST GROUP

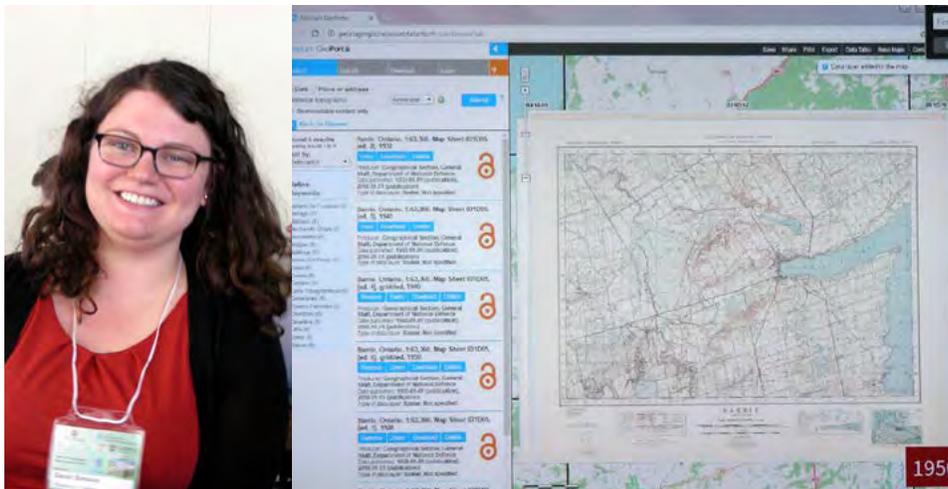
Byron Moldofsky
University of Toronto



Report on Historical Cartography Session at CCA conference 2017 - Ottawa

We had a robust and enjoyable session last summer at Carleton University during the CCA annual conference and meeting. The Conference theme of “150 Years of Cartography: Past, Present and Future” to commemorate Canada’s sesquicentennial, allowed us to divide the presentation sessions accordingly, starting off with “The Past” at the beginning of Day 1. This was comprised of the Keynote Address by Dr. Ian Crain, “The CGIS + 50: Origins, Innovation, and Lasting Legacy”, followed by seven wide-ranging talks under the general heading of “Historical Mapping and GIS.”

Roger Wheate was first up, giving us a “Brief History of 150 years of Topographic Mapping in Canada” accompanied by terrific images of the different map series as they changed over time, delivered with his usual flair. Sarah Simpkin told us about the collaborative Ontario Universities Library project which has digitized and made available for public use a collection of over 1100 historical topographical maps of Ontario, demonstrating their web delivery system with some of the historical series showing nearby Ottawa locations (<https://ocul.on.ca/topomaps/>).



Sarah Simpkin presents Ontario Universities Library project - 1100 historical topographic maps

Giuseppe Filoso then outlined the Statistics Canada project to restore and distribute detailed Enumeration Area mapping from the 1971 boundary files, which will enable much better historical analysis of population change in Canadian CMAs (<http://www.statcan.gc.ca/pub/16-510-x/16-510-x2017001-eng.htm>). Kevin Ballantyne showed us the very nifty method and website he has developed for “Mapping Historic Buildings in Ottawa.” (<http://www.kballantyne.ca/geomatics/bygone-buildings-ottawa/>). Wendy Smith described “The Toronto PARK LOT PROJECT — Mapping the Founding History of Toronto & Upper Canada” (<http://parklotproject.com>). Finally, Rebecca Bartlett and Trevor Ford demonstrated how they have combined their GIS and military history expertise to generate and display the front line movement at the Battle of Vimy Ridge, April 1917. Oh, and I squeezed one in there myself as well, outlining the recent progress made on the Canadian Historical GIS Partnership project (<http://geohist.ca>).

Abstracts for all of the presentations can be found online in the Published Program at:

<http://cca-acc.org/wp-content/uploads/CCA-Conference-2017-Carleton-Program-O-V4.pdf>

and several of them are available as PDFs online at:

<http://cca-acc.org/conferences/past-conferences/past-conferences-selected-presentations>

The presentations were excellent, but in this article I just wanted to highlight what Ian Crain shared with us in his keynote presentation. Most of us have heard that “GIS was invented in Canada” - and been exposed to some version of the story of the “Canadian Geographic Information System” or “CGIS”, its development usually credited largely to Roger Tomlinson back in the 1960s. Ian’s talk took us back to the origins of the project, which can be traced to the 1958 Senate Committee’s report “Resources for Tomorrow”, calling for what we would now call evidence-based government policy, and concerned with rural poverty and the effective use of land. This led



Dr. Ian Crain presents “The CGIS +50: Origins, Innovation, and Lasting Legacy” CCA conference at Carleton University

to the 1961 passing of the Agriculture Rehabilitation and Development Act (ARDA) by John Diefenbaker’s government, and the development of the Canada Land Inventory (CLI). The CGIS was the technological response to the need for a CLI, and Tomlinson’s contribution was really to define the scope and functional requirements of such a system, and to identify the innovations in spatial science and computing that this required. He wrote the feasibility study that managed to convince the powers of the time that such an unheard of and ambitious program was truly possible, and could be achieved - here in Canada? All of us whose reach in proposal-writing has exceeded our grasp can marvel at that accomplishment, and the successful development of the CLI that followed.

Ian became personally involved with the CGIS in 1982, when he became head of the Canada Land Data Systems (CLDS) Division of Environment Canada, responsible for the operation, as well as the overhaul and modernization of the CGIS. It continued to run successfully, expanding and branching out into the Canada Land Use Monitoring Program, among other products, through the 1980s. But by 1988 pressures mounted on the CLDS, both technical (aging customized software and tape-based hardware) and administrative (service-oriented rather than science and policy-oriented trends in government.)

By 1995, when it shut down, the CGIS and CLI had become something of a reclamation project, as the original data and documentation for various parts of the project had been lost or obscured (where have we heard THAT before!) and at one point the idea of scrapping all the project maps and tapes was considered. Ian told us the tale of the rather extraordinary efforts, by himself and a group of unsung volunteers from among the original folks who worked on the CLI project during the 1980s, to reclaim and restore the data that we all as taxpayers had paid for, and we all as Canadian GIS workers and historians still need! Despite huge challenges, both technical and fiscal, and with the aid of bits and pieces of information from StatsCan, AgCan, Environment Canada, and help and some funding from NRCan, the original CLI data was transferred from tape and reclaimed. The files were released through GeoGratis and I would guess that many of you reading this have downloaded them at some time or another, and found them as important and useful as I have.

Ian has compiled a collection of the (mostly unpublished) documentation related to the development of the CGIS and CLI, which he accumulated during the reclamation process and since. He has donated it to Library and Archives Canada, and this would be an essential resource if any aspiring historians of cartographic technology ever wish to write the “complete” history of Canada’s first and most influential GIS project. Details about this and other aspects of the project are available in Ian’s presentation, available at:

<http://cca-acc.org/wp-content/uploads/CCA-2017-Ian-Crain.pdf>

Thanks again to Ian, and to all of our presenters.

Ottawa Conference Update
150 Years of Cartography: Past, Present & Future
Els Aelvoet
GIS analyst, Library of Parliament, Ottawa

A summary of the 2017 Conference of the Canadian Cartographic Association: “150 Years of Cartography: Past, Present and Future”



2017 CCA Attendees, Carleton University (Photo: Alberta Wood)

The 42nd Annual Conference of the Canadian Cartographic Association was held, May 31st thru June 2nd, at Carleton University. Inspired by the 150th birthday of Canada, the guiding theme of this year's conference was "150 Years of Cartography: Past, Present and Future".

The venue for the conference was the Richcraft Hall, formerly known as the River Building at Carleton University. The Hall, with its signature open space and beautiful patio overlooking the Rideau River, formed an excellent venue for a well-attended conference with students, researchers, educators, and professionals from different levels of government and the private sector participating.

An absolute highlight of the conference was the variety of events held each day. Each successfully bonded the conference together into one congruent whole, while providing ample opportunities to network. The conference kicked off with a guided tour of the Canadian Museum of History, followed by a trivia Icebreaker event on Wednesday evening, and a Wine and Cheese reception on Thursday evening.

There was a map display and poster contest throughout the conference, for which the final results were announced during the Annual General Meeting on Friday afternoon. The conference closed with an orienteering contest on the Carleton University Campus, followed by drinks and dinner at the Barley Mow pub.

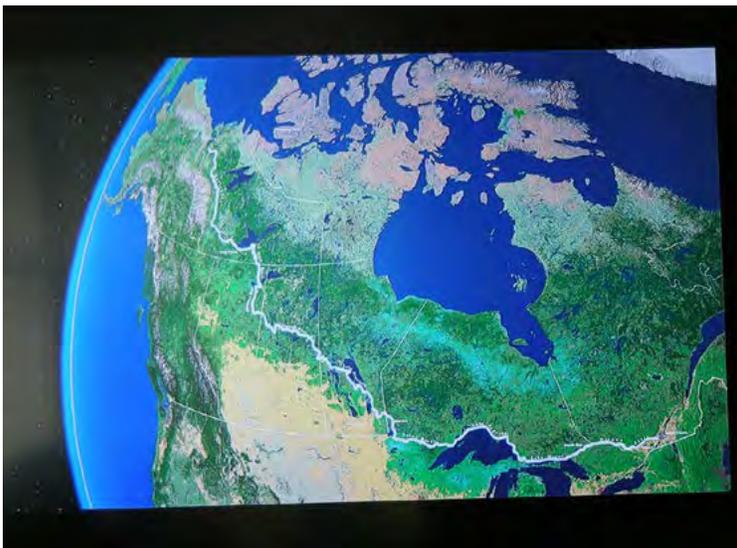
With about 30 presentations in total, the participants were particularly able to immerse themselves in their much-loved interest of maps.

The conference sessions began Thursday morning with an insightful talk, by keynote speaker Ian Crain from the Orbis Institute, on the Canadian Geographic Information System (CGIS) and the amazing story of rescue and recovery of the entire CGIS databank.

The morning continued with an introduction to the sequence and series of topographic mappings that laid the foundations for the thorough mapping of Canada, and then how historic topographic maps and historical spatial data have been made available for research as well as public use. The morning ended with a deep-dive into the techniques that enabled historians a clearer visualization of the battle for Vimy Ridge.

The afternoon continued with discussions of current map applications and techniques.

Keynote speaker Chris Brackley from *As the Crow Flies cARTography*, demonstrated how the design of maps can enable map-readers to interpret the sometime abstract concept of maps. Additional presentations addressed some current techniques, research results and challenges regarding how maps are deployed to explain crucial information to those needing to know. NRCan also provided an overview of their geospatial offerings and shared some future plans.



Cartographic Work By Chris Brackley, As the Crow Flies cARTography
(Photo: Alberta Wood)

On Friday, a prognosis was given on the future of mapping. The keynote presentation by Fraser Taylor from Carleton University challenged the audience to reflect on the need for cartographers to take control of their future destiny and not allow technology to drive their response.



Dr. Fraser Taylor presents on Rapid Technological Change and the Future of Cartography (Photos: Alberta Wood)

A quick snapshot of the afternoon presentations indicated a promising and abundant diversity of possibilities for the future, supported by an active and dynamic community of cartographers: i.e. Structure in Motion technology, the current approaches that employ Deep Learning Neural Networks, testing route-finding efficacy, mapping spatial patterns of urban travel with open source tools, a new method for line simplification, investigations concerning impact of restaurant proximity on public health, and the potential as well as limitations of cartographic applications that are dedicated to the representation of stories and its use for mapping life stories of refugees.

The day concluded with a technical session on the Web Mercator Projection and Raster Tile Maps.

In 2018, the CCA conference will be held at Lawrencetown, Nova Scotia at the Centre of Geographic Science (COGS), May 30-June 2.

For those who could not make it this year, here you can find a detailed overview of all topics and presenters of the 42nd annual CCA conference.



Conference Photos Contributed by Alberta Wood & Monica Lloyd



Conference Photos Contributed by Alberta Wood & Monica Lloyd

ICC Conference Update

Aileen Buckley

ICC 2017 Conference Co-chair

Twenty–Eighth International Cartographic Conference July 2–7, 2017, Washington, DC

The Twenty-Eighth International Cartographic Conference (ICC) was held July 2–7, 2017, in Washington, DC, with attendees and exhibitors representing an international assembly of governments, academia, and private industry. As the official conference of the International Cartographic Association (ICA), the ICC takes place every two years in one of the ICA member countries, where it is organized and sponsored by national societies or agencies. This year's conference was sponsored by the Cartography and Geographic Information Society (CaGIS), a sister society to the Canadian Cartographic Association (CCA). The Local Organizing Committee (LOC)—consisting of 40 people and chaired by Lynn Usery with the support of co-chairs Aileen Buckley and Tim Trainor—worked on this event for over six years, ever since the United States first bid for the ICC at the 2011 ICA General Assembly in Paris. After losing the bid for the 2015 ICC to Rio de Janeiro, the United States was awarded the 2017 ICC. This was the first ICC to be held in North America since Ottawa in 1999, hosted by a consortium of nine Canadian associations, including the CCA.

Here are some highlights of ICC 2017:

- Just over 900 registrants from 57 countries, including 14 from Canada
- 26 student participants
- 496 scientific paper presentations and 205 poster presentations, of which, respectively, 10 and 4 entries were from Canada, plus one commercial exhibit – Avenza Systems.
- The International Cartographic Exhibition (ICE), with 475 maps, atlases, globes, and other cartographic works, including 20 entries from Canada
- The Children's Map Competition, with 193 entries from 34 countries, including 3 entries from Canada
- 28 student assistants from 9 different countries
- 12 preconference workshops with 271 attendees
- 10 technical tours with 230 attendees

The ICC 2017 website (<http://icc2017.org/>) provides additional information about the conference and these events.



Attendees of ICC 2017 assembled after the opening ceremony for a group photo. (Photo by Eric Anderson; the conference co-chairs Aileen Buckley and Lynn Usery are at the bottom left.)

Venue

Conveniently located along the Red Line of the Metro rail rapid transit system, the venue for ICC 2017 was the Marriott Wardman Park hotel (<http://icc2017.org/conference-hotel/>), located just two and a half miles northwest of the White House and across from the Woodley Park Zoo. The Metro offered easy access by subway to all of Washington, DC, including the free Smithsonian museums and Washington's National Mall with its historic monuments.

Overview of Events

The ICC began with preconference workshops that convened in the four days prior to the opening of the conference. The Extraordinary General Assembly of delegates to the ICA was held on Sunday, July 2. ICC 2017 began the next day with an opening ceremony that had an audience of around 900. The program included a special presentation by Menno-Jan Kraak, ICA president; a number of welcomes from the American cartographic community; and a musical program by the award-winning Howard University Gospel Choir, which also performed the ICA anthem (introduced at ICC 2015 in Rio).



The Howard University Gospel Choir performed a short but enthusiastic musical program during the ICC 2017 opening ceremony on July 3. (Photo by Dierdre Bevington-Attardi.)

After the opening ceremony, the exhibition hall—which included the International Trade Exhibition and the International Cartographic Exhibition—was opened to the public, as was the area with the maps that had been entered in the Barbara Petchenik Children’s World Map Drawing Competition. The scientific program began on Monday afternoon and included concurrent sessions on a wide selection of conference themes. An icebreaker reception was held in the exhibition hall later that evening, allowing conference attendees to mix and mingle over drinks and a healthy offering of appetizers.



Dan Cole, Roger Wheate, and Mark Denil catch up at the icebreaker reception on July 3. (Photo by Dierdre Bevington-Attardi.)

The week continued with each day consisting of concurrent paper sessions, poster presentations, and plenary sessions. Business meetings of the ICA commissions were also scheduled throughout the week, as were technical tours and a variety of social events. ICC 2017 ended with the closing ceremony on the afternoon of Friday, July 7, during which a variety of ICA awards were announced (<http://icaci.org/ica-awards-ceremony-icc2017dc/>). The student assistants offered their insight into the conference, and a wrap-up presentation was given by President Kraak. Also during this ceremony, the organizers officially received the ICA flag for the next ICC, to be held in 2019 in Tokyo, Japan (<http://icaci.org/icc2019/>).

Details about these and other ICC 2017 events follow.

ICA Commission Workshops

The first ICC 2017 activity was the History of Cartography workshop, held June 28–30 at the Library of Congress. Other preconference workshops were held both on- and off-site on Saturday and Sunday, July 1 and 2 (<http://icc2017.org/preconference-workshops/>). These workshops were organized by commissions of the ICA and included such topics as the following:

- Location-Based Social Media and Tracking Data
- Supporting Sustainable Development with Geoinformation Management
- Mapping Tools for Nonmapping Experts
- Planetary Maps and Maps for Children
- Map Projections
- Mapping Challenges Identified in the United Nations Disaster Risk Management Conference
- Spatial Data Infrastructures, Standards, and Open and Open-Source Data
- Maps and Emotions
- Maps and Charts from the Early Modern Period to the Twentieth Century

In all, 415 people registered for these workshops—over half the conference registrants!

Extraordinary General Assembly

While this was not an ICA General Assembly (those are held every four years, with the last in Rio in 2015), the ICA did convene its Extraordinary General Assembly (<http://icaci.org/extraordinary-general-assembly-2017/>), primarily to introduce and get approval for a number of bylaw changes. Visit the ICA website for a report on the 2017 assembly (<http://icaci.org/>). In addition, the ICA national delegates voted to approve the acceptance of three new member nations: Estonia, Georgia, and Bangladesh.

Scientific Program

The scientific program (<http://icc2017.org/conference-program/>) was developed from more than 763 submissions and papers submitted to the ICC LOC (<http://icc2017.org/icc-2017-local-organizing-committee/>). Under the direction of Dr. Cindy Brewer, scientific program chair, nearly 80 members of the Scientific Program Committee (see page 5 of the print program at <http://www.eventscribe.com/2017/ICC/assets/AbridgedProgramPDF.pdf>) organized papers and posters for sessions relating to the 40 conference themes. Oral presentations were given in over 10 concurrent sessions held July 3–7. Poster sessions were held July 3–5.



Scientific program chair Cindy Brewer worked hard to make sure the program was up-to-date.
(Photo by Dierdre Bevington-Attardi.)

The program also included a series of plenary presentations
(<http://icc2017.org/keynote-presentations/>) from the following:

- Tom Patterson, Senior Cartographer, US National Park Service, on Tuesday, July 4
- Robert Cardillo, Director of the US National Geospatial-Intelligence Agency, July 5
- Lee Schwartz, Geographer, US Department of State, July 6
- Mikel Maron, Mapbox, on Friday, July 7



Dr. Lee Schwartz (centre) greets Frasier Taylor (left) and ICC Conference Chair, Lynn Usery (right)
after his plenary presentation on July 6. (Photo by Dierdre Bevington-Attardi.)

International Cartographic Exhibition

In conjunction with each ICC, the International Cartographic Exhibition is organized, wherein map products originating from ICA member nations and affiliate members are displayed. The maps in the exhibition are first authorized and selected by the ICA national members. At the ICE, an international jury selects the best entries in various categories. As with the papers and posters, the entries in the ICE can be searched for and viewed in the online program or via the web app—you can even see thumbnail images of each entry

(<https://www.eventscribe.com/2017/ICC/PosterTitles.asp?h=International%20Cartographic%20Exhibition>).

The 475 total entries in the twenty-eighth ICE included the following:

- 289 maps on panels
- 44 digital cartographic products
- 43 charts on panels
- 41 atlases
- 24 educational cartographic products
- 24 other cartographic products
- 9 digital services

Canada had 20 entries in the International Cartography Exhibition:

2 atlases

- Africa West Route Travel Atlas
- Deuxieme Atlas des Oiseaux Nicheurs des Maritimes

18 maps on panels

- Adragal
- Banff, Yoho, Kootenay National Parks
- Burnie Glacier Area
- Communities of the Northwest Territories
- Confronting the Illusion: Identifying Food Mirages and Food Deserts in Winnipeg
- Contaminated & Remediated Sites in the Northwest Territories
- Cuba Travel Reference Map
- Generalized Land Cover Map of Alberta
- Haida Gwaii/Queen Charlotte Islands Wall Map
- Kamloops Geopictorial™ Travel Guide/Poster
- Residential Building Construction Dates Revisited: 2003 vs 2016
- RK. Heliski Tenure and Run Map
- Surf and Soak: Southeastern Alaska
- The Great Trail | Le Grand Sentier
- The Landscapes of Grand Pre: Images, Maps, Past and Present
- Toronto's Skyline to Join the Big Leagues: What the City Could Look Like in 2020
- West Kootenay/Boundary Geopictorial™ Travel Guide/Poster
- White Glacier 2014, Axel Helberg Island, Canadian Arctic Archipelago



Canada's paper maps were displayed on five panels in the International Cartographic Exhibition; one panel is shown here. (Photo by Dierdre Bevington-Attardi.)

Barbara Petchenik Children's World Map Competition

The Barbara Petchenik Children's World Map Competition is a biennial map drawing competition for children. It was created by the ICA in 1993 as a memorial to Barbara Petchenik, who had a lifelong interest in maps for children and, unfortunately, died while in service to the ICA as a vice president on the association's executive committee. The aim of the contest is to promote children's creative representation of the world in graphic form. Entries are first selected in a national competition in all participating ICA member countries. The winning entries in the national competitions are then exhibited during the International Cartographic Conference, where the international winners are selected (visit the ICA website, where the winning maps will be posted: <http://icaci.org/icc2017/>). The 2017 competition included entries from 34 participating countries and 193 drawings categorized in the following age groups (<http://www.explokart.eu/petchenik/>):

- Under 6 years of age (16 submissions)
- 6–8 years of age (29 submissions)
- 9–12 years of age (75 submissions)
- Above 12 years of age (73 submissions)

Canada's three entries—each from Lord Elgin Public School in London—were the following:

- Peace Is within Us

Tasnim Abou Ghalyoun, Kovan Alhamo, and Dominic McCaulley (9 years old)

- Open Your Heart to the World Arif Mehwish (14 years old)
- Love the Earth Zainab Fugarai (14 years old)



Canada entered three national winners in the Children's Map Competition (clockwise from top): *Peace Is within Us*, *Open Your Heart to the World*, and *Love the Earth*.
(Photo by Dierdre Bevington-Attardi.)

International Trade Exhibition

The International Trade Exhibition was open to conference goers from July 3 to July 6, with 25 exhibitors representing federal agencies, private industries, universities, publishers, and professional societies from around the world. Attendees could also visit the booths of the Hemisphere-level ICC 2017 sponsors: Esri; the US Census Bureau; the US Geological Survey; Global Earth Observation System of Systems (GEOSS); and Afriterrra, the free cartographic library. A special booth gave visitors a glimpse of what to expect at ICC 2019 in Japan.



Visitors to the International Trade Exhibition could sample delights that are sure to be experienced at the ICE 2019 in Tokyo, Japan.
(Photo by Alberta Auringer Wood.)

Technical Tours

Several technical tours were offered during the conference, enabling participants to experience and learn about the latest cartographic developments in local governmental and private institutions. ICC 2017 offered 10 technical tours

(<http://icc2017.org/technical-tour-information/>) that featured visits to seven different cartography and geospatial information science organizations in the DC area:

- US Geological Society
- Library of Congress Geography and Map Reading Room (4 tours)
- National Geographic Society
- National Oceanic and Atmospheric Administration
- Fairfax County Government GIS and Mapping Services Department
- Esri R&D Center, Washington, DC
- Smithsonian Institution

There were 230 registrants for these tours.

Social Events

ICC 2017 was scheduled during the United States' Independence Day holiday, and the Washington, DC, area is famous for one of the most elaborate Fourth of July fireworks displays in the country. Conference attendees were graced with a shortened schedule on that day and were encouraged to participate in local holiday celebrations.



Fireworks displays on July 4 were spectacular, especially when viewed from the top floor of the conference hotel. (Video by Dierdre Bevington-Attardi.)

In addition, a number of social events were planned for other days during the week (<http://icc2017.org/social-program/>):

- The icebreaker reception on the evening of the opening day
- A meridian walk led by Dr. Keith Clarke
- A walking tour of historic bars in DC, led by Doug Vandegraft
- A Washington Nationals baseball game, which unfortunately got rained out
- A gala dinner at a Texas-style restaurant
- An orienteering event with 33 registrants
- An art gallery reception featuring the works of Mary Edna Fraser

During the meridian walk, on July 5, 11 registrants visited the markers and sites along the four principal meridians used in mapping before the Greenwich meridian was adopted as the US standard. On the walking tour of historic bars, the 28 registrants visited several local Washington brewpubs and former speakeasies and grabbed dinner at the historic Old Ebbitt Grill. The ICC gala dinner was held on Thursday, July 6, as an informal event at the Texas Hill Country Barbeque Restaurant—152 registrants partook of a barbeque dinner, which was followed by music by a live band and dancing.



The gala dinner provided ample opportunity for people to visit, eat, drink, and dance—all with Texas flair. (Photo by Eric Anderson.)

The ICA orienteering event (<http://icaci.org/orienteering/>) was held on Thursday, July 6, at Fountainhead Regional Park in Fairfax County, Virginia, on one of the premier championship-quality courses in the nation. The event, hosted by the local Quantico Orienteering Club, included three courses: Advanced Beginner (Yellow, 1.7 km, 95 m, 8 controls), Intermediate (Orange, 3.1 km, 10 controls), and Advanced (Brown, 3.7 km, 195 m, 10 controls). Because of the anticipated heat and humidity, the event started early, at 8:00 a.m. Unexpected rain and flooding caused many participants to exert all their skills to navigate and complete the courses. Winners were announced on the ICA website (<http://icaci.org/orienteering/>).



Heavy rains and flooding challenged orienteering event participants but did little to dampen the spirits of (from left to right) ICA president Menno-Jan Kraak, ICA past president Georg Gartner, and ICA secretary general László Zentai. (Photo courtesy of László Zentai.)

On July 5, an exhibition entitled *Rising Tides: Batiks on Silk* was held at a local art gallery. The exhibition featured works by Mary Edna Fraser, a world-renowned artist who specializes in creations that integrate cartography and geospatial science and technology. Fraser's batiks were also prominently displayed above the International Trade Exhibition entrance, which was also where entries in the Children's Map Competition could be viewed by conference attendees and the public.



Mary Edna Fraser's batiks hung over the Children's Map Competition, gracing the entrance to the International Trade Exhibition. (Photo by Dierdre Bevington-Attardi.)

At the end of the week, the ICC 2017 attendees were tired, wired, and inspired. In all, ICC 2017 provided a week full of activities to engage, educate, and entertain its participants.

Footnote: the next ICC meetings will be held in July in Tokyo, 2021 and Florence (Italy) in 2023.

FEATURE ARTICLE

Ian Crain, Principal, The Orbis Institute

CGIS +50 - Origins and Legacy



This article is a condensed version of part of the Keynote Address by Ian Crain given at the CCA Annual Conference in Ottawa on May 30. Ian is a long-time member of the CCA and was the Director of the CGIS from 1981-1989.

The Canada Geographic Information System (CGIS) was publicly launched 50 years ago with a rather grand 22-minute movie produced by the National Film Board called “Data for Decision - The Geographic Information System of the Directorate of Regional Planning”, with a feature stand-up by the acknowledged “Father of GIS”, Ottawa-based Roger Tomlinson, who passed away in 2014. This was an important landmark in Canadian cartography, and globally in what has come to be called “Geomatics” or the “Spatial Sciences”. The development of the world’s first GIS is a real Canadian story co-incident with Canada’s Centennial, and thus worth telling or re-telling at this 150th Anniversary of Confederation. You can find a number of slightly differing accounts of the origin of the CGIS (some by Tomlinson himself) in GIS textbooks, and even a rather garbled version in Wikipedia. In putting this together, I have also made use of a collection of contemporary documents now held by Library and Archives Canada (known as the “Ian Crain Collection”) that shed light on the technological challenges and solutions found. (See description on page 22)

Context of the time

Ah - the 1960s! - some of us are old enough to remember - mini-skirts, flower power, student activism, Expo-67, Trudeaumania (number one), and the **computer revolution**. Canada was already a world leader in aerial photography and mapping technology, and the sixties brought with it a bold spirit and confident “can-do” attitude that infected the entire country. Everybody (I was no exception) was writing papers with titles starting with “Using computers to...” It was in this atmosphere that the CGIS was born - like many inventions, out of necessity.



In the beginning

As it is said, “necessity is the mother of invention”, so who then is the real father (or mother) of GIS - well one alternate candidate is John G Diefenbaker...

In 1961, responding to a Senate Committee report “Resources for Tomorrow”, the Diefenbaker government passed the Agricultural Rehabilitation and Development Act (ARDA). The concerns were rural poverty and future food production for the rapidly growing population. The Act called for:



John G Diefenbaker

- a nation-wide inventory of resource land, later called the Canada Land Inventory (CLI)
- an Agricultural Rehabilitation and Development Administration with the mandate to assess the economic potential of various land uses and relationship between land suitability and socio-economic factors, especially on so-called “marginal lands”, and
- very importantly, serious funding (to the tune of \$25 Million) to get on with the job. It was an early example of “The West Wants In”!



Roger Tomlinson

Meanwhile Roger Tomlinson, who worked for the Ottawa-based aerial survey firm Spartan Air Services, in the early 1960s had already been looking at the possibility of using computers to assist with projects requiring multiple map overlays - having lost a bid on a project in Kenya because an impossible amount of manual work was required. A supposed “chance meeting” on a plane with a senior ARDA official, Lee Pratt, led to Tomlinson making a proposal - a 1962 document entitled “An introduction to the use of electronic computers in the storage compilation and assessment of natural and economic data for the evaluation of marginal lands.” Not a catchy title, but clearly directed at the specific mandate of ARDA. This sufficiently impressed Pratt that a contract was issued to Spartan for a proper Feasibility Study to put some practicality (and costs) to the proposed concepts. The “Feasibility Report of Computer Mapping System” was presented to ARDA in September 1963. It stands today as the defining functional specification of a GIS*, and included the preliminary design of a cartographic input scanner.

* In these early documents, the term “Computer Mapping” and “Geo-information system” and even “GeoIS” were used. The reputed first published use of the term “Geographic Information System” is in a 1968 conference paper by Tomlinson (1), although the term was used in 1967 in an internal IBM Report by F K Jankulac (2), and several other circulated, but “unpublished”, reports, as well as in the sub-title of the NFB film, also in 1967.

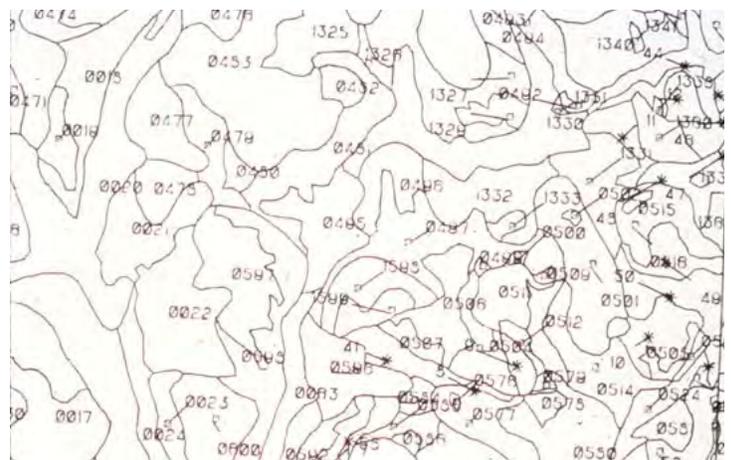
The *Feasibility Report* clearly outlined the major challenges and user needs, for example:

- **Total area:** 1,080,000 sq miles
- **Input maps required:** 1700 existing maps, along with new maps to be prepared leading to a requirement of 1000 per year
- **Number of areas (polygons):** estimated at 8 per sq mile, i.e. about 8 Million for each single theme of land capability in the CLI (5 themes initially called for)
- **Data storage of polygon boundaries:** at 100 points per inch would fill 2,286 reels of magnetic tape
- **Positional accuracy:** essential for map superposition (overlay) to work properly.

Some key **functional requirements** were:

- **General Purpose System:** not specific to any particular thematic maps and the particular needs of ARDA and the CLI. (Tomlinson was also trying to interest the US and Canadian military, and other applications)
- **Seamless Coverage of (at least) all of Canada:** not split into map sheets
- **Full Topological Overlay:** especially to link with socio-economic data
- **Retrieval and Analysis by Area Selection:** generalization (dissolve function), corridor function (i.e. “buffering”).

It is important to note that Tomlinson defined requirements in practical, quantitative, and functional terms without regard to the apparent limitations of computer capacity at the time. This was a user-directed or “bottom-up” specification, **not** *What can computers do to assist?* rather *What must they do to meet the requirements?*



System Development

The Feasibility Report was accepted and a contract issued to Spartan (1964), who partnered with the expertise of IBM - both the research facility in Poughkeepsie New York and the IBM Canada office in Ottawa - in order to have the computer technology expertise to tackle the obvious challenges. (This was not a directed contract, there was at least one other proposal, from Computing Devices Canada).

It was then up to the technical experts (Tomlinson was not a software or hardware engineer, mathematician or programmer) to come up with the innovations that would enable feeble 1960s computers to meet the ambitious requirements. Their efforts are documented in a number of contemporary reports, mainly unpublished. Some of these unsung heroes, almost all from IBM-Ottawa, are:

- Robert Kemeny - data compaction, directional run-length encoding algorithms
- D.R Thompson - design of the drum scanner (3)
- Don Lever - raster to vector conversion of scanned linework
- Guy Morton - efficient data access and seamless process
- Frank Jankulac - accurate coordinate referencing and area calculation (5)
- Peter Kingston - software programming and systems integration System Operation

When the promotional documentary "Data for Decision" was made in 1967, the pieces of the system were not yet together, so everything you see in that film is fake. Some of the interactive functions "demonstrated" were not incorporated until the mid 1980's! The flashing light special effects look like something out of a very low budget sci-fi movie of the 50's. The film is also well worth watching for the 60s fashions and gender stereotyping - the women are in clerical jobs and wear Mary Quant mini-dresses; the men are the "Administrators" and wear suits - one sports a pipe (unlit). Versions of the film can be found on YouTube in 3 sections (search for "Data for Decision"). A six-minute clip that contains Tomlinson's rather wooden and stumbling rationale, is available on the ESRI web-site.

** Somewhere around 1979 the organization that operated the CGIS was named the Canada Land Data System (CLDS) Division. The CGIS name was retained to refer to the software and processing system, but the two set of initials were often used interchangeably.

In spite of this, by 1993, the CGIS had fallen into disuse and was officially closed down in 1995, leaving the massive data collection at risk. The tale of attempts to rescue the CLI and hundreds of other irreplaceable datasets will be told in the next Cartouche edition.

Legacy

The legacy left by the CGIS is a mixed bag. On one hand, all GIS historians credit CGIS as the origin, and the principles of the 1963 Feasibility Report are recognizable in all modern GIS. The basic dual data structure of linked spatial data and attribute data, the chain-node (now called arc-node) representation of line work, and the term "coverage" have been passed on.

There have been a few related indirect spin-offs of Canadian commercial systems:

- SPANS – a Canadian raster-based GIS that used the quad-tree concept to good effect.
- CARIS – developed by Dr Sam Masry at UNB, who has always acknowledged the connections to, and impetus from, CGIS.

On the other hand, in spite of a few attempts, CGIS was never successfully commercialized, and few references to GIS history credit the technological innovations or suggest any direct parentage to subsequent systems.

The CGIS concept of data partitioning or tiling are evident in Google Maps and its relatives, and one sees CGIS data compaction approaches in such things as ".jpg" files. But this seems more likely a case of "necessity is the mother of re-invention" rather than CGIS legacy.

Overall, the CGIS represented a paradigm shift in cartography – towards spatial decision-support systems. No commercial system has ever reached the capacity and functionality of CGIS. Perhaps CGIS met the fate of some other ahead-of-their-time technology leaders - like the Avro Arrow, BetaMax, Blackberry...

References

(1) Tomlinson, R F, 1968, A Geographic Information System for Regional Planning, in Land Evaluation - papers of a CSIRO Symposium, Canberra 26-31 August 1968, ed. G A Stewart, Macmillan of Australia, p 200-210

(2) Jankulak, F K, 1967, A System Design for a Geographic Information System, IBM Internal Report, Ottawa

(3) Thompson, Donald R, 1967, An IBM Special Cartographic Scanner, in Proc. ASP-ACSM Annual Conference

(4) Morton, Guy, 1966, A Computer Oriented Geodetic Data Base and a new technique in file sequencing, IBM Internal Report

(5) Jankulak, Frank K, 1966, A Reference Coordinate System for Computer Mapping, IBM Internal Report

(References 2 through 5 can be found in the Ian Crain Collection in the LAC)

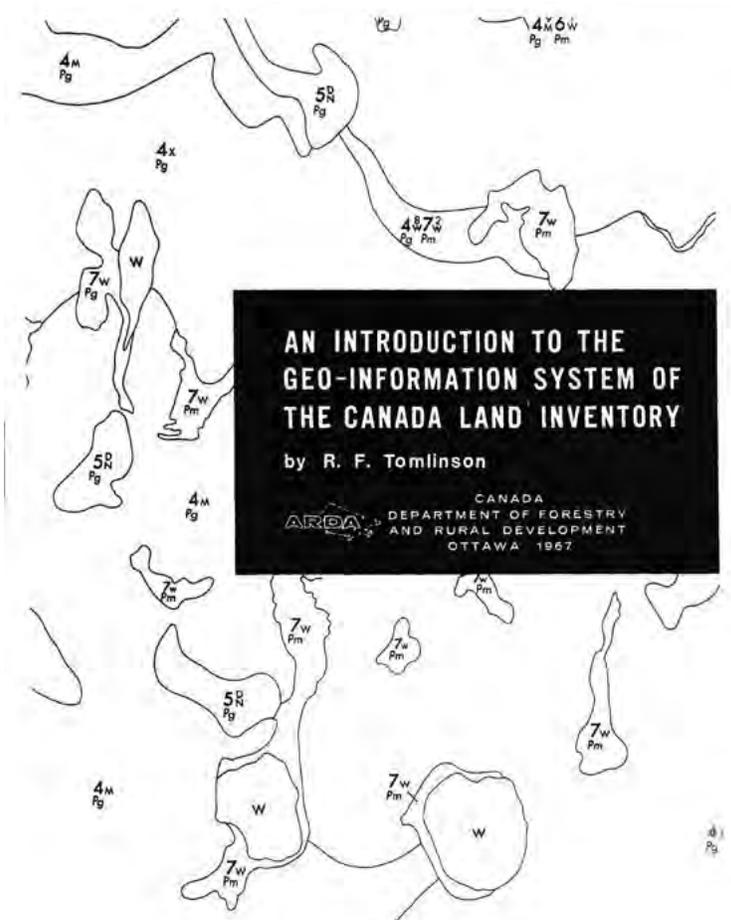
The Crain Collection R13742-0-2-E
BAN 2009 00870-7
MIKAN No. 4046905

The collection consists of documents from the early feasibility studies and proposals as early as 1962, through to data catalogues and technical documentation of 1988, created by the Canada Geographic Information System (CGIS), Environmental Conservation Service, Department of the Environment and collected by Ian Crain, Director of CGIS for a number of its last operational years. The material is significant, including much referenced but largely unavailable internal reports of IBM during the software development, and technical specifications for the design and later re-building of the famous drum scanner (some items annotated). Materials such as the "CLDS Technical Report Series" were only informally published and many are identified as "draft". The collection also consists of early unsuccessful proposals by rivals to the Spartan/IBM partnership, and engineering reports that would provide researchers with insight into the technical innovations as they unfolded, as well as the individual contributions of particular scientists and engineers. Included are a couple of original sample plots on mylar from the old Gerber plotter with the historical value of being among the first, if not the first, machine-drawn maps of the Canada Land Inventory (CLI) data, and some printed maps from the Canada Land Use Monitoring Program (CLUMP), which at the time were the first ever printed maps that were fully automated end-to-end as GIS outputs.

Related material on the Canadian Geographic Information Systems (CGIS) can be found in Mikan Series I35137 - Environmental Conservation Service, Department of the Environment fonds.



CGIS in the 80s



Feature Article

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Creating Data for Canada's Indian Residential Schools

This is a tale of geographic data you might have thought already existed, and how useful Canada's survey records have been in trying to create it.

Canada's unfortunate history of Indian residential schools is widely recognized, even if most people do not know many of the details. Mortality rates at these schools were high, and they are infamous for abuse of students, as well as policies that aimed to eliminate native culture. I am not a historian of the residential schools, so I will leave the details to others who are better informed, but I was fortunate enough to be a cartographer who got a job in 2017 of figuring out where the schools were.

You might be surprised to learn that we don't exactly know where all the schools were. A researcher for the Truth and Reconciliation Commission told me that the budget for determining this information not exist at the time. And, if you think about it, there is so much evidence that the schools existed (former students, photographs, vast archives of correspondence) that neither the settlement process nor the commission hearings needed to establish exactly where the schools were.

Locating residential schools is more complex than you might think. How many schools existed? For purposes of the settlement process, the government of Canada recognized 139 federally-funded schools and hostels. While my project was limited to locating these, it is worth bearing in mind that residential schools that did not receive government funding are not on this list, nor are day schools.

In the simplest scenario, what is usually identified as an Indian Residential School (IRS) operated in only one location, and today the building is not only well-known but is currently in use as something else. An example is the Assiniboia IRS in Winnipeg, which now is the offices of the Canadian Centre for Child Protection. A more unusual example is the St. Eugene IRS near Cranbrook, BC, which has become a golf and casino resort.

(<http://steugene.ca>)

Such schools are relatively easy to locate. But a more typical scenario is that a school was moved some time during its history -- perhaps more than once -- and the buildings today are gone. An example would be the Guy Hill IRS, which initially opened in the 1920s in Sturgeon Landing, Saskatchewan. In 1952 it moved to temporary quarters in The Pas, Manitoba, and then in 1958 it relocated to a new building on the south shore of Clearwater Lake, just north of The Pas. The school operated until 1979, and the building was taken down in the 1980s.

The residential schools were usually (but not always) run by religious organizations, the three major churches involved being the Roman Catholic church (various orders), the Anglican Church of Canada, and the United Church of Canada. To the geographic researcher, the significance of the religious affiliation of a school is that the Anglican and United Churches have extensive, well-researched web pages detailing the history of each school; but the Catholic schools have no such systematic documentation.

A good place to begin is with the previous mapping projects for the schools. The Truth and Reconciliation Commission produced a map, (http://www.myrobust.com/websites/trcinstitution/File/pdfs/2039_T&R_map_nov2011_final.pdf) but the scale is too small to show where the schools actually were. More detailed are the on-line efforts of Eugenics Archive (<http://eugenicsarchive.ca/discover/institutions>) and the Residential Schools Interactive Map (RSIM) from Carleton University's Cybercartographic Atlas of the Lake Huron Treaty Relationship Process (http://atlas.gcrc.carleton.ca/lakehuronrelationships/biography.html?surname=ResidentialSchools&side_panel=residential_schools_side). Both of these are useful, but have notable holes. Eugenics Archive only has schools west of Ontario, and does not include schools in the Arctic. Carleton's map does not seem to have been maintained beyond its initial creation -- although it includes some locations determined by the National Commemorative Marker Project, a crowd-sourcing initiative in which people were asked to go out

and get the GPS coordinates of former schools. (That project, unfortunately, does not seem to have left its data accessible on the web.)

The best on-line mapping project of residential schools is that at the National Centre for Truth and Reconciliation (NCTR, at <http://nctr.ca>), an archive at the University of Manitoba that was set up to receive materials that came out of TRC hearings. These maps have the correct school location more often than not, although sadly they do not have a link where you can download the data.

The most useful resource then in pinpointing the schools is survey plans, specifically those archived by Natural Resources Canada at the Canada Lands Survey System site (CLSS, at <http://clss.nrcan.gc.ca/map-carte-eng.php>). Oh, how many times I have been grateful for the people at NRCan who had scanned and entered these old surveys! Between this service, and the Canada Lands KML file (“Canada Lands.kmz” from Geogratis (<http://geogratis.gc.ca/api/en/nrcan-rncan/ess-sst/a0bd9999-600e-48ad-a186-310dfe135b28.html>)) one can locate surveys at many of the old school sites that were on or next to reserve lands.

To illustrate how all these pieces work together, and the confusion surrounding the data on residential schools, let take a look at a specific case, that of St. Peter’s Residential School in Hay River, Northwest Territories. This school, which was operated by the Anglican Church, was open from 1895 to 1937 according to NCTR. (The Anglican Church website however says it opened earlier, in 1894. And, for a third opinion, the excellent archive at the Shingwauk Residential Schools Centre of Algoma University says it was there from 1898 – 1949. This kind of disagreement among sources is typical.)

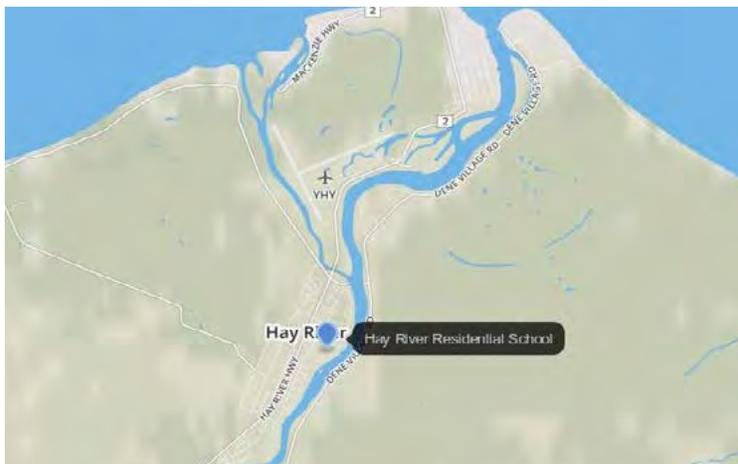


Figure 1: Eugenics Archive on-line map for the Hay River school. The dot is in the new town of Hay River. The old town is at the river’s mouth.

The map at Eugenics Archive [figure 1] places the school in the town of Hay River, but a little Wikipedia research reveals that today’s Hay River is not the original Hay River. That is, there are two towns: a new Hay River, south of the airport, and an old Hay River, closer to Great Slave Lake.

The RSIM at Carleton University has the school in a different place in the new town.



Figure 2: Residential Schools Interactive Map for Hay River school. The dot is near the end of the airport runway!

NCTR has it down by the old town, yet on the other side of the river.

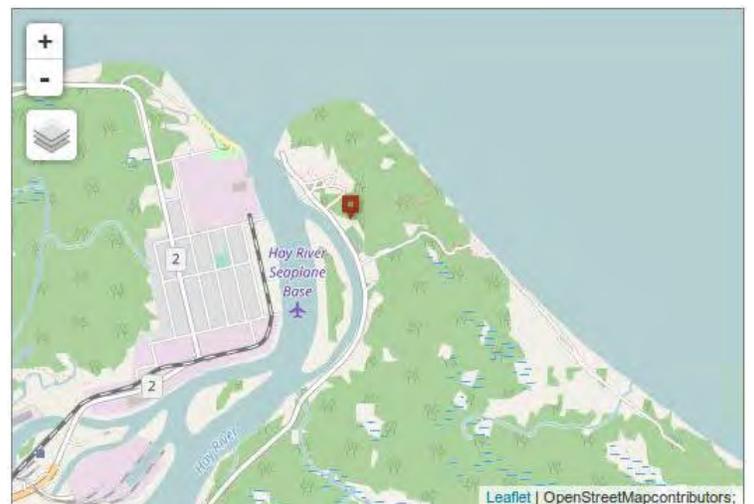


Figure 3: NCTR on-line map for the Hay River school. The location given is across the Hay River from the old town.

Opening Canada Lands in Google Earth reveals that here across the river is where the reserve lands are, specifically the HAY RIVER I reserve.

One of these on-line maps may have the right location, but which? Unfortunately, none of them provides the reasoning or chain of proof that underlies the coordinates they are presenting, so we're going to have to dig deeper. (And if I can, let me take this opportunity to make a plea for providing to your web visitors why you decided a feature was in a given place. In many cases the location of features is not disputed, but in cases where a consensus has not yet been reached, this kind of justification would be invaluable.)

There are a number of ways into the land surveys at CLSS. You can use Survey Plan Search to get a list of surveys on the HAY RIVER I "Canada Land:" this gives 83 results to wade through. You can search graphically on the CLSS Map Browser: here you can see a number of surveys in the area where NCTR's marker is, but you must call each one up and examine it. Or you can use Survey Plan Search to find plans in the NWT that include a term like school, or mission: although this doesn't produce anything in the Hay River area.

Surveys are identified with a five-digit number, followed by "CLSR" and two letters to identify the province. After a bit of casting about, you come up with a hit! A 1914 survey by an S. D. FAWCETT, called 22460 CLSR NT, shows the "English Church Mission" in Lot 14 on the east side of the river.

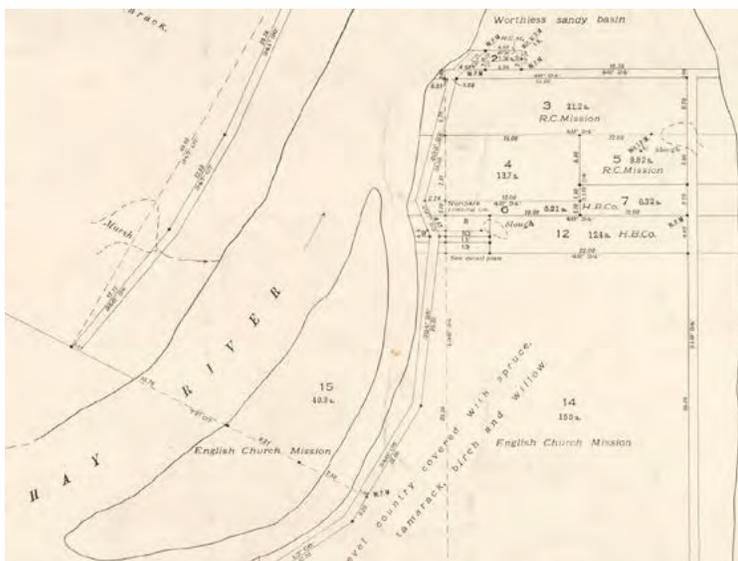


Figure 4: A detail from survey 22460 CLSR NT, showing the east side of the Hay River. Note the "English Church Mission" in Lot 14.

It's also worth noting the "R. C. Mission" lands up on Lots 3 and 5, and the Hudson's Bay Company on Lots 7 and 12. This trio is repeated over and over again across Canada: the English Church and the Roman Catholic Church competing for souls, with the HBC (and often the Revilion Brothers) providing the goods.

But how do we know the school was there on the English Church Mission lands? On the page for each survey, CLSS has the valuable feature of also telling us if there are any "related documents." In this case there is one called FB I 3885 CLSR NT. The leading "FB" indicates that it's the surveyor's fieldbook, and a fieldbook often contains even more details than are on the map. Sure enough, on page 4 of the fieldbook is "Mission School."

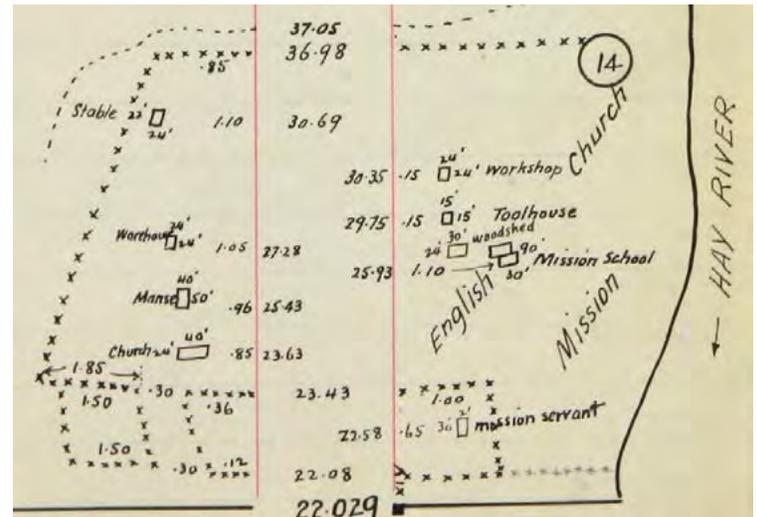


Figure 5: A detail from Fawcett's 1914 fieldbook. South is at top, with distances noted in chains along the central red column as the surveyor walks through Lot 14. The Mission School is the building closest to the river.

It's four chains (or roughly 80 metres) south of Lot 14's northern boundary.

In this manner, surveys helped pin down the building locations for 62 of the 139 schools I looked at. In other cases, old maps at Library and Archive Canada were extremely helpful. This is not to say I was able to locate all schools and hostels with this degree of confidence. Some are just a mystery, like the two residential schools in Fort George, Quebec, for which there is ample photographic evidence but no map showing where these institutions were in a small community that was largely abandoned in 1979. At present I still have 34 schools for which I can only give a general location, within a kilometre of a certain point. It is a work in progress.

Feature Article

Daniel G. Cole

GIS Coordinator and Chief Cartographer, Smithsonian

William Fitzhugh

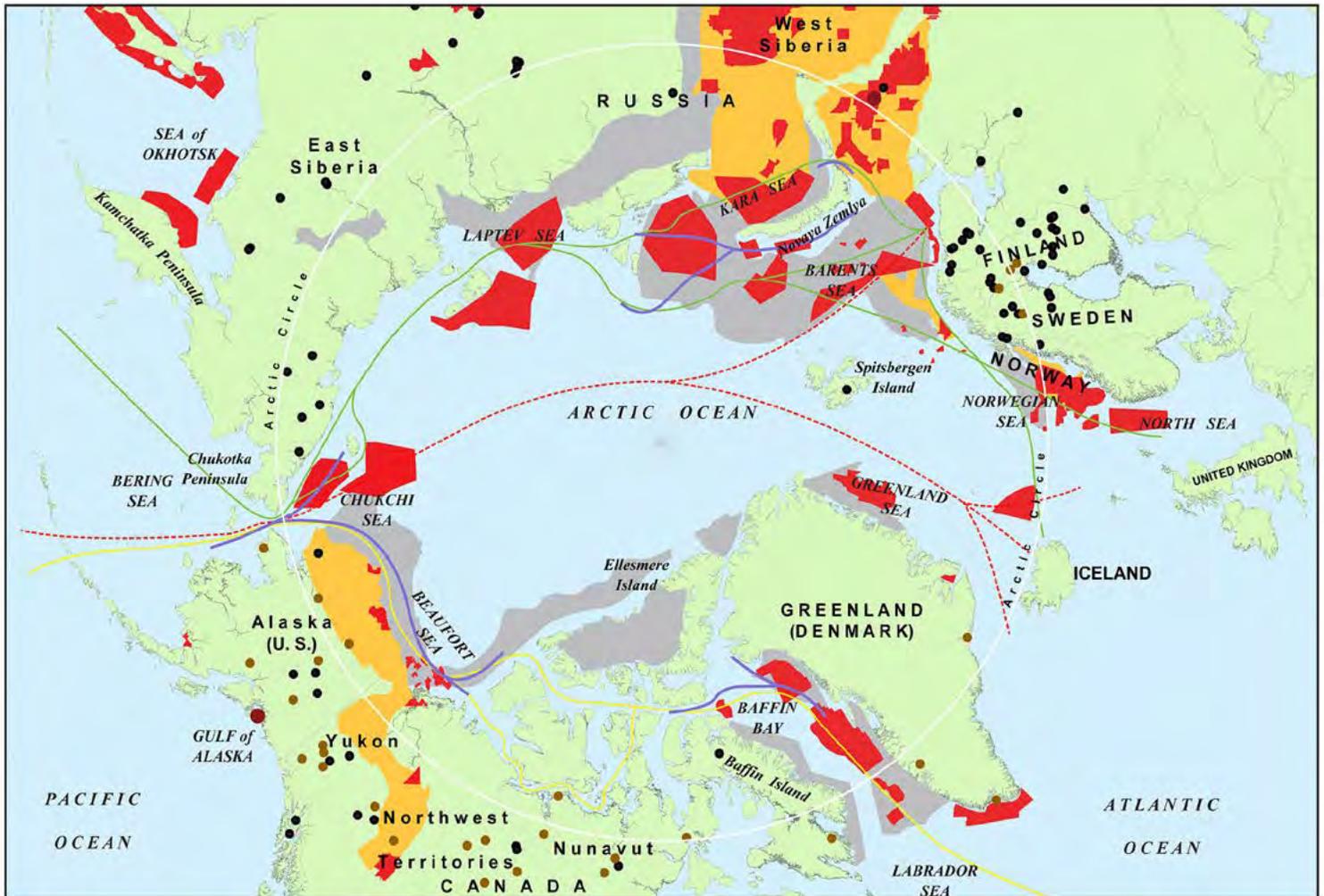
Director of the Arctic Studies Center and Exhibit Curator



Exhibiting the Interconnections between Inuit, Narwhals, and Climate Change

In August 2017, the National Museum of Natural History (NMNH) opens an exhibit focusing on the Inuit, narwhals and the changing climate of Arctic (Narwhal: Revealing an Arctic Legend). First, in dealing with the narwhal, we examine and display this cetacean in terms of its biology, distribution, population, and how its spiral tooth has inspired art, legend, and cultural practice for centuries. Second, the Inuit knowledge of the Arctic's physical geography and zoogeography is coupled with scientific research to help us better understand narwhals and the changing Arctic. Narwhals have been well-known to the Inuit for thousands of years. These animals play important roles in Inuit diet, local economy, community life, and spirituality. Inuit live in towns and settlements throughout Arctic Canada and Greenland. About 36,000 people live in Nunavut, and about 84% identify themselves as Inuit. Approximately 50,000 Inuit also live in Greenland, composing nearly 90% of the island's total population. And third, six reminders of "Climate Connections" are placed throughout the exhibit to learn how climate, narwhals, humans, and Arctic ecosystems are all connected.

One of the Climate Connections notes that: The Arctic's thick ice cover has made travel difficult and dangerous for centuries. Throughout history, explorers seeking a "Northwest Passage" from the Atlantic to the Pacific via the Arctic Ocean were unsuccessful – and often perished - in their quests. But today, there are many "Northwest Passages." Since 2007, ships have been able to navigate during the low-ice summer season. The new traffic brings noise and pollution to areas previously untouched by large-scale human activity. The map (figure 1) indicates current and potential Arctic industry and shipping routes.



Aside from climate change, on the same panel as figure 1, the exhibit documents industrial practices in the Arctic. Less pack ice and warmer waters have encouraged an increase in a type of oil, gas, and mineral exploration called seismic testing. Short, intense blasts of sound from air guns indicate fossil fuel deposits under the water. But loud underwater sounds may disrupt narwhals' and other sea mammals' echolocation abilities, which help them navigate and find prey. It also may scare the animals from their migratory paths and feeding grounds, or place them in danger of entrapment. Data show that fish, including the Greenland halibut that make up the narwhals' primary food source, can be stunted or killed in the larval stage by seismic noise – leading to less food for narwhals. As a result, both marine mammal experts and the Inuit recommend caution – and more research – as Arctic development moves forward.

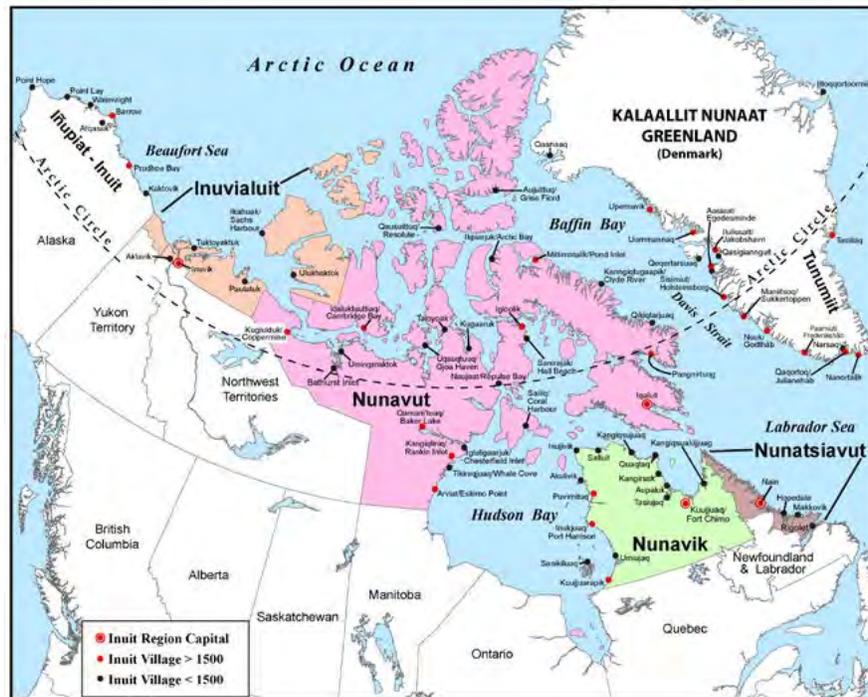


Figure 2 illustrates most of the Inuit towns and settlements throughout Arctic Alaska, Canada and Greenland. While sparsely populated, nonetheless, this map helps educate the public that the Inuit regions have a number of active villages.



Figure 3 focuses on Pond Inlet or Mittimatalik in Inuktitut, the main Inuit language. Living there are about 1,600 people, predominantly of Inuit heritage. Narwhals are annual visitors to Pond Inlet, and they make up an important part of the town's economy.

Both anthropologists and Inuit historians and elders have extensively examined Pond Inlet’s connections to the narwhal. This map shows some of the largest communities. The dashed line indicates the range of the local population of narwhals.

An exhibit panel explains that the Inuit hunt narwhals and other marine mammals for subsistence, to feed and support their families, and take only what is needed. Only Inuit are allowed to hunt narwhals. Inuit who eat a traditional diet - including seal, walrus, narwhal, caribou, birds and fish – benefit in several ways, from a lowered risk of diabetes, obesity and heart disease to the communal benefits of sharing food with extended family and neighbours. But there are also costs: modern pollutants such as heavy metals are reaching the Arctic food web as shipping and mining increase. These substances can affect humans’ reproductive, neurologic and immunologic health.

Another panel includes a quote from James Simonee of Pond Inlet: “I’ve noticed many more big ships near Pond Inlet, and I wanted to find out whether the marine life we hunt is affected by shipping. Is it still safe to eat? I’m working with the University of Waterloo in Ontario to measure the contaminants in Arctic char. I measure and weigh the fish, and take out the organs, a fin clip and the inner ear bone – which tells a fish’s age. In Waterloo, they’ll test the samples. I hope to also measure the contaminants in ringed seals and narwhals.”



Figure 4 is of one of the main panels in the exhibit.

Figure 4 is of one of the main panels in the exhibit. It was updated to 2016 when the minimum summer ice pack was relatively small. Animations of Arctic sea ice packs can be seen at:

http://osisaf.met.no/stories/sea_ice_animations/

https://nsidc.org/data/seaice_index/archives/image_select.html

<https://www.climate.gov/news-features/videos/old-ice-arctic-vanishingly-rare>

<https://www.youtube.com/watch?v=Fjerjleg49s>

Climate change is a present-day reality in the Arctic. Human-caused temperature increases are affecting the Arctic about twice as fast as the rest of the world. At a time when industrial development is rapidly expanding into Arctic regions, the iconic narwhal- so intimately connected with the Inuit and Arctic sea ice- provides a unique vehicle for informing the public about the need for protection of the Arctic environment in a rapidly changing world.

FEATURE ARTICLE

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Obesogenic Environments in Winnipeg

Abstract

In Canadian, the rate of obesity in adults has nearly doubled since the 1980s. Our research explores the contributors to obesogenic environments in Winnipeg based on socioeconomic variables and restaurant density. Five explanatory census variables (restaurant density, minority population, unemployment rate, education, number of children and average household income) plus restaurant density were used to predict variable obesity rates across census tracts. As all datasets were found to be spatially autocorrelated using Global Moran's I, Geographically Weighted Regression (GWR) was chosen to explore these relationships. All of the variables contributed unique information (e.g., not redundant), however, restaurant density and unemployment rate were not found to be significantly related to obesity rates. The variables explained ~75% of expected obesity values (linear) while ~85% of the spatial pattern of obesity was effectively explained (GWR). All the models, (3, 4 or 6 variables), were found to have to have similar ability to fit the observed obesity patterns, however the 4-variable model best represented obesity patterns overall. Results show there are still variable(s) missing to better explain obesity patterns in Winnipeg. Further exploration of restaurant density compared to restaurant proximity also needs to be explored to better understand restaurant food access impact on obesity.

Introduction

Retail food environment research in Canada has increased significantly with 66% of retail food research conducted since 2010 (Minaker et al., 2016). The three research agenda's for retail food research are food-health relationships, policy decisions and spatial statistics. In Canada, most of this research (70%) has been conducted in major cities such as Montreal, Quebec City, Toronto and Vancouver with the a few applied in smaller cities such as London, Edmonton or Ottawa.

Winnipeg is sorely lacking in both research and policy for retail food environments. As a result, Winnipeg's city council authorized the creation of the Winnipeg Food Council with public engagement via the Food Matters Manitoba portal (Food Matters Manitoba, 2015; City of Winnipeg, 2017). This work focuses on the City of Winnipeg's socioeconomic patterning of food environments using Glanz's conceptual model (Glanz et al., 2005) which emphasizes community nutrition environment, a measure of geographic food access, combined with socio-demographic factors that determine eating patterns (Minaker et al., 2016). Specifically, we are exploring the contributors to obesogenic environments in Winnipeg to better inform Winnipeg Food Council policy decisions.

Obesogenic environments are relationship between food environment and physical activity; food environment (global food supply, unhealthy but convenient food) in a community that make it easier for citizens to make inappropriate food choices, eat poorly and remain sedentary (Block et al., 2004; Pearce et al., 2007; Hemphill et al., 2008; Ogilvie and Eggleton, 2016). Almost 70% of Canadian adults are either overweight or obese (herein 'obesity') which represents a doubling in obesity rates since the 1980s (Ogilvie and Eggleton, 2016). Researchers have conjectured that the climbing obesity rates are a direct result of the changes in community food environments over the past several decades (Ogilvie and Eggleton, 2016). Recently, researchers have explored the obesogenic environments (e.g., access to high-calorie restaurants, at risk socioeconomic conditions) to better understand obesity patterns in cities. In larger cities, studies have shown that neighbourhoods with lower socio economic status had less travel distance to the nearest restaurant than wealthier neighbourhoods (Block et al. 2004, Burns and Inglis, 2007; Pearce et al. 2007; Kwate et al. 2009; Day and Pearce, 2011). Restaurant accessibility increased consumption of fast food for these populations resulting in higher childhood obesity rates, increased risk for Type 2 diabetes and

a higher likelihood of obese adults which are all adding pressure to health care systems (Deckelbaum and Williams, 2001; Powell et al. 2007; Fleischhacker et al. 2011).

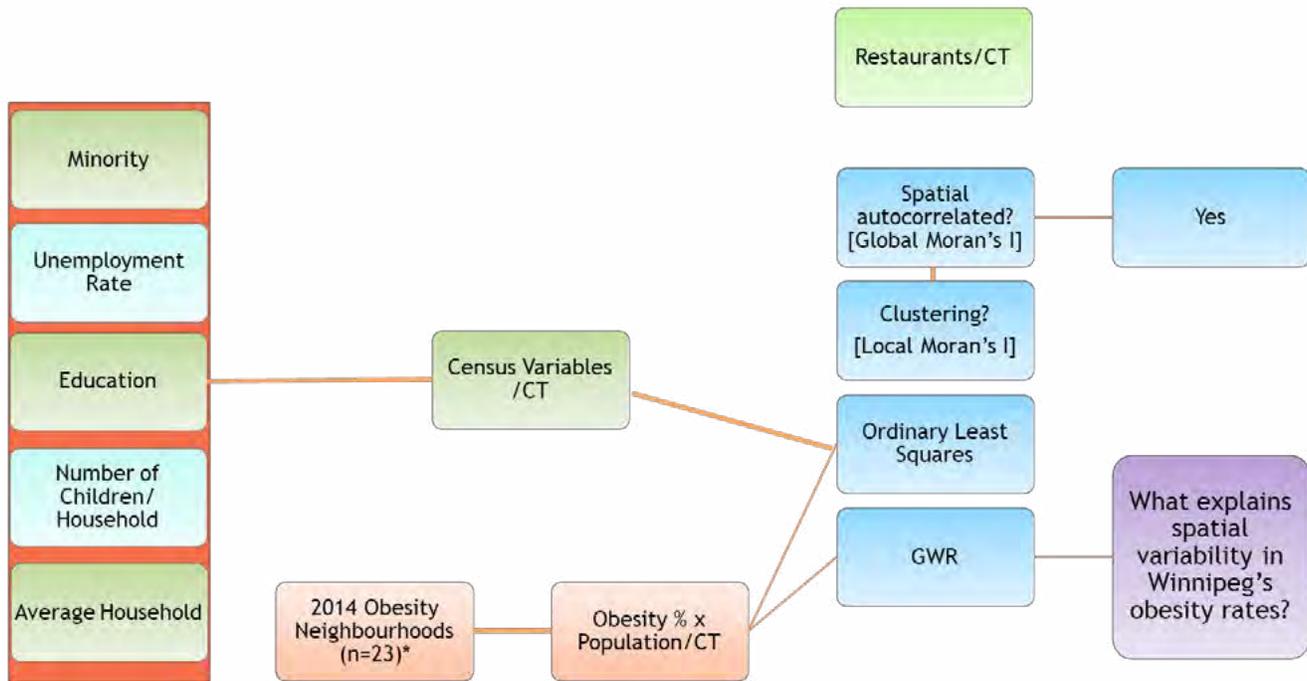


Figure 1: Census variables, Obesity data and the process to conduct Geographically Weighted Regression within ArcGIS.

In this study, we investigated how the spatial variability in Winnipeg populations self-identified as obese are influenced by socioeconomic status (Block et al. 2004; Larson et al. 2009; Pearce et al. 2007) and restaurant density (Figure 1). Socioeconomic census data for this study were obtained from Statistics Canada, obesity data using Winnipeg Regional Health Authority (WRHA) Neighbourhood Clusters from the Manitoba Centre for Health Policy at the University of Manitoba (Fraser et al. 2012; CHAR, 2014; MCHP, 2016), and 2015 restaurant data from Manitoba Health.

Figure 2 shows the 155 Census Tracts (CT) and 1288 restaurants in the Winnipeg Urban Area. This analysis used 2011 Statistic Canada variables per CT which included Minority Populations (combination of Total Visible Minority and Total Aboriginal Population); Education Level (high school or less versus post-secondary; Krieger et al., 1997); low versus acceptable Total Household Income (below and above median

thresholds; Block et al. 2004); Unemployment Rate (Pearce et al., 2007); and Average Number of Children per Household (CHASS, 2014). Most researchers use one value of obesity for the entire city while this study used n=23 neighbourhoods of obesity rates based on Manitoba Health zones; the variability of obesity rates provides a better representation of the city's diverse population. The average number of people self-reported as being obese is approximately 2200/CT (~ 54%) in Winnipeg which is just below the provincial average obese of 57% (CHAR, 2014). The restaurant and obesity data were converted into Census Tract spatial units for subsequent analysis with the socioeconomic variables.

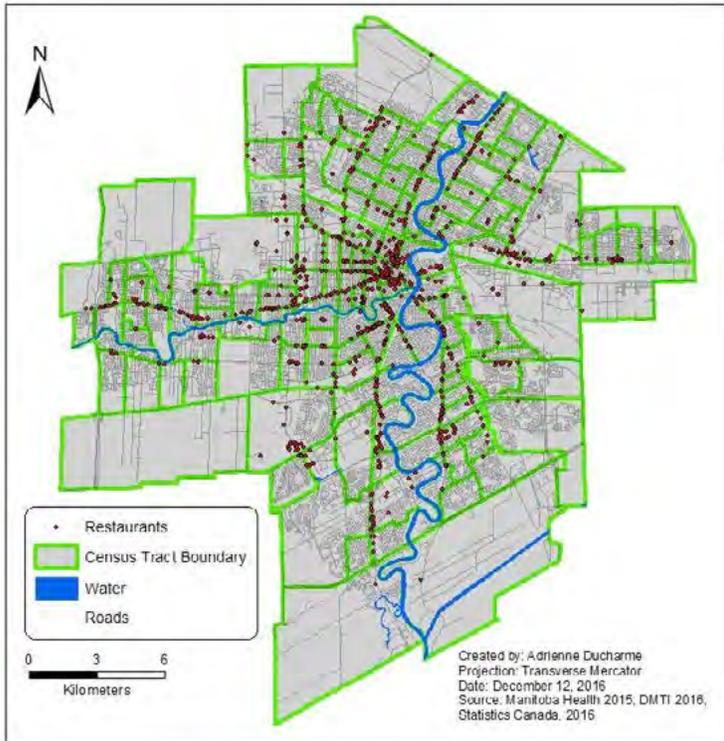


Figure 2: Distribution of restaurants and Census Tract boundaries of Winnipeg Urban Area.

The data was first tested for spatial autocorrelation using Global Moran's I to determine if spatial statistics and analysis were appropriate. The results showed that the five census variables, restaurant and obesity datasets were spatially autocorrelated (e.g., restaurants were clustered, similar education levels were located closer together, etc.), and thus the use of spatial analyses such as Geographically Weighted Regression (GWR) is appropriate. The GWR two-step process provides the analyst with spatial knowledge of where additional data or variables are required, which variables are not important to the analysis, shows clusters or trends, and identifies contributing explanatory variables.

Next we assessed which variables had an impact on obesity variability in Winnipeg. The result of the Ordinary Least Squares (OLS), the first stage of the GWR process, identifies the significant relationships and differences between each of the variables. Each variable is assessed using Variance Inflation Factor (VIF) to determine if the information content is redundant, thus assessing the variable contribution to the regression model ($p < 0.05$). Explanatory variables associated with VIF values > 7.5 are removed from the regression model as they do not provide additional information (Chi et al. 2013). A spatial autocorrelation test is also conducted on the OLS regression residuals to determine if there is a

statistically significant explanatory variable(s) missing from the analysis. Spatially autocorrelated residuals show over- or under-predictive dependent variables which tend to be clustered (Chi et al., 2013). The Akaike Information Criterion (AIC) value determines which observations should be included or excluded in the estimation process (Chi et al., 2013). This local weight matrix or 'W' (Chen and Truong, 2012), places more weight on locations that are closer in space to the focal location and takes into account the degree of spatial dependence in a continuous spatial framework. Essentially, the AIC helps to distinguish the relative quality of statistical model for this given set of data. Once AIC values are calculated, the difference between each model's ability to best fit the observed data is evaluated using an exponent of range relationships $[\exp(\text{AICmin}-\text{AICmax})/2]$. The closer this value is to zero, the more probable the two models have equal ability to best fit the data.

OLS was used to determine significance of socioeconomic variables and restaurant density for predicting obesity rates. The results meant that three scenarios were explored to determine the variables impact on obesity: (a) 6-variable model that included all five census variables plus the restaurant density, (b) 4-variable model that included number of children (K), minority (M), education (E), and income (I); and (c) 3-variable model that includes MEI. Restaurant Density (R) and Unemployment (U) were included in the 6-variable analysis but were not found to be a significant predictor ($p > 0.05$ Keokner value) of obesity rate variability, thus not included in the 4- or 3-variable model (Table 1). However, the Minority, Education and Income had the most significant relationship with obesity changes resulting in a 3-variable model in the analysis.

After the OLS was completed, the GWR was used to predict obesity rates based on explanatory variables (Fraser et al. 2012; Chi, et al. 2013). GWR was used to test the hypothesis that CT obesogenic environments are determined by socioeconomic variables and density of restaurants, and thus contribute to higher than normal levels of obesity in these areas. Unlike OLS, GWR allows the regression coefficients in the model to vary from place to place which allows for the changing relationships among the variables over space (Chi et al. 2013; O'Sullivan and Unwin, 2014). GWR works by constructing a separate equation for each Census Tract using the values for the explanatory variables within each CT.

Results & Discussions

Results of the OLS analysis showed that the five census socioeconomic variables and restaurant density data explained 74% - 76% of the obesity rate variability (Table 1) depending on if 6-, 4- or 3-variables were included in the model. All the variables contribute unique information, i.e., none of the variables were redundant ($\text{VIF} < 7.5$). Based on AIC exponent differences, the 4-variable model is 0.068 times more probably

than the 3-variable model to minimize information loss; the 6-variable model is not likely to minimize information loss compared to the 4- or 3-variables models (0.0000). Thus all models (3-, 4- or 6- variables) have, in general, equal ability to best fit the observed obesity patterns, with 4-variables slightly better than 3-variables (<0.07).

Table 1: Relationships between Obesity and predictive variables of K (# of children), M (visible minority), U (unemployment %), E (education), I (household income) and R (restaurant density)

Predictive Variables	OLS Adjusted r2	AICc	Jarques-Bera (p-value)	t-test p<0.05	VIF	Koekner (p-value)	GWR Adjusted r2	Moran's I	z-value	p-value	Clustered, Random, or Dispersed
Six Variables (K,M,U,E,I,R)	0.759	2354	0.056	K,M,E,I	All <7.5	K,E,I	0.840	0.1210	4.021	0.0001	Clustered
Four Variables (K,M,E,I)	0.757	2352	0.008	K,M,E,I	All <7.5	K,E,I	0.854	0.0748	2.570	0.0101	Clustered
Three Variables (M,E,I)	0.733	2365	<0.000	E,I	All <7.5	E,I	0.876	0.0220	0.899	0.3680	Random

The GWR was used to predict obesity based on the explanatory variables to determine if the relationship changed over space (Figure 3). Results of the GWR analysis predicted a clustered obesity pattern based on the 6- and 4-variables but a random obesity pattern using the 3-variables. The adjusted r2 values for each of the three GWR models (84-88%) was higher than the OLS adjusted r2, which indicates that obesity is more effectively modelled using spatial data. Given that the 3-variable model identified a random pattern for obesity, but we already know that obesity is clustered (Global Moran's I), the 3-variable model did not generate an accurate spatial pattern of the obesity data.

It was concluded that the 4-variables (K, M, E, I) best represented the spatial pattern of obesity in Winnipeg because of the equal or slightly better AIC value compared to the other variable models, the significant relationships of these variables with obesity, and the accurate representation of obesity clustering. Similar to other studies, we found that certain socioeconomic variables play a statistically significant role in determining the spatial relationship between obese populations and area-level environmental variables. The population of visible minorities (Smoyer-Tomic et al. 2008; Chen and Truong, 2012), number of Children (CHASS, 2014), education level (Hemphill et al. 2008) and average household income (Block et al. 2004) were the explanatory variables in our GWR model that best explained the obesity spatial patterns. However, there are predictive variables missing from the analysis (e.g., GWR r2 values ~85% and OLS r2 values ~ 75%) as 15-25% of the spatial and linear relationship is left unexplained.

The lack of correlation (r2 = 0.011) between obese populations and restaurant density corresponds with results by Hollands et al., (2013) which also found no relationship between BMI and restaurant density. This appears to corroborate McPhail et al., (2011) qualitative study that explored reasons for fast-food consumption among a large cross-national sample (n = 132) of rural and urban Canadian teenagers. Qualitative findings show that fast-food consumption is not merely a function of geographic proximity to or density of fast food outlets but, rather, that teenagers engage in complex dimension of social factors, individual preference and moral dictates for choosing fast food.

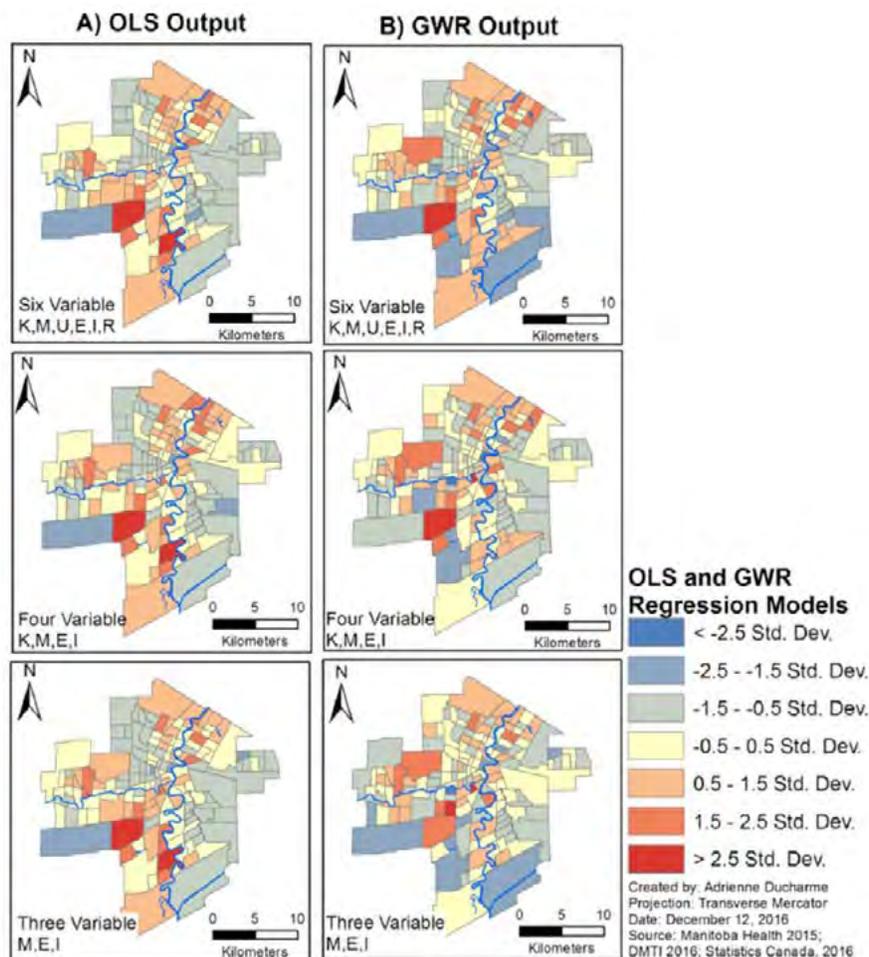


Figure 3: Predicted obesity pattern using Ordinary Least Squares (OLS) and Geographically Weighted Regression (GWR) based on (bottom) the 3-variables of Visible Minority (M), Education Level (E) and Average Household Income (I); (middle) 4-variables of Number of Children (K), (M), (E) and (I); and (top) includes K, M, E, I, Unemployment Rate (U) and Restaurant Density (R).

In a Minaker et al., (2016) review, the vast majority (91%) of the articles that looked at the relationships between food environments and outcomes used density rather than proximity measures. This suggests that these researchers tend to conceptualize geographic access as density (Block et al., 2004; Austin et al., 2005), although some studies found more strongly associated with proximity measures (Minaker et al., 2013; Balcaen and Storie, 2016). The results may relate to the geographic unit used in analysis. Restaurant density at the CT level used here had no significant relationship but distance to closest restaurant at the Dissemination Block had a significant relationship in Balcaen and Storie (in review, 2016), both applied in Winnipeg.

In conclusion, there is evidence to suggest that spatial pattern of obesity is a result of area-level socioeconomic factors in Winnipeg. However, the complexity of obesity spatial variability was not fully represented; other socioeconomic variables still need to be identified. The spatial analysis of obesity can be used to inform strategies to promote healthy living at the Manitoba Health identified 'neighbourhood level' but the results leave the obesity-restaurant relationship in question for policy decisions.

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FEATURE ARTICLE

Scott Tweedy and James Fairlie,
Natural Resources Canada, Ottawa



The Evolution of NRCan's Geospatial Offerings, July 2017

At the 42nd Annual Conference of the Canadian Cartographic Association at Carleton University, Ottawa in June 2017, Natural Resources Canada's (NRCan) Canada Centre for Mapping and Earth Observation (CCMEO) shared information on its current offerings and plans for the future.

CCMEO is the Government of Canada's centre of excellence for Geomatics, mapping and earth observation. CCMEO has taken on a leadership role to make accurate, authoritative, and accessible data available to all Canadians in support of Government priorities. Over time, more and more of CCMEO's geospatial data have been made available to the public through the GeoGratis website. This enabled users to download and use the data without extensive licensing restrictions. CCMEO's digital geospatial offerings for both products and delivery has evolved over the past few years and continues to move forward.

The list below summarizes recent evolution in CCMEO's offerings and its plans for the future, including the migration to the Open Canada environment.

National Topographic System (NTS) Series

NRCan has now completed its "Mapping of the North" project. Prior to 2009, NRCan's Canadian topographic map production was compiled, produced, and made available through the former Centre for Topographic Information. These maps are now available free of charge from online sites including CanMatrix and CanTopo. Paper copies can be purchased at map resellers.

Vector Datasets

NRCan's CanVec product has now superseded the National Topographic Data Base (NTDB) and the Atlas of Canada National Scale Data collections. The new multi-source product CanVec is comprised of the National Topographic Series collections at 1:50,000 and 1:250,000 as well as the Atlas of Canada National Scale Data collections at 1:1,000,000; 1:5,000,000 and 1:15,000,000.

Glaciers

Recently new glacier data have been prepared for the Atlas of Canada National Scale Data collections. The Randolph Glacier Inventory (RGI v5.0) http://www.glims.org/RGI/00_rgi50_TechnicalNote.pdf and Geological Survey of Denmark and Greenland (GEUS) <http://www.geus.dk/UK> were the authoritative sources for the glacier data used. The Atlas Data team in collaboration with the Canada Centre for Remote Sensing (CCRS) validated the RGI data over the Canadian landmass using multi-year annual Minimum Snow and Ice (MSI) extent derived from 250m MODIS imagery.

The Geological Survey of Canada advised on the interpretation of Google Earth and LANDSAT 8 OLI_TIRS image products that were used as references. The glacier data were generalized through the conventions of selection, amalgamation and simplification for integration with the 1:1,000,000; 1:5,000,000 and 1:15,000,000 National Scale Data.

Annual Minimum Snow and Ice (MSI)

The first spatially enhanced Moderate Resolution Imaging Spectroradiometer (MODIS) clear-sky mosaic for the Arctic circumpolar zone has been made available. The major intended application of the new data is mapping the surface albedo at 250m spatial resolution. The MODIS sensor functioning on the TERRA and AQUA satellites is one of the most advanced Earth observing sensors currently operating in space. The fusion method developed at the CCRS to generate the enhanced 250m MODIS clear-sky data products over the northern part of the North American continent centered over Canada (Luo et al. 2008) has been expanded to cover the entire Arctic circumpolar region (9000 km x 9000 km). A generalized vector representation of the layer will be made available in 2017.

Generalized vector representations of the 2016 annual Minimum Snow and Ice extents covering Canada were integrated with the 1:1,000,000; 1:5,000,000 and 1:15,000,000 National Scale Data. <http://open.canada.ca/data/en/dataset/808b84a1-6356-4103-a8e9-db46d5c20fcf>

High Resolution Digital Elevation Model

The High Resolution Digital Elevation Model (HRDEM) is part of the CanElevation Series created in support of NRCan's National Elevation Strategy. It includes a Digital Terrain Model (DTM), a Digital Surface Model (DSM) and other derived data. For DTM datasets, derived data available are slope, aspect, shaded relief, color relief and color shaded relief maps and for DSM datasets, derived data available are shaded relief, color relief and color-shaded relief maps.

The productive forest line separates the northern and the southern parts of the country. This line is approximate and may change based on requirements. In the southern part of the country, DTM and DSM datasets are generated from airborne LiDAR data. They are offered in 2m resolution and are projected to the UTM NAD83 (CSRS) coordinate system and the corresponding zones. Each dataset covers an area of 20 km by 20 km. In the northern part of the country (north of the productive forest line), due to the low density of vegetation and infrastructure, only DSM datasets are generated. Most of these datasets have optical imagery as their source data. They are generated in 5m resolution using the Polar Stereographic North coordinate system referenced to WGS84 horizontal datum or UTM NAD83 (CSRS) coordinate system. Each dataset covers an area of 50 km by 50 km.

The HRDEM is referenced to the Canadian Geodetic Vertical Datum of 2013 (CGVD2013), which is now the reference standard for heights across Canada. Complete coverage of the Canadian landmass is gradually being implemented. HRDEM datasets are processed and made available as the data are acquired. Source data for HRDEM datasets is acquired through multiple projects with different partners. Since data are acquired by project, there is no integration or edge-matching done between projects.

<https://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/free-data-geogratis/whats-new/19669>

National Air Photo Library

NRCan's National Air Photo Library (NAPL) archives over 6 million aerial photographs covering all of Canada, some of which date back to the 1920s.

The National Earth Observation Data Framework (NEODF) online application enables public and government users to search and order raw Government of Canada Earth Observation images and archived product managed by NRCan such as aerial photos and satellite imageries. The NEODF online application allows clients to search and retrieve metadata for over 3 million

from 6 million air photos. The NEODF online visually depicts the 'footprint' of air photos on a seamless map background. After a search is completed, the air photos can be ordered through NAPL.

<http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/9265>

High Resolution Optical Imagery

High resolution optical imagery provides the fundamental reference and evidence that underpins scientific work, allowing for decisions on economic development, environmental stewardship and governance. Therefore, within the Government of Canada, there has been a focused and committed effort to making national coverage of the most cost-effective updated and precise High Resolution Optical Satellite Imagery available. The open datasets that are currently available, despite being out of date, continue to be amongst the most highly utilized optical satellite datasets across Canada.

To achieve this goal, the Government of Canada is establishing the key components for an open and shared data environment. Core elements system will include the Federal Geospatial Platform (FGP) and the Earth Observation Data Management System (EODMS). These two portals could greatly increase the productivity and capacity with respect to geospatial analysis through the availability of a national coverage of High Resolution Optical Satellite Imagery.

Web Mapping Services

NRCan's CCMEQ supports three main Web Mapping Service (WMS) products: the Canada Base Map: Transportation (static), the Canada Base Map: Transportation (dynamic); and, Toporama. These WMSs are intended primarily for online mapping application users and developers. These services are available in multiple formats and projections including: WMS, WMTS, Esri REST, SOAP, Lambert Conformal Conic (ESPG:3978), Web Mercator (EPSG:3857), etc.

<http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/free-data-geogratis/geogratis-web-services/17216>

Geographical Names

The Geographical Names Board of Canada (GNBC) was established in 1897 and is responsible for official place names in Canada. NRCan appoints the Chair of the GNBC and provides the GNBC Secretariat (within CCMEQ). GNBC maintains the national database of authoritative geographical names and provides access to the delineation, and accurate information pertaining to these names. GNBC is producing a series of

commemorative maps for release in 2017.

<http://www.nrcan.gc.ca/earth-sciences/geography/place-names/about-geographical-names-board-canada/11084>

Floodplain Mapping

The Floodplain Mapping team at CCMEQ supports the implementation of the Public Safety's National Disaster Mitigation Program (NDMP) by providing leadership, advice, expertise, and technical resources in the area of floodplain mapping and stakeholder engagement. Additionally, CCMEQ staff chair the federal Flood Mapping Committee (FMC) and actively participate by developing the Federal Floodplain Mapping Guidelines Series. Plus, the Floodplain Mapping Team is compiling an index of existing flood hazard maps produced under the former Flood Damage Reduction Program (FDRP). Also, NRCAN will compile and share floodplain delineations from NDMP projects that will result from updated mapping techniques including increased elevation accuracy from LiDAR imagery. The distribution of this information will promote sharing of information to benefit all Canadians concerned with flooding and will promote better decision making by policy and planning officials at all levels of government.

Dynamic Geospatial Data Extraction (Clip-Zip-Ship)

NRCAN offers geospatial data from seamless national datasets based on custom-defined geographic area and customized data options. Greyed out or disabled options become available as you zoom-in on the map. Define the Location, Name, Postal Code, or NTS, and then select the clipping area.

<http://geogratis.gc.ca/site/eng/extraction>

Federal Geospatial Platform

The Federal Geospatial Platform (FGP) is an initiative of the Federal Committee on Geomatics and Earth Observations (FCGEO). FCGEO is a committee comprised of 21 departments and agencies that are producers and/or consumers of geospatial data, or have an interest in activities, requirements and infrastructure related to geomatics. The FCGEO community recognized an opportunity for federal departments and agencies to manage geospatial information assets in a more efficient and coordinated way by using a common "platform" of technical infrastructure, policies, standards and governance.

The FGP aims to make geospatial information available in a coherent way to the public, academic institutions, the private sector and others to conduct research or produce value-added

products and applications, driving innovation and stimulating economic development. It will have two faces: an internal site that can be found at gcgeo.gc.ca (internal government network), and a public site entitled Open Maps, on the Open Government Portal. Open Maps provides access to the Government of Canada's geospatial information. Users can combine, visualize, and analyze geospatial data and collaborate with other Canadians. Open Maps is a work-in-program and will expand and improve throughout 2017/18.

<http://www.nrcan.gc.ca/earth-sciences/geomatics/canadas-spatial-data-infrastructure/geospatial-communities/federal>

Circumpolar Map 2017

This is NRCAN's newest map release. This bilingual map shows the geography of the northern circumpolar region, north of approximately 55 degrees, at a scale of 1:9 000 000. The map uses the polar azimuthal equidistant projection. It includes all international boundaries, as well as the Canadian provincial and territorial boundaries and Canada's 200 nautical mile offshore exclusive economic zone. National capital cities are shown, as are other cities, towns, villages and hamlets. Some seasonally populated places are also included. The map displays a number of significant northern features, including the median sea ice extent for September 1981 to 2010, the tree line, undersea relief, land relief, the Magnetic North Pole, glaciers, ice fields and coastal ice shelves. Many of the physiographic and hydrographic features are labelled.

<http://www.nrcan.gc.ca/earth-sciences/geography/topographic-information/free-data-geogratis/whats-new/19707>



FEATURE ARTICLE

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Analysis of Flood History and Flood Progression in Grand Lake Meadows

Grand Lake Meadows (GLM) is a class II protected area in New Brunswick which includes the largest freshwater marsh in the province. GLM is a low-lying area of interval lands and wetlands, roughly bordered by the Saint John River to the south, Jemseg River to the east, Grand Lake (and other associated lakes) to the north, and Portobello Creek to the west, Figure 1 (McGrath, 2014).

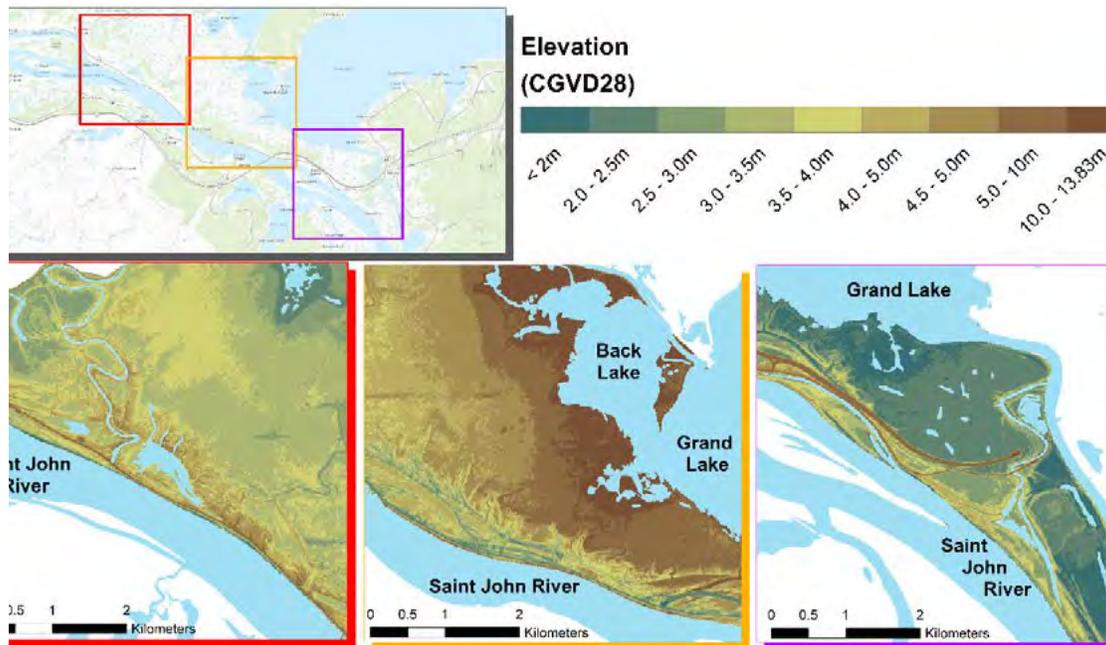


Figure 1 Grand Lake Meadows area and elevation (as derived from provincial LiDAR dataset)

A consequence of this low lying region and proximity to multiple water bodies is that the area is prone to flooding. A timeline illustrating the history flood records in GLM is shown in Figure 2, with the largest flood years being highlighted in red. From Figure 2, one can see an increase in the frequency of flood events. In the 1700s' there are four flood events on record, three floods in the 1800s, and in the 1900s, a total of 32 floods in GLM. So far in the 21st century, up to 2014, five floods have been recorded.

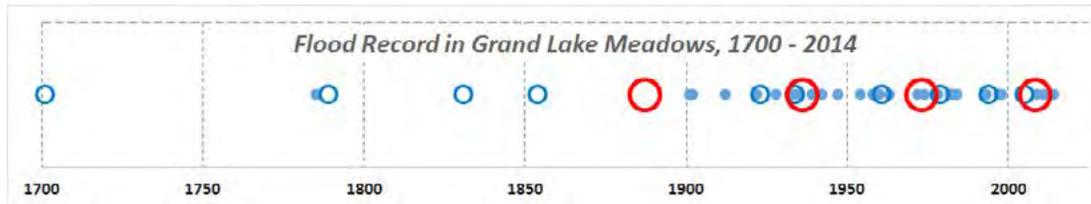


Figure 2 Flood record in GLM from 1700 to 2014 as derived from the provincial flood history database (<http://www.elgegl.gnb.ca/0001/en/Home/Mai->)

The spring floods typically deposit a new, thin layer of soil. This resurgence of soil along with fluctuating water levels are two of the major contributors to the diversity of flora and fauna in GLM (GNB, 2017). While the primary land use in GLM is agriculture, which benefit from this resurgence of rich soil, there are also numerous buildings, including: homes, barns and businesses which are at risk of flooding. A review of existing literature have allowed us to better understand the progression and recession of flooding in the GLM area. Primarily, flood events occur during the spring freshet, though flooding at other times of the year have also been recorded. The progression of flooding from low to high stages are described, in the [ArcGIS Online StoryMap](#). To summarize, at low flood stages, the land surrounding Grand Lake is the first to flood. As the flood level rises, the Jemseg River typically reverses flow, surging into Grand Lake. At both low and moderate stages, the old TransCanada Highway (Rte 105) acts as a dyke, protecting areas adjacent to the Saint John River. At high flood stage, which is typically considered +6m above sea level at Maugerville, water begins to pour over the old TransCanada Highway and water enters Portobello Creek which creates a secondary channel for flood flow. Figure 3 shows measurements from historic floods as recorded at the Maugerville river gauge from 1970 to 2014 (<https://wateroffice.ec.gc.ca/>). The largest floods, recorded at the Maugerville River Gauge occurred in 1973 (7.096m) and 2008 (6.894m). These two floods exceed the computed 100 year flood level.

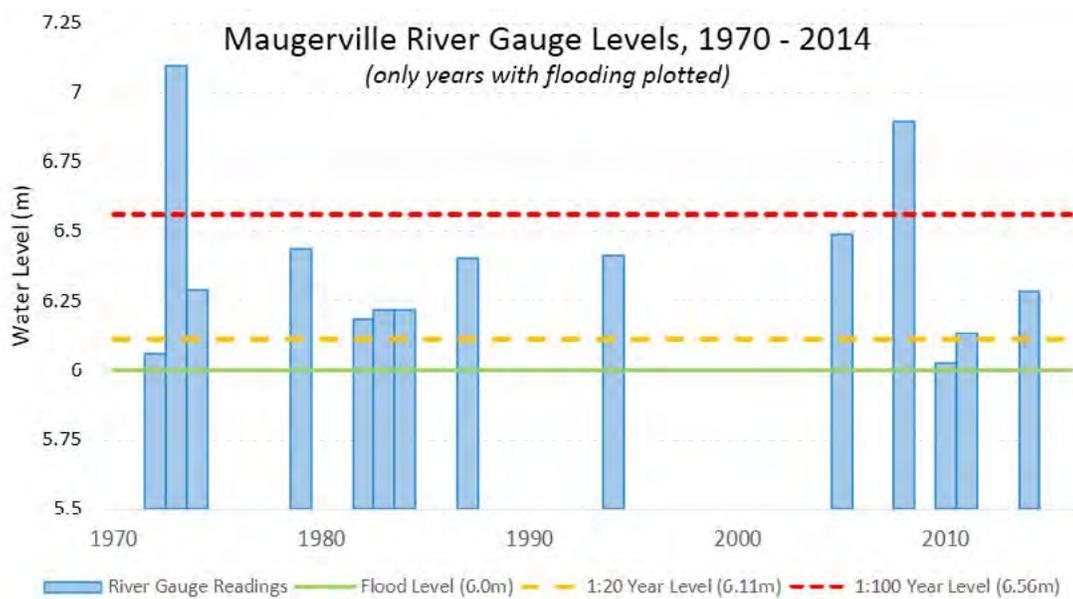


Figure 3 Maugerville river gauge measurements. Flood records sorted by time and highlighted by the flood level, 20yr and 100yr flood recurrence interval levels shown, as determined in the 1970s.

Flooding occurs in the GLM area due to a variety of factors, including: heavy rain, mild weather, snow melt and ice jamming. While installation of the Mactaquac Dam in the 1960s' has significantly reduced flooding due to ice jams by holding back ice flow (Franklin and Cardy, 1976). While the headpond of the Mactaquac Dam is a storage reservoir, it fills up within a few hours during the spring freshet, thus does not hold back a significant volume of water. Other flood control measures were investigated, however, the costs of providing significant flood control storage were great in proportion to the computed potential benefits. Thus, at present, no physical flood control measures have been implemented (Franklin and Cardy, 1976). Instead, flood forecasting has been a greater focus and tools have been developed to predict water levels, such as Service New Brunswick River Watch Tool (<http://www.snb.ca/geonbi/e/apps/river-E.asp>). Additionally, land management strategies have been put in place to control construction in these flood-prone areas.

For further description of the flood history in the Grand Lake Meadows area, interactive maps and animations, please follow this link to the online [Esri Story Map](#).

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FEATURE ARTICLE

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Exploring Ottawa's Bygone Buildings

Introduction

Major cities are constantly changing. Older buildings are demolished and replaced with modern ones. Ottawa is no exception. As Canada's Capital, its built landscape has changed significantly throughout its history with projects intended to improve the National Capital Region. With many of these projects came the demolition of existing buildings.

A lot of these buildings were documented with photos. Some of these images still exist in public archives and private collections. The goal of my project was to collect information on these buildings and document it as an interactive web map to geographically tell their stories for historians and people interested in Ottawa's history.

Ottawa's Built History

Ottawa (or Bytown as it was first called) had its beginnings as a settlement for the workers of the Rideau Canal. However, the first permanent buildings were for military purposes, such as for the Commissariat and Barrack's Hill (now Parliament Hill). Once the canal was completed, wooden structures were built to house the workers who remained for the lumber trade.

In 1857, Ottawa was chosen as the capital of the Province of Canada. To accommodate the government workers, new buildings were needed. The first government structure to be built was the Parliament Buildings, begun in 1862 and completed in 1877. As the country grew, so did the government. New buildings were needed for the expanding public service. The Office of the Prime Minister and Privy Council (until recently called the Langevin Block) was built in 1889 and the original Supreme Court of Canada building (just west of the West Block on Parliament Hill) was built in 1882 and demolished in 1955.

In the beginning of the 20th century, the Canadian Government began steps to beautify the capital region. The Ottawa Improvement Commission, renamed the Federal District Commission in 1927 and the National Capital Commission (NCC) in 1959, initiated projects for both the expanding public

national monuments. In 1912, the government expropriated a community in Uppertown for the eventual construction of the Confederation Building in 1938 and the Supreme Court Building in 1949. For the construction of the War Memorial in 1938 and later the National Arts Centre and Confederation Park in 1969, the government expropriated an area bounded by Laurier Avenue, Elgin Street and the Rideau Canal.



Figure 1 The original Ottawa Post Office, demolished in 1938 for the War Memorial. (Source: Library and Archives Canada, PA-046844)

In the 1960s, both the federal government and the City of Ottawa initiated larger scale projects for the improvement of the region. Between 1962-1965, the NCC expropriated and demolished a community of about 154 acres known as Lebreton Flats for the construction of a new National Defence building. However, this plan was never carried out and the area remained vacant for 4 decades until the construction of the Canadian War Museum in 2005. The City of Ottawa expropriated and demolished a community known as Lowertown East, just east of the Byward Market, to replace aging buildings with modern townhouses and apartments.

Private ventures have also helped to shape Ottawa's landscape. The largest scale initiative was the construction of the Rideau Centre, in 1982, which saw the demolition of many historic shops along Rideau Street. In Uppertown, large city blocks containing historic buildings were demolished to make way for modern sky scrapers.

Bygone Buildings Project

Motivation for Project

Throughout my research of local history, I found a great number of photos of pre-existing buildings in Ottawa. However, the location of these buildings was often hard to determine. Also, there didn't seem to be much history about these buildings that was easily available to the public, mainly online. The goal was to gather the historic information with the photos, determine the locations of the buildings and present the findings as an interactive web map.

Fire Insurance Plans of Ottawa

My eventual discovery of the 1912 Fire Insurance Plans of Ottawa (see Figure 2) on the Library and Archives Canada website was the impetus for this project. The plans contain outlines, usage, and sometimes the owners, of the all the buildings which existed in Ottawa in 1912. With these plans, the geographic location of the buildings could easily be determined, they just had to be georeferenced.

Georeferencing the Plans

The software choices for georeferencing the plans were mainly free or open-source software: QGIS, Python, GDAL and Google Earth. The City of Ottawa GeoOttawa website provided, as ArcGIS mapservers, the datasets for the georeferencing process, consisting of the property parcel dataset and the aerial photos from 1928, 1956 and 1965. The Google Satellite Plugin in QGIS was also used during this process.

QGIS was used entirely for the georeferencing of the fire insurance plans. Using the Georeferencer tool, points were placed at each street corner in the plans and the corresponding street corner on the property parcel dataset (see Figure 3). Each street corner required only one point and all the points lined up with each other to avoid warping in the results. Once an adequate number of points was plotted, the georeferencer could be run and the results saved as a GeoTIFF.

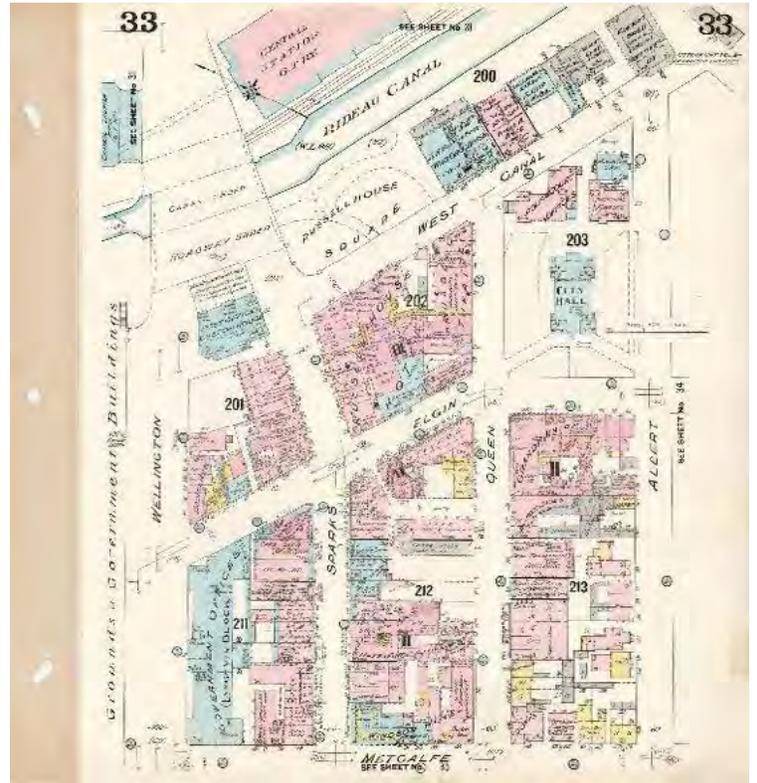


Figure 2 Example of the Ottawa Fire Insurance Plans. (Source: Chas. E. Goad, "Insurance plan of the city of Ottawa, Ontario, Volume 1", 1912, Library and Archives Canada, R6990-291-X-E)

Figure 3 Example of plotting the points (in red) with the property parcels using the Georeferencer Tool in QGIS.

However, the final goal for these plans was making them available to the general public online. I created a Python script using GDAL to convert the GeoTIFF files to KMZs so users could load the plans into Google Earth. The fire insurance plans were given to the Carleton University Library and made available to the public on their website.

Collecting Buildings

Using Google Earth, the KMZ files of the fire insurance plans were used to outline any buildings containing historic photos. Since all information for the buildings would later be added to a database, each polygon in Google Earth contained the database table names, columns and values separated with equal signs. Each photo in the entry would be separated by a vertical line. Once all the buildings were collected, the polygons were saved as a KML file.

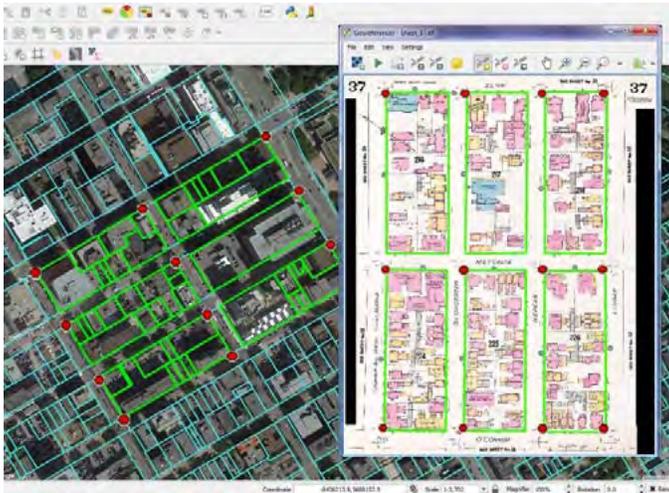


Figure 3 Example of plotting the points (in red) with the property parcels using the Georeferencer Tool in QGIS.Goad, "Insurance plan of the city of Ottawa, Ontario, Volume 1", 1912, Library and Archives Canada, R6990-291-X-E)

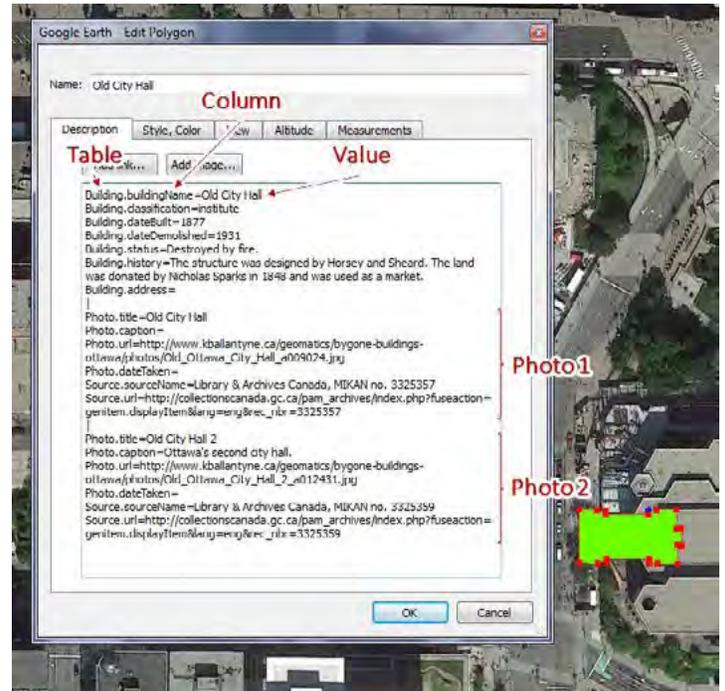


Figure 4 An example of the polygon collection (shown in green) of the buildings in Google Earth and the information included in each polygon's properties, such as the table names (building, photo), the columns and values, and the individual photos.

Figure 4 An example of the polygon collection (shown in green) of the buildings in Google Earth and the information included in each polygon's properties, such as the table names (building, photo), the columns and values, and the individual photos.

Initially, an SQLite database was created to include information on all the collected buildings. The database contained tables for building information, photos, sources and architects, and contained historic information and the geographic coordinates of the building outlines. A Python script was created to import the KML file created in Google Earth, mentioned above, into the database.

At first, I decided to present my results as a downloadable KML file so the public could view the results in Google Earth. I wrote a Python script which would convert all information in the database to a KML file. The final KML (see Figure 6) contained all the outlines of the buildings, their photos and historic information.

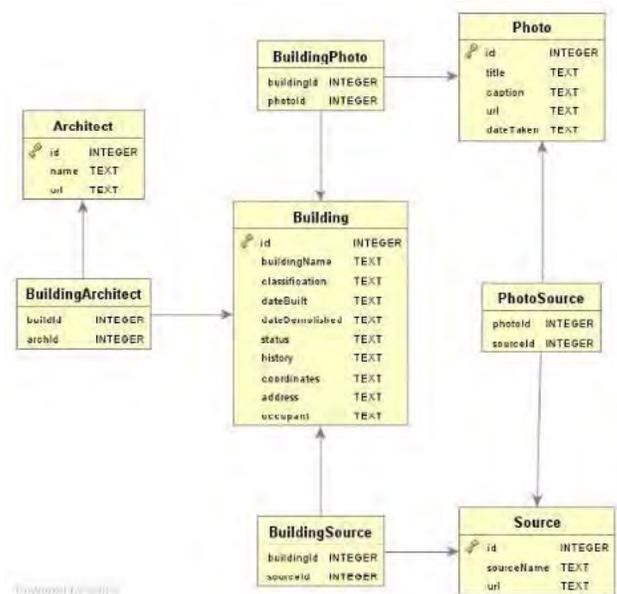


Figure 5 The final database holding the building information.

Web Release

My final goal, as mentioned, was to create an interactive web map for the general public. I set up a personal domain (www.kballantyne.ca) and built a website to host my various geomatics projects. For this one, I created a web map using Openlayers 3 and have loaded in the KML file containing all the Bygone Buildings of Ottawa for which I have found information and photos (www.kballantyne.ca/geomatics/bygone-buildings-ottawa/map).

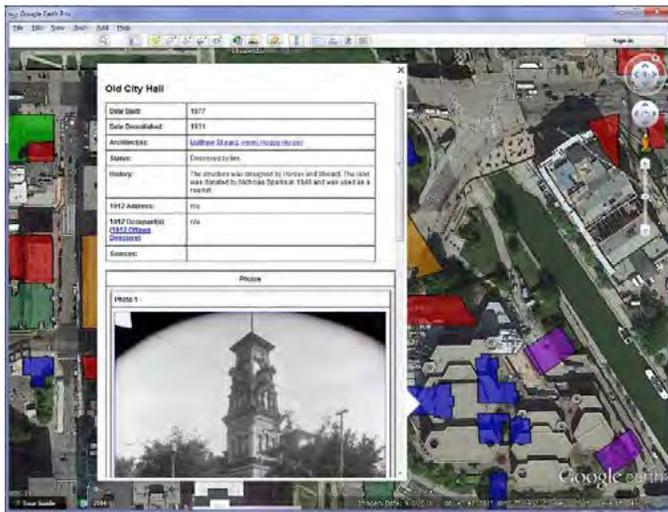


Figure 6 Example of the final KML file with the building information.

Conclusion

Ottawa's growth will continue to impact its built heritage. New projects, both public and private, are being created all the time. With the capital's ever-changing landscape, I will continue to add to my Bygone Buildings website for the benefit of historians and the general public.

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FEATURE ARTICLE

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REDISCOVERING THE JOURNEY OF AN ABANDONED CHILD: A GIS APPROACH

Abstract

A decade or so ago, few would have imagined looking at the top view of their home on a digital screen. Digital mapping and visualization techniques have seen major growth over the years and this has extended the geospatial analysis capabilities of computers beyond imagination. The top international bestseller book “A Long Way Home” narrates the story of a five-year-old child who boarded and got lost on a train which took him almost a thousand miles away from his home and family. The abandoned child survived and wound up alone in Kolkata India, before ultimately, he was adopted by an Australian couple. At his age of thirty, he found his first home with persistent determination and ample luck. He found his first home and family with only a handful of memories by using the the recently created Google Earth technology . It almost took him seven years to rediscover his childhood home as Google Earth has limited capabilities with attribute and spatial analysis, and he was lacking GIS expertise. This paper explores utilizing online mapping tools for performing attribute and spatial analysis which might have made his search easier. ESRI Web Appbuilder is an easy-to-use application for people with limited GIS skills; users can quickly discover locations by using the preconfigured widgets. The applica-tion developed for this research can be extended to other geographic regions and case studies.

I. Introduction

Software developers are more interested in utilizing freely available web based GIS tools than custom-developed desktop applications. Creating and maintaining a system which allows users to view and query spatial data using desktop GIS applications would need major program-ming and technical skills.

ESRI (ESRI Online Reference 2017) is a pioneer organization in supplying GIS software, and web GIS data management applications. ESRI introduced Web AppBuilder (ESRI Web Ap-pBuilder 2017), a web based GIS platform which allows users to make use of templates and pre-existing widgets for developing visually pleasing GIS applications. The existing widgets in ESRI Web AppBuilder allow the developer to focus on primary objectives of the application rather than designing the user interface.

This work is inspired by the movie “LION”, based on the book ‘A long way home’ (Sa-roo Brierley, Penguin Books, 2013), the true story of a five-year-old who got lost on a train near his home town in India. He travelled alone to Calcutta, more than a thousand kilometers away from his hometown. Not knowing the local language, he survived terrifying challenges before he was adopted by an Australian couple. The non-fictional book narrates how he found his home after twenty-five years without much GIS skills. The process of rediscovering his home town would have consumed less time, if there was a better attribute and spatial analysis system than Google Earth. This paper explores utilizing ESRI Web Appbuilder, an easy-to-use application for non-GIS people.

2. Literature Review

2.1 Story of an abandoned child

The overall journey of the child is depicted in Fig. 1



Figure 1: Overall Picture of the Child's Journey (Source: people.com)

Some of the key memories which kept the hope of finding his home over the years were: a. the town where he boarded the train near his hometown starts with a letter 'B'; b. it was always warm ($>27^{\circ}\text{C}$) at night in his town; c. he had never seen the sea in his childhood, so, he was sure that his town is located inland; d. he could recall landmark places such as a bridge over the river and the nearby water tower where he played as a child; e. thinking about how far he could have been transported from his home town, he assumed that the journey lasted somewhere between twelve and fifteen hours.

Having these clues in mind he started his initial search by station names starting with "B" but he realized that it is going to take his entire life to find his home town. He reorganized his strategy by tracing the train lines which run between Kolkata and "B" places. In the process of narrowing down his search area, he excluded northern India as it was always cool ($<27^{\circ}\text{C}$) in the night. After discussing with his friends, he calculated how many kilometers he might have traveled during that time. The general consensus of 80 to 90 kilometers an hour of train speed made him search for places within a thousand kilometers along a train line out of Kolkata station. The buffer of 1000 kilometers around Kolkata station means that he needed to search over a quarter of India's huge landmass. He looked only for rail route

types which connect stations between two different states, and found that he had to extend his search beyond 1000 km. One night, he finally saw the familiar bridge next to a large water tank close to a railway station named "Burhanpur" (~1500km distance). Further search around Burhanpur helped him locate his hometown "Khandwa".

Even though he rediscovered his home after a tedious search using Google Earth, later when he was travelling on the Kolkata Mail which runs between Howrah and Burhanpur (the "B" place), he realized that the average speed was between 50 to 60 kilometers per hour, and the journey longed for almost thirty hours. When he looked back at his process of rediscovering Khandwa (his home town) he had a thought about approaching things differently. The system which might have allowed to search the rail stations which start with "B" and trace the path along rail lines between Howrah (Kolkata station) and Burhanpur could have helped him. Also, if the system had the provision for filtering out the data based on the temperature conditions and the type of railway would have saved time.

2.2 ESRI WebAppBuilder

Web AppBuilder for ArcGIS helps in building GIS applications that can run on desktops, tablets, and smartphones. The inbuilt widgets in Web AppBuilder enable 2D and 3D web GIS applications without writing a single line of code. As the user adds to the map and configure the tools, they can be seen directly in the application, and ready for use right away. It includes HTML/JavaScript based apps that can be configured to use on any device (ESRI Web AppBuilder 2017).



Figure 2: ArcGIS Geoinformation Model (Source: ArcGIS Online)

Fig.2 demonstrates the geoinformation server model of ArcGIS. A portal in ArcGIS maintains the collection of items organized in a custom website powered by ArcGIS online services. Each custom website is managed by an organization or individual member. This portal can include content from the organization, community content or member's own content. ArcGIS geoinformation model is structured such a way that it can be used to create, and share geographic information with anyone (ESRI Web AppBuilder 2017).

3. Research Questions

GIS software provide various geospatial analysis capabilities but they require lot of technical knowledge in developing user friendly applications.

This research is aimed at answering the following questions:

1. How could the process of rediscovering his home have been approached different-ly so he might possibly have found his first home quicker?
2. What are efficient GIS tools that can be utilized in designing such a system?

4. Methodology

4.1 Data collection and geodatabase creation

India is bounded by 8°4' to 37°6' N latitude and 68°7' to 97°25' E longitude, and has 29 states further divided into districts. The digitized versions of state and district boundaries have been obtained from www.diva-gis.org. The following shapefiles were added for spatial analysis.

1. Rail network (Linear layer)
2. Railway stations (Point layer)
3. Average Temperature data (Polygonal layer)
4. Political boundaries (Polygonal layer)

The above layers are shown in Fig. 3,4,5 and 6.

Figure 3: Political Subdivision of India

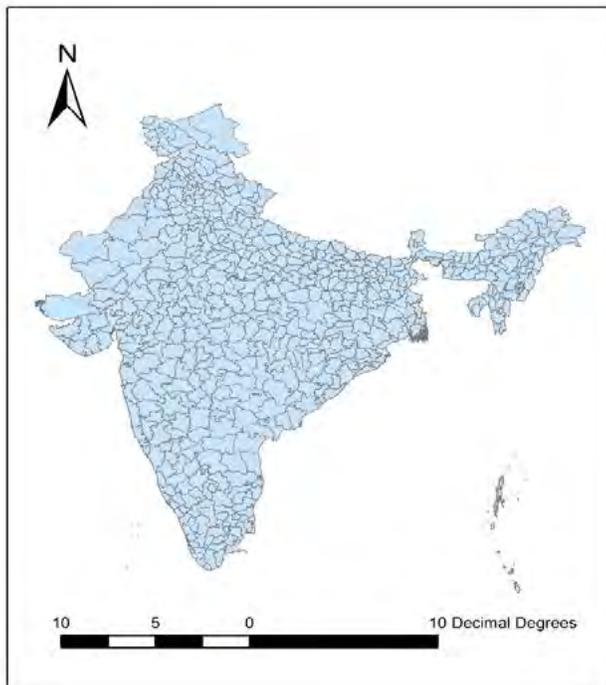


Figure 4: Average Temperature at Night

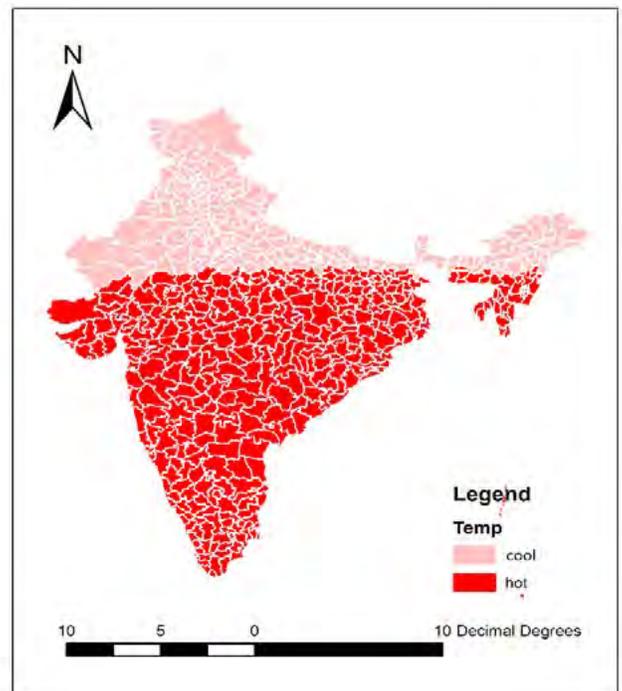


Figure 5: Railway Stations in India

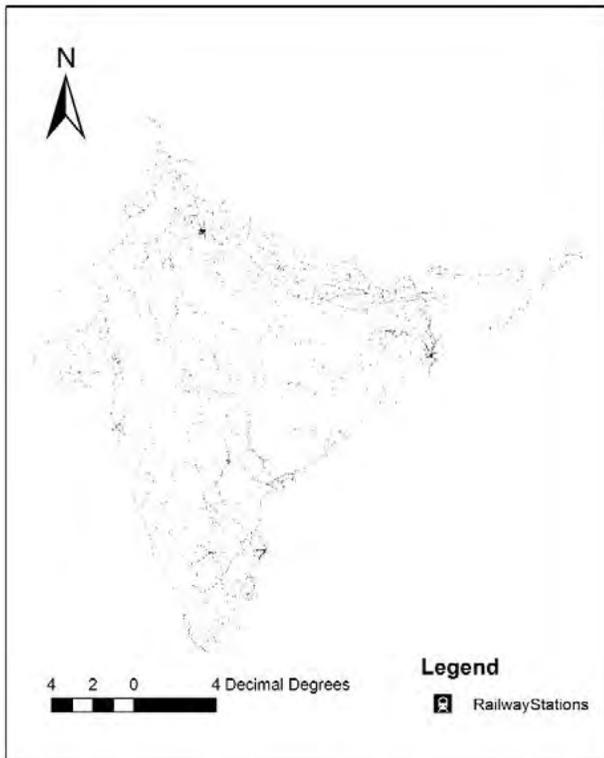
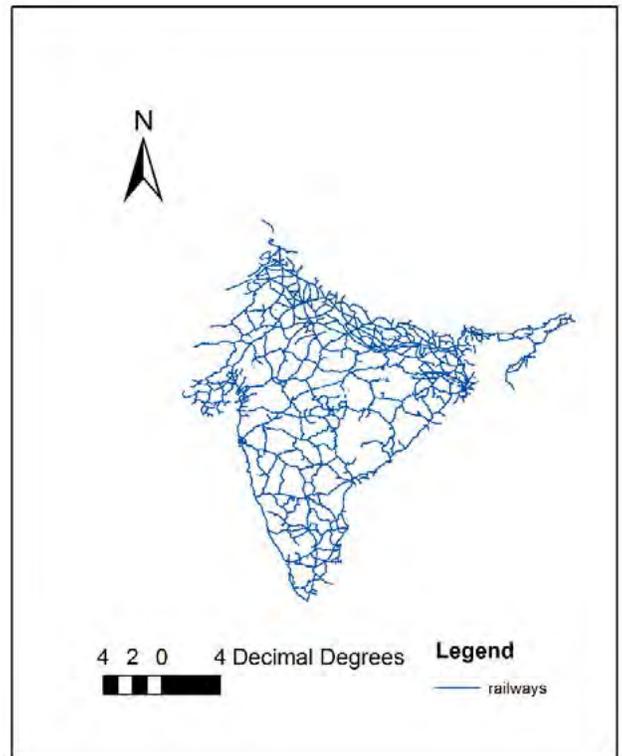


Figure 6: Railway Network of India



4.2 Configuring widgets in Esri Web Appbuilder

The shapefiles are published as feature layers to ArcGIS Online Services. ESRI Web AppBuilder accesses data from ArcGIS Online Services to build custom applications. Developing the application with existing templates provides a consistent look and feel to the users. The custom developed route analysis widget helps the user to trace the path between two different railway stations. The existing directions widget utilizes ESRI geocoder for finding the direction between two or more locations. It has the limitation of considering only the road networks. So, it has been customized to find the route between two or more railway stations. The network dataset for Indian railway routes have been built using ArcMap desktop application and hosted as a service to Web AppBuilder (ESRI Web AppBuilder 2017). Fig. 7 depicts the overall system workflow.



Figure 7: System Workflow Overview (Source: Modified from ArcGIS Online)

The following 4 widgets were configured in Web AppBuilder:

1. Widget for searching based on the station name
2. Widget for differentiating the regions based on the average temperature
3. Widget to filter the rail routes based on the type
4. Widget for finding the direction between two or more railway stations

The first widget is to filter the rail stations based on their name. For example, if the user enters “B”, all the stations with starting letter “B” will get filtered from the whole list of stations (Fig.8) (ESRI Web AppBuilder Search widget, 2017).

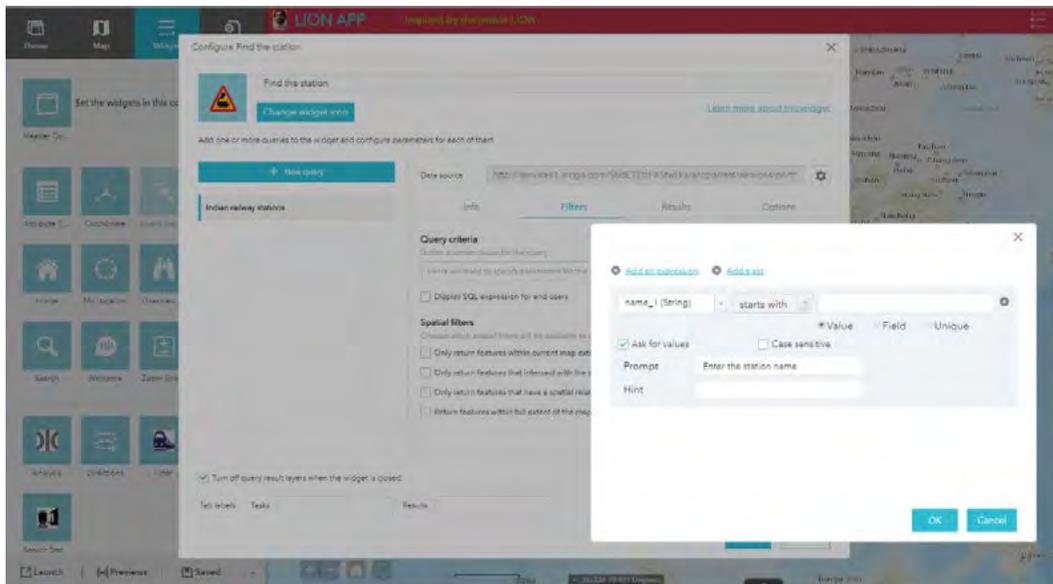


Figure 8: Configuring the Search Based on the Station Name

The second widget is for differentiating the regions based on the average temperature at night. This filter is executed on the layer which contains the temperature data for individual districts (Fig.9).

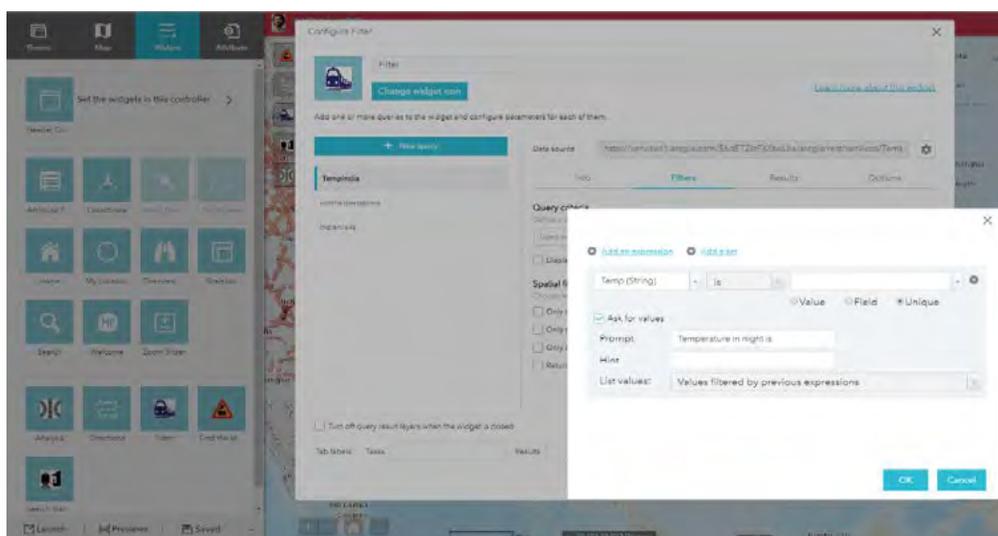


Figure 9: Configuring the Search Based on Average Temperature

The third widget enables the user to filter the rail routes based on their type. The main categories are: funicular, monorail, narrow_gauge, rack, rail, subway and tram. Each railway type has different speeds which help in calculating the travelling time. The funicular, monorail, rack, subway and tram type of rail routes run within the city limits and they don't connect between two different states. So, these types of routes can be omitted from further search as narrow_gauge and rail type routes only connect stations for long distance (Fig. 10).

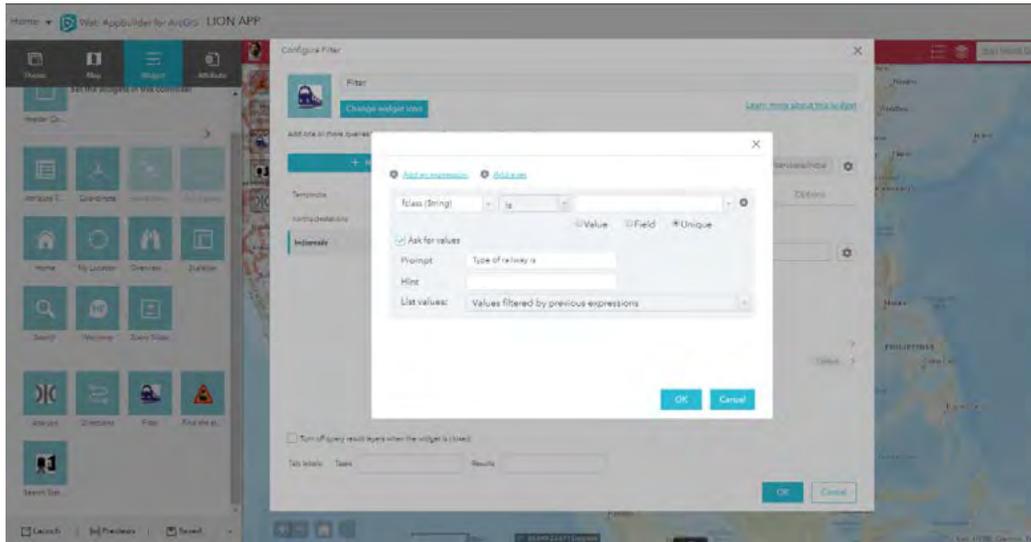


Figure 10: Configuring the Search Based on the Type of Railway

The fourth widget is a custom-developed route analysis tool for finding the direction between two or more railway stations (Fig. 11). The existing directions widget is configured with ESRI's predefined routing API which does not let the user trace the path along railway lines. So, the network layer of rail routes has been created using ArcMap's network analysis tool, enabling the user to find the route between two or more railway stations. This network layer is hosted from UNB's ArcGIS server. The route URL in ESRI WebAppBuilder's direction widget is configured to access the network layer from UNB's ArcGIS server (Fig. 11) (ESRI WebAppBuilder Directions widget, 2017).

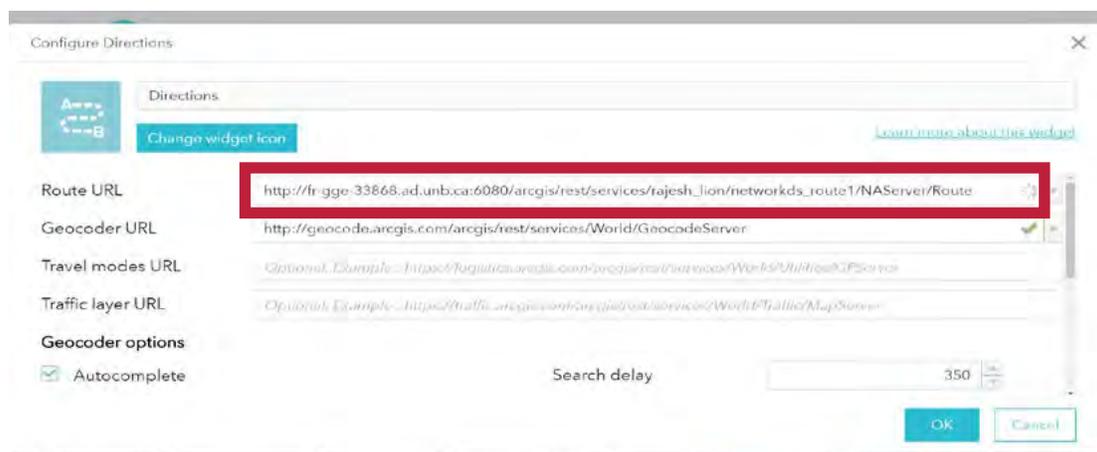


Figure 11: Configuring the Direction Widget to Find the Route Between Two Railway Stations

The widgets are ordered such a way that each widget's filter is executed on top of the data filtered by the previous search widget. For example, the filter based on "rail type" is executed on the result obtained by place name based search widget. This sequential search allows the system to reduce the geographic region which is being searched each time.

5. Results and Discussion

The final application has been hosted from UNB ArcGIS online account and shared with the public so that the application can be accessed from any device with internet connection (<http://unbgis.maps.arcgis.com/apps/webappviewer/index.html?id=53d55ddf5adc464f82a27c02f494b5c4>). Ideally, anyone with basic knowledge of computer and internet can easily interact with the application. From the homepage URL of the application, the Indian rail route and stations map is shown to the user (Fig.12). The widgets are available on the right of the window with zoom in and zoom out operators available near the left border. The sequential search lets the user easily identify the place that they are looking for.

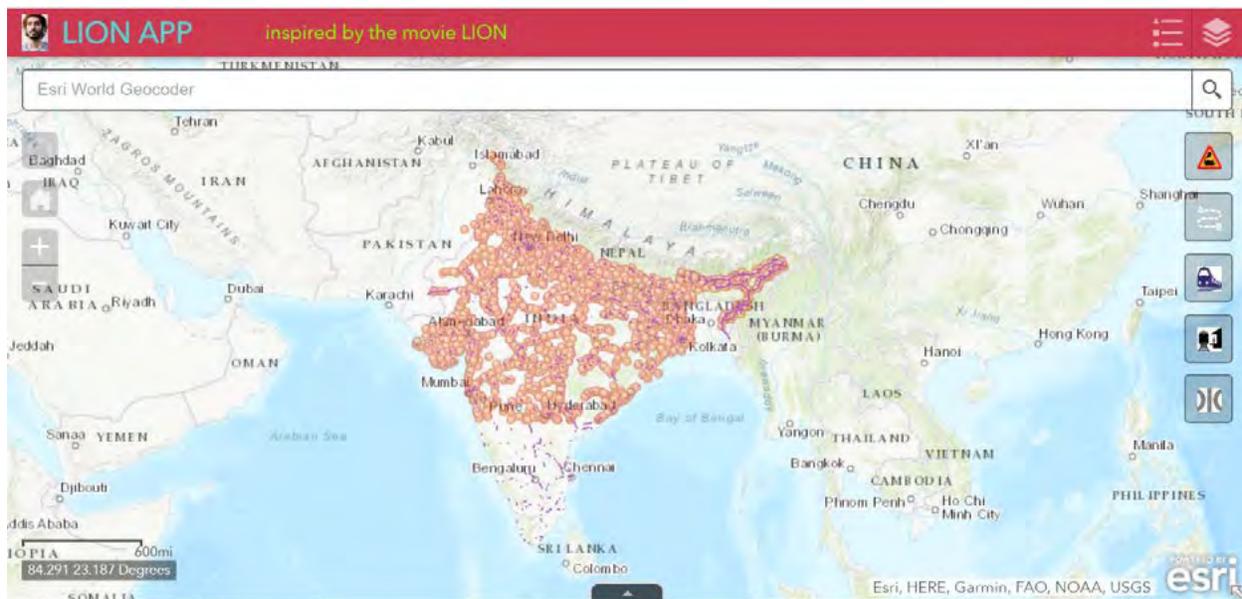


Figure 12: Map of India Railway

Once the initial map has been loaded with the system filters the user can search for locations by using the widgets. Fig. 13 shows the results of applying the query based on the station name. The information panel on the right also lists the attribute information about each location identified on the map.

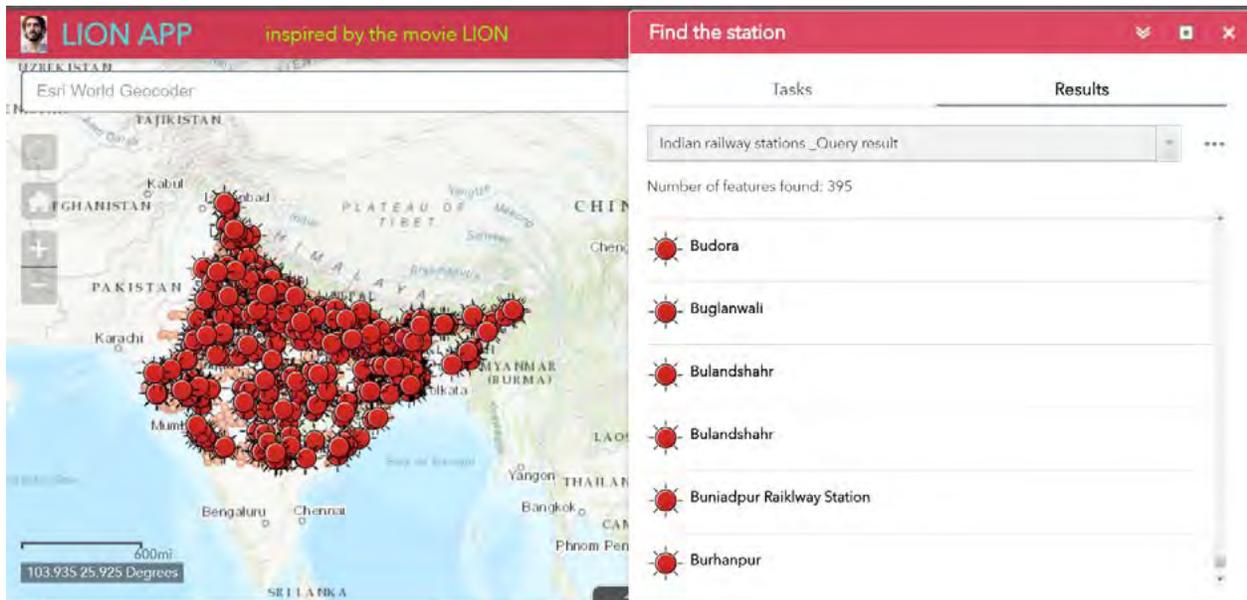


Figure 13: Search Results of the Stations Starting with “B”

The search results based on average temperature are shown in Fig. 14. This result helps the user in narrowing their search region by identifying the districts where it was hot during the night. The regions are classified into “hot” and “cool” based on the average temperature during the night. In this case the regions with temperature greater than 27°C are classified as hot.

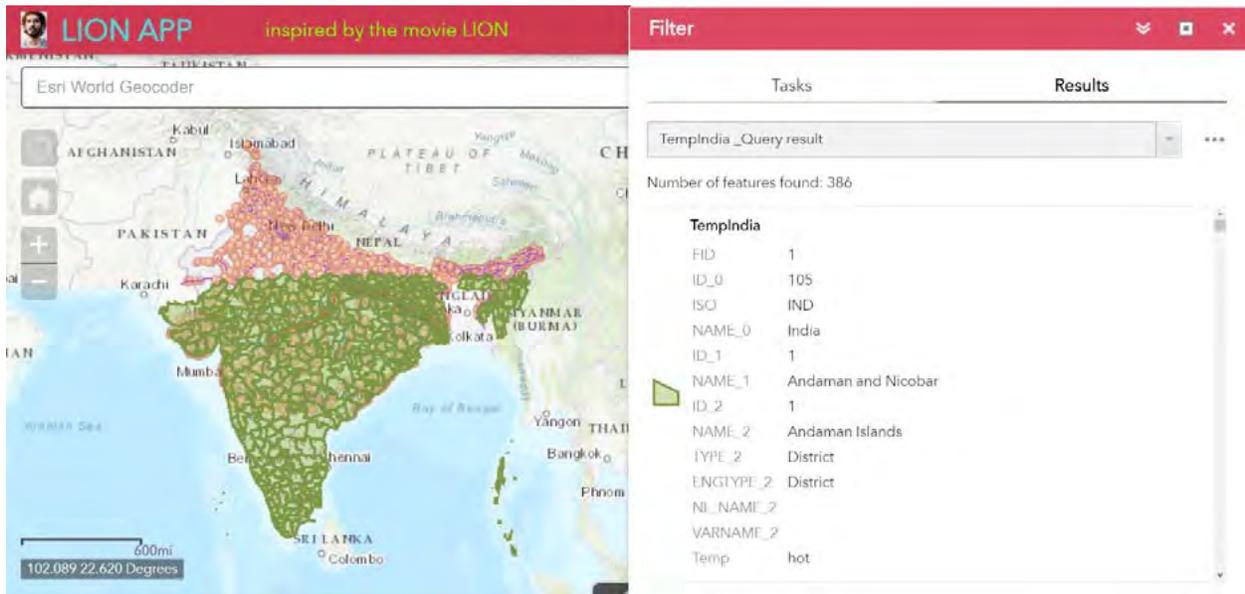


Figure 14: Searching Results Based on the Temperature Conditions

Now that the user has looked for places starting with “B” and where it had been hot during the night, the next step would be tracing the rail route between Howrah station and to all the “B” places within the region filtered by the temperature based search widget. The hosted network layer of rail routes enables the system to find the rail route between all the “B” places and How-rah station. An additional filter based on rail route type helps the user in eliminating intra state transport routes such as tram lines and metros. The journey between

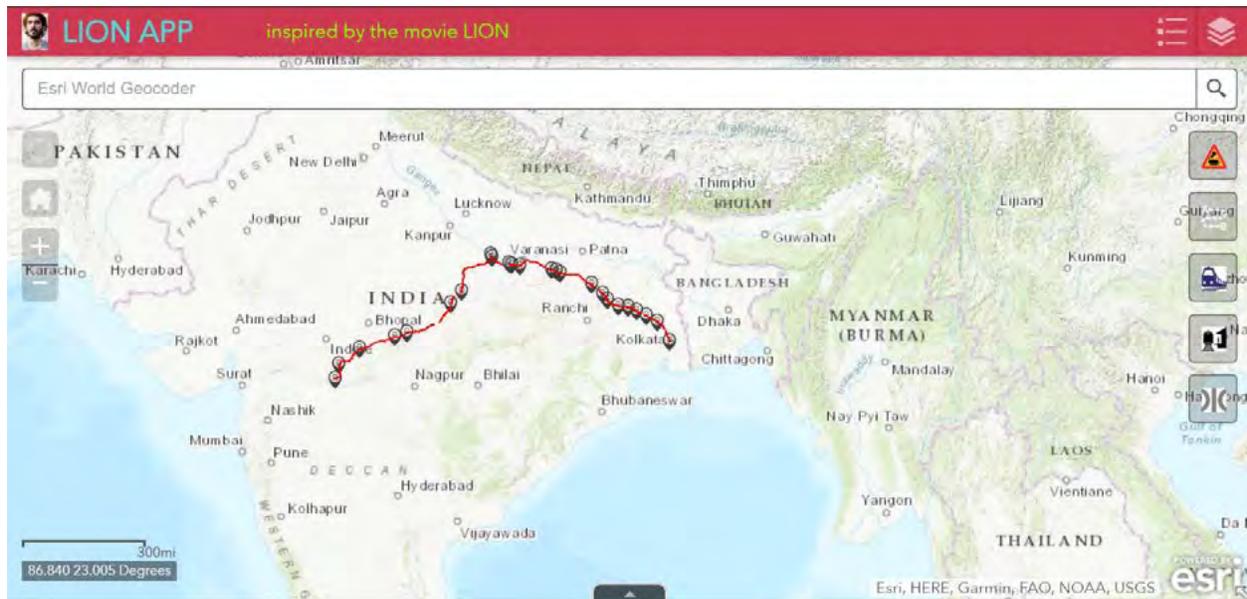


Figure 15: The Journey Between Howrah and Burhanpur

With the spatial data for railway routes and stations not available 25 years ago, it is hard to make the decision now. But a heuristic historical GIS data might have benefitted the system to provide appropriate results. However, the developed application with current data may serve in the future by aiding in identifying similar places from a limited number of clues.

6. CONCLUSIONS

This paper involved utilizing the WebGIS development platform ESRI WebAppBuilder in rediscovering the home of an abandoned child. The developed application enables users to search for locations based on place names, type of railways and temperature conditions. The capabilities of existing widgets have been utilized while some widgets have been customized using ESRI WebAppBuilder developer edition. The motive for using ESRI WebAppBuilder is to make the application usable by people with limited technology skills. In future work, special attention could be given in developing a standalone application which can support object based image search in the geospatial domain. At this time the application is focused on one particular region, however enhancing these geospatial analysis functionalities to other geographic regions is another future goal. Including historical GIS data over the years would make the system more reliable in providing appropriate results.

References

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ESRI Online Reference. <http://www.esri.com/software/arcgis/arcgisonline> ESRI Web AppBuilder Reference. <http://doc.arcgis.com/en/web-appbuilder/create-apps/widgets-tab.htm>

ESRI Web AppBuilder Search widget. <http://doc.arcgis.com/en/web-appbuilder/create-apps/widget-search.htm>

ESRI Web AppBuilder Directions widget. <http://doc.arcgis.com/en/web-appbuilder/create-apps/widget-directions.htm>

The True Story Behind Lion. <http://people.com/movies/lion-movie-true-story-saroo-brierley/>

NATIONAL AND INTERNATIONAL (CARTOGRAPHY RELATED) MEETINGS, 2018

ICA MOUNTAIN CARTOGRAPHY COMMISSION:
May 21-25, Hvar, Croatia.
<http://science.geof.unizg.hr/cmc2018/index.php>

AUTOCARTO:
May 22-24 Madison, Wisconsin
<http://www.ucgis.org>

ACMLA:
May 28 – June 1, Montreal, QC,
52nd annual conference, in conjunction with IASSIST.
<http://www.library.mcgill.ca/iassistcarto2018>

CCA:
May 30- June 2, Lawrencetown, NS
Community mapping: place-making through Maps.
<http://www.cca-acc.org>

CAG:
August 6-10, Québec City,
International Geographical Union (IGU) regional conference.
<https://www.cag-acg.ca/cag-annual-meeting>

NACIS:
October 17-20, Norfolk, VA.
<http://nacis.org/annual-meeting/current-meeting/>

Membership Coordinator
Roger Wheate
 University of Northern British Columbia



Membership Report, 2017

Membership has increased from 100 to 112 from the same time a year ago. This results from two events or initiatives: the Annual meeting in Ottawa in June, and adding a new student category at only \$10, which includes Cartouche but does not include the journal. Membership renewals will be due in the new year - the best method is to use the 'Apply Online' option at: <http://cca-acc.org/membership/>

Welcome new members 2017:

Sarah Simpkin	Ottawa, ON
Kevin Ballantyne	Ottawa, ON
Scott Mitchell	Ottawa, ON
Jeff Allen	Toronto, ON
Wendy Smith	York, ON
Emory Shaw	Montreal, QC
Laura Thomson	Burnaby, BC
Giuseppe Filoso	Ottawa, ON
Scott Emmons	Prince George, BC
Mo Wang	Montreal, QC
Thomas McGurk	Montreal, QC
Nate Wessel	Toronto, ON
Anna Delorme	Low, QC
Nelly Markovsky	Montreal, QC
Amos Hayes	Ottawa, ON
Trevor Ford	Ottawa, ON
Ann Saumier	Ottawa, ON
Richard Kennedy	Ottawa, ON
Patricia Cosmopoulos	Ottawa, ON
Sara McClacherty	Ottawa, ON
Scott Tweedy	Ottawa, ON
James Fairlie	Ottawa, ON
Marianna Sterlini	Ottawa, ON
Els Aelvoet	Ottawa, ON
Jordan Aharoni	Richmond Hill, ON
Andrew Black	Kensington, PE
Thomas Zuberbuehler	Vancouver, BC

Past President
Christopher Storie
University of Winnipeg



How Can You Get Involved?

The CCA has long been supported and sustained by a dedicated and devoted membership and executive. The vibrancy and collegiality of the CCA is strongly evident at our annual meetings. To capitalize on our latest meetings and keep that momentum going, the association needs your time and commitment.

The CCA has several openings on our executive, which include:

1. Vice-President - This individual would commence June 2018 after the annual general meeting at COGS in Nova Scotia. The typical commitment of this individual is 3 years as they would become President and then Past-President
2. Secretary – We need an association secretary who would commence duties in June 2018.
3. Communications Officer – The CCA, recognizing the role social media plays in modern day communications is seeking a communications officer to coordinate the association communication channels (Facebook, Twitter, Web) and to ensure consistent messaging across all platforms. As this position is currently undefined in our executive tasks list one of the first duties, in conjunction with the P and VP will be to clearly define the tasks as they relate to the position.
4. Special Interest Group Chairs – additional we have several unfilled interest groups chairs. SIG chairs seeks to capitalize on the specific interests of the membership by driving various thematic areas through online discussions and more importantly through the organization of special sessions at our annual meetings. The groups include:
 - Mapping Technologies & Spatial Data
 - History of Cartography
 - Education
 - Geovisualization and Map Design

For information on any of these openings you can consult the executive tasks list page on the CCA website

(http://cca-acc.org/wp-content/uploads/documents/CCA_Executive_Task_List_2008.pdf)

or contact Christopher Storie at pastpresident@cca-acc.org.

President**Julia Siemer**

University of Regina



Cartographica Technical Editor (Manuscript Copy Editing)

Position available: The new Cartographica technical editor will be sharing duties with Daniel Cole, Smithsonian Institution, who has previously shared the duties with Paul Wozniak, Geological Survey of Canada / Natural Resources Canada. Many thanks to Paul for his contributions as Technical Editor since 2010, and to Dan for his continuing work.

Cartographica Technical Editor (Manuscript Copy Editing)

In the capacity of a Technical Editor for Cartographica, emphasis is on ensuring the perspectives and findings of author contributions are clearly conveyed to the intended audience. This may include identification of spelling, punctuation, and grammatical errors but the focus is primarily on the clarity of the message, readability of the paper, and accuracy of the information presented.

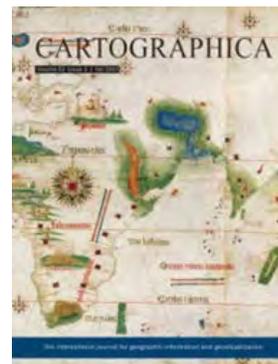
Figures, including maps, and tables are of particular importance in Cartographica papers and the Technical Editor must critique the figures and recommend changes to ensure legibility and clarity of information that is presented cartographically, graphically, and in tables. Attention must be given to potential copyright issues for figures, to identify content that may require proper permission for reproduction in the journal. Once the technical/copy editing is complete the paper undergoes a comprehensive check by the publisher, University of Toronto Press (UTP), for spelling, and grammar.

Depending on the extent of the changes required for a paper, the Technical Editor will correspond directly with the author(s) in the Technical/Copy edit stage, and must be available to provide clarification of recommended or required changes to a manuscript and its figures and tables. Guidelines for submissions are available and help facilitate completion of the technical/copy editing process.

ScholarOne is the on-line application now used by UTP for publication processing. The Technical editor must also become familiar with the ScholarOne system for exchanging information, content, and documents with authors and editors; the following quote underscores their main roles:

“Copy editors review copy for errors in grammar, punctuation, and spelling and check the copy for readability, style, and agreement with editorial policy. They suggest revisions, such as changing words and rearranging sentences and paragraphs to improve clarity or accuracy. They also may carry out research, confirm sources for writers, and verify facts, dates, and statistics. In addition, they may arrange page layouts of articles, photographs, and advertising.”

If you are interested in this position, please contact Julia Siemer, CCA President:



Julia.Siemer@uregina.ca

Phone: +(306)585.4405

Potential editors can also contact Dan Cole for more details:

coled@si.edu

We would like to fill this position by Spring 2018

43rd CCA Conference and Annual General Meeting

Centre of Geographic Sciences, Lawrencetown, NS
Wednesday, May 30 - Saturday, June 2, 2018



Centre of Geographic Sciences, Lawrencetown, Nova Scotia

The Canadian Cartographic Association (CCA) and the Centre of Geographic Sciences (COGS) invites you to the 43rd annual general meeting and conference to be held at COGS, Lawrencetown, Nova Scotia May 30 – June 2nd, 2018.

Our campus has a long history of teaching cartography and looks forward to hosting in 2018. This four day event will kick off with technical sessions and icebreakers followed by two days of presentations, CCA meetings, orienteering event, dinner with flavours from the Annapolis Valley, and opportunity to tour Grand-Pré and local wine region.

Keynote speakers include Michael Goodchild, Marcel Morin Lost Art Cartography and COGS alumni Edie Punt and Clint Loveman from Esri Redlands.

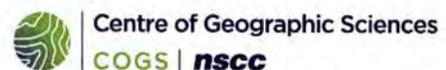
See <http://cca-acc.org/> for conference details, to be posted shortly.

The CCA and COGS look forward to seeing you at CCA 2018 in Lawrencetown!

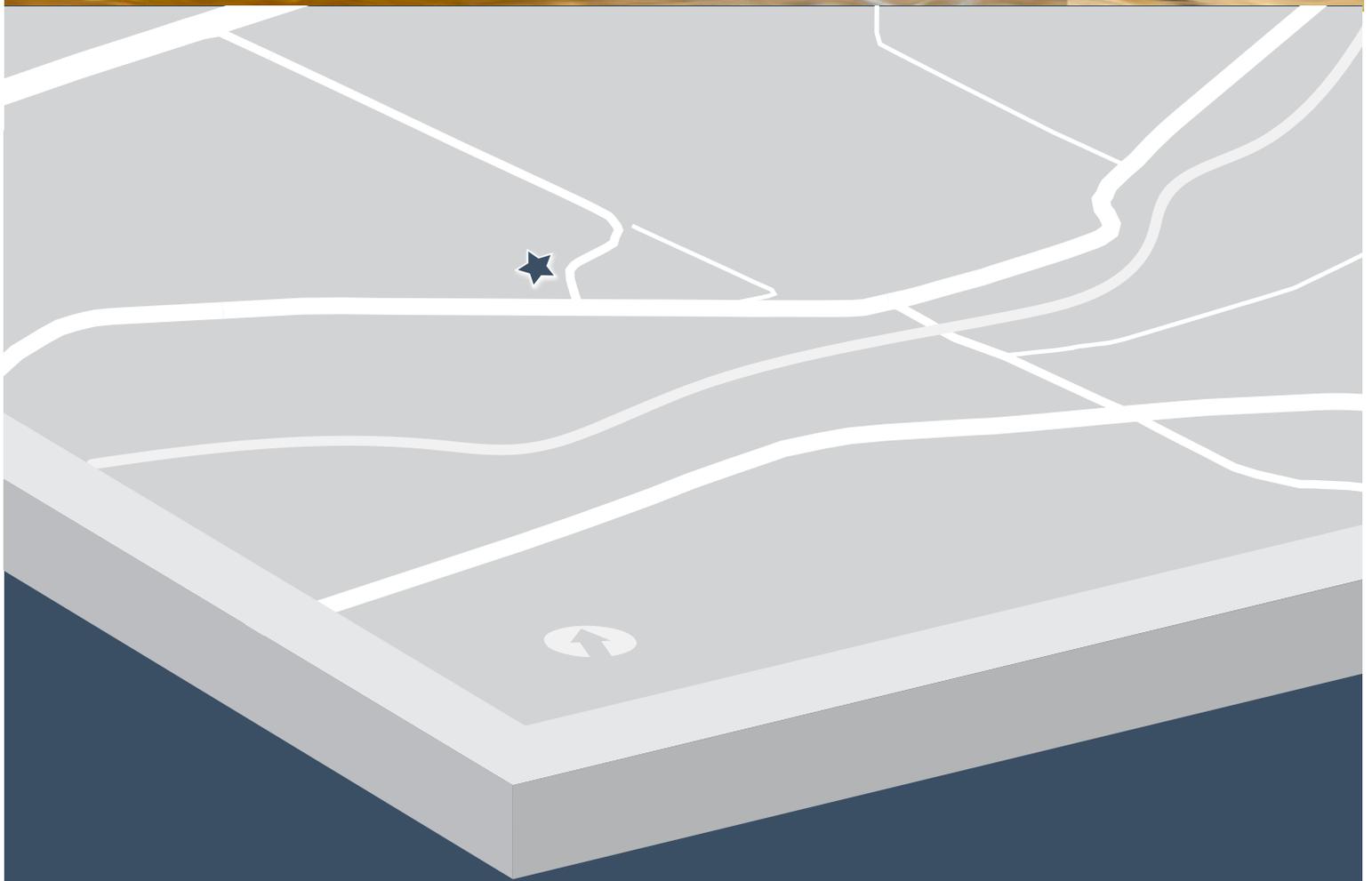
Local Organizing Committee:

Monica Lloyd
Centre of Geographic Sciences
Nova Scotia Community College
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Lawrencetown, NS B0S 1M0 CANADA

monica.lloyd@nsc.ca



Canadian Cartographic Association
l'Association canadienne de cartographie



COMMUNITY MAPPING: PLACE-MAKING THROUGH MAPS

43rd Annual Canadian Cartographic Association Conference

NSCC - CENTRE OF GEOGRAPHIC SCIENCES | 50 Elliott Road - Lawrencetown, Nova Scotia

COGS | *nscc*

May 30 – June 2, 2018



The Executive Committee of the Canadian Cartographic Association is pleased to grant an

Honorary Member Alberta Auringer Wood

The CCA were proud and pleased to make the following nomination for honorary member, according to Section 2 in the Constitution, in April 2016.

Section 2

HONORARY MEMBERS.

Individuals who have rendered outstanding service in the field of cartography, or other distinguished persons upon whom the Association has conferred honorary membership.

Alberta, along with Cliff Wood, moved to Memorial University and Canada a few years after the formation of the CCA, and quickly gained prominence both in the association and through Cartography at Memorial University, as the Sciences Collection librarian and then Head of the Map Library.

In the previous millennium, Alberta gained recognition in other mapping associations: as the first female president of the American Congress on Surveying and Mapping (ACSM) 1987, President of the Association of Canadian Map Libraries and Archives (ACMLA) 1993, and Vice-President of the International Cartographic Association, 1999. Through the near three decades with Cliff on the CCA executive, Alberta used the wealth of her knowledge and experience with these other groups to benefit and advise the association and its members. In the new millennium Alberta served on the CCA executive, completing a double term as secretary, 2006–10, and played a key role in organizing the executive's activities. Alberta has an unmatched experience and memory store of CCA history.

It gives me great pleasure to present the honorary membership to the CCA to Alberta Auringer Wood.

Dr. Julia Siemer
President, Canadian Cartographic Association



Honorary Member Alberta Auringer Wood Receives Honorary Membership from CCA President Julia Siemer, Ottawa, 2017

The Executive Committee of the Canadian Cartographic Association is pleased to grant an

Award of Distinction for Exceptional Contributions to the CCA to

Janet (Jan) Mersey

The Executive Committee of the Canadian Cartographic Association is pleased to grant an Award of Distinction for Exceptional Contributions to the CCA to Janet (Jan) Mersey.

This award is long overdue. Janet is a long serving faculty member at the University of Guelph, and was elected as Interest Group Chairperson and then CCA Vice-President in 1994, succeeding as President the next year. In the new millennium, her service to the CCA has been uninterrupted, as Canadian delegate to the International Cartographic Association (ICA) and simultaneously Chair of the Canadian National Committee on Cartography and the Canadian Institute of Geomatics (CIG) Technical Councilor for Cartography from 2003–13. Since relinquishing those positions in 2013, she has continued as the CCA delegate to the ICA, and co-ordinates the Canadian National Map display at ICA conferences, including the upcoming meeting in Washington DC in July.

It gives me great pleasure to present this award for exceptional contributions to the CCA in 2017 to Janet Mersey.

Dr. Julia Siemer
President, Canadian Cartographic Association



Jan Mersey receives an Award of Distinction from CCA President Julia Siemer

The Executive Committee of the Canadian Cartographic Association is pleased to award the

Norman L. Nicholson Memorial Scholarship to Johnathan (Johnny) Eaton

**Student in the
Diploma in Geographic Sciences: Concentration in Cartography
Nova Scotia Community College**

The Executive Committee of the Canadian Cartographic Association is pleased to award the Norman L. Nicholson Memorial Scholarship to Johnathan (Johnny) Eaton for the 2017/18 school year.

Dr. Nicholson was a well known and respected educator and member of the Canadian Cartographic Association. He had a long and distinguished career in government and academe, where his interests lay in the history of cartography and Canadian government mapping, in particular the National Atlas of Canada.

This award recognizes and encourages exceptional student achievement and ability in any aspect of cartography.

It gives me great pleasure to present this award to Johnny Eaton.

Dr. Julia Siemer
President, Canadian Cartographic Association



*Johnny Eaton Recipient of the
2017 Norman Nicholson Scholarship*

The CCA is accepting applications for the 2018/19 [Norman L. Nicholson Memorial Scholarship](#). Application packages are due March 15th 2018. Award winners receive a cheque for \$500 and certificate of recognition.



2018 STUDENT MAPPING COMPETITIONS

The Canadian Cartographic Association (CCA) would like to draw your attention to the 2018 student mapping competitions.

THE PRESIDENT'S PRIZE

The CCA President's Prize recognizes excellence in student map design and production and is open to all students at Canadian post-secondary institutions who have completed and produced a cartographic project in the preceding school year. The President's Prize Competition will consist of two prizes of \$250, one for entries from college-level or CEGEP students, and one for entries from university-level students in the **thematic map** category:

A thematic map is a map that is meant to communicate a specific subject matter within a particular geographic area. They are often defined as special purpose maps and can be either quantitative or qualitative in nature. The International Cartographic Association (ICA) defines the thematic map this way: "A map designed to demonstrate particular features or concepts. In conventional use this term excludes topographic maps" (Dent 1999, 8).

THE CARTO-QUEBEC PRIZE

The Carto-Quebec Prize is a special annual competition for the best **student-authored cartographic product in French**. The award has been established through a gift from the former Association Carto-Québec to promote and recognize excellence in map design. The competition is open to all post-secondary students in Canada who have completed and produced a cartographic project in the preceding school year. The Carto-Quebec Prize will consist of two awards of \$500, one for entries from college-level or CEGEP students, and one for entries from university-level students.

Entry Guidelines

There are no restrictions on size but the cartographic project must have been completed and produced during the school year preceding the competition. Cartographic projects will consist of a map or a map series forming a coherent whole (printed as a single map or a poster displaying several maps) and may be submitted in any finished form (on paper or other medium). The Carto-Quebec Prize entries must be in French. The President's Prize entries must be thematic maps.

For both competitions, all students enrolled at a Canadian university or college, are eligible to submit their maps made in the 2017/2018 school year. Deadline for submission to the 2018 competition is **May 25th, 2018**.



WEB MAP AWARD

This award recognizes excellence in web mapping and is open to all post-secondary students who have completed and produced a web map in the preceding school year. The 2018 CCA Web Map Award Competition will consist of one prize of \$250 entries from college-level, CEGEP students, or university-level students.

Submissions will be evaluated by a panel of three judges made up of CCA executives. Participants are asked to email their project URL to CCA Vice President Monica Lloyd: vicepresident@cca-acc.org by **11 p.m. Friday, May, 25th, 2018.**

Judges will be evaluating projects based on the following criteria:

Map Story - Does the web map tell a unique story with a specific purpose or client in mind?

Cartographic Design - Project showcases current cartographic web mapping practices with a balance of necessary data layers, high quality web-ready multimedia elements and presented in professional presentation.

User Interactivity - Aspects of user interactivity (popups, zoom control, layer control, user ability, etc.) are all fully functional for intended audience.

Complexity - Is the web map created using a proprietary application or using code and/or plugins? If coding is used, is it organized and commented.

Package - Overall package of the project: side panels, explanations, flow of information, data quality, multi-media, and proper sourcing will all be considered.

Submission - Please submit a [bitly](#) link to the URL for the hosted web map. It is asked that the winning submission be online for one year.

The CCA looks forward to reviewing your web map creations and seeing your mapping stories in this cartographic format. Best of Luck.

Monica Lloyd
Vice President
CCA



Canadian Cartographic Association
l'Association canadienne de cartographie

2018 STUDENT MAPPING COMPETITIONS ENTRY FORM

President's Prize Carto-Quebec Prize Web Map Award

Entrant's Name	
Map Title	
Permanent Mailing Address	
Telephone Number	
E-mail	

POST SECONDARY CATEGORY

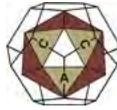
College or CEGEP Year or Level 1 2 3 4 5
 University Postgraduate

Instructor's Name	
Instructor's E-mail	
Course Number	
Institution	

In a clear and concise manner in no more than one double spaced typed page, state the design objectives of your project and provide a rationale for your design choices. In order to be eligible, this form along with your design objectives (see above) must be submitted with submissions as well as a digital copy of your map (or link to your electronic map). Entries must be received no later than **May 25th, 2018**.

<p>CCA PRESIDENT'S PRIZE OR CARTO-QUEBEC PRIZE</p> <p>Send this entry form, your design objectives and printed map to</p> <p>CCA President's Prize or Carto-Quebec Prize c/o Vice President, Canadian Cartographic Association Monica Lloyd NSCC COGS Lawrencetown, NS B0S 1M0</p> <p>Send your digital file for President's Prize, Carto-Quebec Prize to vicepresident@cca-acc.org</p>	<p>CCA WEB MAP AWARD</p> <p>Send this entry form, your design objectives and URL for your map to</p> <p>Monica Lloyd vicepresident@cca-acc.org</p>
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**Canadian Cartographic Association (CCA)
L'Association Canadienne de Cartographie (ACC)**



**Membership / Renewal 2018
Renouvellement d'adhésion 2018**

All fees are in Canadian dollars (no GST).

Donations may be made to the Nicholson Scholarship fund.

Tous les frais indiqués sont en dollars canadien (TPS nonincluse).

Nous acceptons les dons pour le fond de la bourse Norman Nicholson.

Address / Adresse:

Please make changes where necessary. / S.V.P. indiquer les modifications s'il y a lieu.

Name / Nom _____

Street / Rue _____

City / Ville _____

Prov/Prov _____

Country/Pays _____ Postal Code _____

E-mail/Courriel: _____

(must provide e-mail to receive Cartouche / fournir courriel pour recevoir Cartouche)

Tel(business)/Tél(bureau): _____

Tel(home)/Tél(domicile): _____

**Please indicate relevant interest groups/
S.V.P. indiquez vos groupes d'intérêt:**

- Mapping Technologies & Spatial Data
Technologie cartographiques et données spatiales
- History of Cartography
Histoire de la cartographie
- Education
Éducation
- Design and Geovisualization
Cartographie analytique et conception

Please Return to / Veuillez expédier à:

Byron Moldofsky
Treasurer, CCA
177 Brookdale Avenue
Toronto, ON
M5M 1P4

Tel / Tél: (416)978-3378
treasurer@cca-acc.org

Print Form

New Member? / Nouveau membre ?

Membership Category / Catégorie d'adhésion

- Regular / Régulier (1yr / année **\$90**)
 - Retired / à la retraite (1yr / année **\$45**)
 - Student/Étudiant (1yr / année **\$10** NO Cartographica)
 - Student/Étudiant (1yr / année **\$45** Cartographica incl.)
- Educational Institution / Nom de l'institution fréquentée: _____

Family/Famille (1yr / année **\$110**)

Two names / Nom des deux membres: _____

Corporate/Entreprise (1yr / année **\$200**)

Company Name / Dénomination sociale: _____

Two Representatives / Noms des deux représentants: _____

Institutional / Institutionnel (1yr / année **\$45**)

Institution Name / Nom de l'institution _____

One Representative / Nom de un représentant: _____

Institutional membership receives Cartouche only.
Les membres institutionnels reçoivent Cartouche seulement.

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- Print journal / journal imprimé Online / en ligne
- Both Print and Online Access to Cartographica / accès à la fois imprimé et en ligne **ADDITIONAL \$45 / 45 \$ DE PLUS**

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Canadian Cartographic Association/L'Association Canadienne de Cartographie)

VISA Mastercard

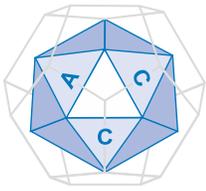
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CSC / CVV Number / numéro □□□

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Vacant

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Vacant

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Barbara Petchenik International Children's Map Competition / Compétition internationale Barbara Petchenik de cartes dessinées par des enfants

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