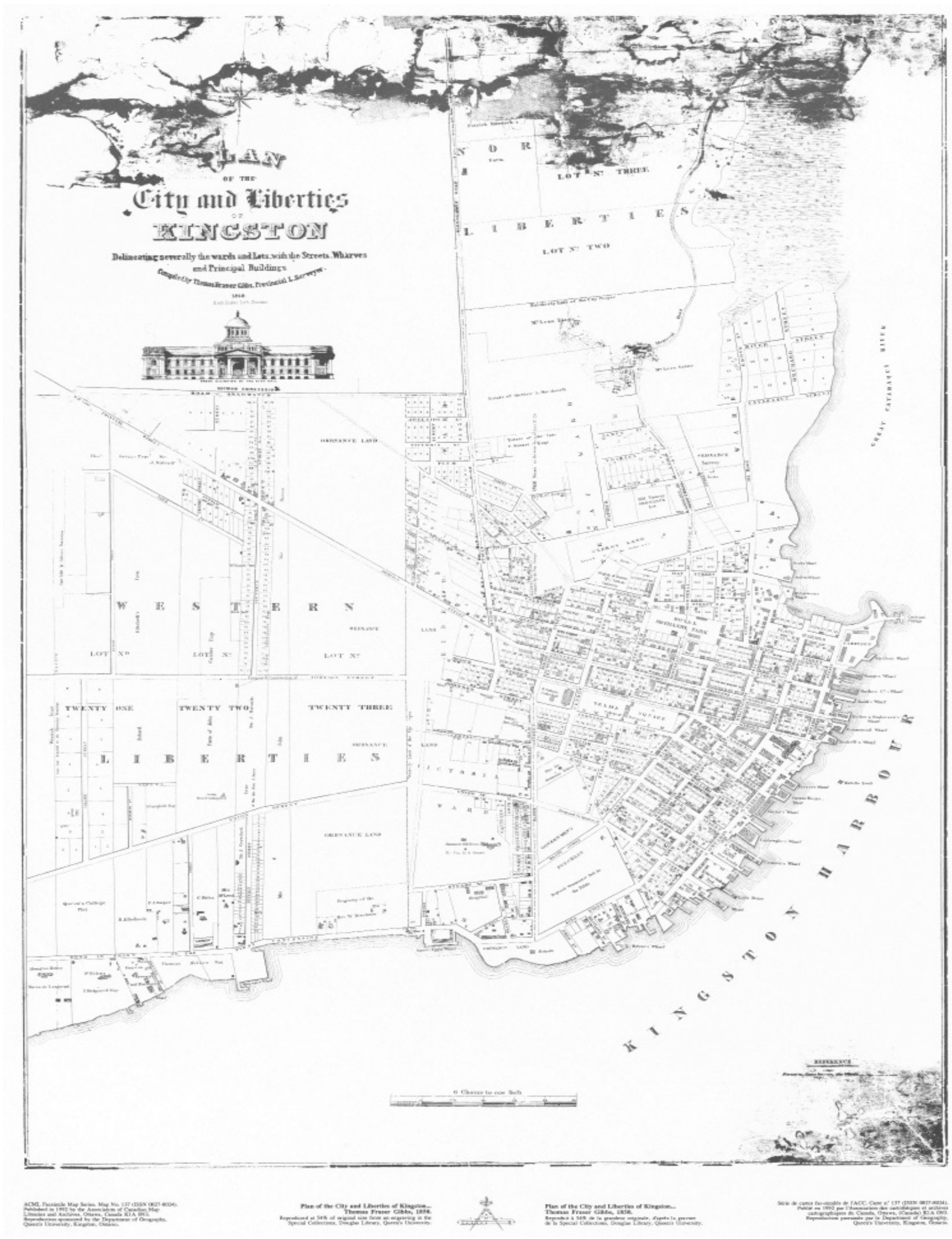
ASSOCIATION OF CANADIAN MAP LIBRARIES AND ARCHIVES

BULLETIN

ASSOCIATION DES CARTOTHÈQUES ET ARCHIVES CARTOGRAPHIQUES DU CANADA



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ASSOCIATION OF CANADIAN MAP LIBRARIES AND ARCHIVES / ASSOCIATION DES CARTOTHÈQUES ET ARCHIVES CARTOGRAPHIQUES DU CANADA

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ON THE COVER...

Plan of the City and Liberties of Kingston. Thomas Fraser Gibbs, 1850

Reproduced from an original from an engraving in the Special Collections, Douglas Library, Queen's University, Kingston, Ontario.

ACML Facsimile Map Series. Map No. 137 (ISSN 0827-8024).

PRESIDENT'S MESSAGE

By the time we receive this issue of the Bulletin, we shall have all survived another fall term and be looking forward to the new year. Expect to hear from the Executive Board regarding issues raised at the AGM in the coming months, including an update on the Copyright Task Force, travel funding, and conference planning. Also among matters for consideration are whether or not to join the new organization GeoAlliance Canada and/or the newly re-designed Canadian Libraries Association. The former has been on our radar for some time, and was discussed at the AGM this past June in Ottawa. The latter was recently presented to us in the form of an invitation to participate in a survey [for organizations] from CLA. They are soliciting feedback from current members and potential new organizational members. We shall keep the membership apprised of both situations.

Bulletin Special Issue
Don't forget about the special, peer-reviewed edition of the Bulletin. The deadline for manuscript submissions is January 15, 2016. Please submit your manuscript, in either French or English, together with a short bio-bibliography (including the paper's title, the author's name, institutional affiliation, mailing address, and email address) to deena.yanofsky@mcgill.ca.

The editors are also still accepting interest from members who would like to volunteer to be peer-reviewers.

Carto 2016
Mark your calendars and start watching for seat sales! The 50th annual conference and annual general meeting of the Association of Canadian Libraries and Archives will be in Fredericton, New Brunswick, June 14th – 17th, 2016. Staff at the University of New Brunswick and Provincial Archives of New Brunswick are excited to welcome ACMLA to Fredericton for the first time since 1984. The Program Committee (programme@acmla-acacc.ca) and the Local Arrangements Committee (carto2016@acmla-acacc.ca) seek volunteers.

See you in Fredericton.

Siobhan Hanratty

3D PRINTING TOPOGRAPHIC DATA: AN INTRODUCTION AND TECHNIQUE

Tomasz Mrozewski
Laurentian University

INTRODUCTION

This paper documents ongoing research into the application of 3D printing processes to GIS data. As 3D printing becomes more accessible to a broad audience, its application to GIS data is being investigated by industry, academia and amateur Makers. This paper will outline a technique for converting contour lines into a digital, printable 3D models using ArcGIS and Rhino software; other methods will also be briefly discussed. The end goal of this research is to develop a set of easy-to-follow guidelines for replicating this process in the context of an academic library, drawing on the author's own experiences.

BACKGROUND

The genesis of this project was a reference question received in August, 2014. A faculty member in Laurentian University's Outdoor Adventure Leadership sought printed 3D maps as an experiment in novel learning objects for use in the program's field trips. Without a clear sense of what they might be, the faculty member was excited by the prospect of knowledge discovery that might emerge from visualizing terrain in a new way. The faculty member also provided proof that other individuals and organizations were already able to create 3D prints of topographic data, including a service of the Geospatial Information Authority of Japan[1] and a post on the MatterHackers website[2].

ELEMENTS OF A 3D MODEL

Before giving specific details about the technique, I shall define terms and discuss the elements of model-making in general terms to contextualize the steps in the process.

Throughout the paper I have tried to distinguish between *digital models* and *printed models*. The bulk of the paper concerns the creation of printable, digital models. Once a digital model is fully and successfully created, printed models will easily follow.

I propose that there are five key elements in converting GIS data into printed model.

1. Elevation data
2. Terrain mesh
3. Sidewalls and base
4. STL conversion
5. Printing

Elevation data for an area may come in vector contour line or raster DEM format. Possible sources for elevation data for Canada covering my AoI include the Ontario Base Map (OBM) series, the National Topographic Series (NTS) and Shuttle Radar Tomography Mission (SRTM).

A *mesh* (also called a polygon mesh) is "a collection of vertices, edges, and faces that describe the shape of a 3D object."[3] *By terrain mesh*, I mean the terrain modeled from the elevation data, represented as a contiguous set of planes in 3D space. ArcGIS users will have encountered terrain meshes by creating triangulated irregular networks (TINs) from contour lines, or by visualizing elevation from the surfaces of a DEM in ArcScene.

In order to print, a digital model must form a watertight solid – that is to say, that it fully encloses a volume of space with no holes. Although extended in 3D space, a mesh has no thickness and is not a

[1] Geospatial Information Authority of Japan. Retrieved from http://cyberjapandata.gsi.go.jp/3d/index.html on July 16, 2015.

[2] Smith, Roy. "How to 3D Print a Map of Anywhere in the World". Retrieved from http://www.matterhackers.com/news/how-to-3d-print-a-map-of-anywhere-in-the-world on July 16, 2015

[3] "What is a Mesh?" From *Blender 3D: Noob to Pro*. Wikibooks, 2014. Retrieved from https://en.wikibooks.org/wiki/Blender_3D:_Noob_to_Pro/What_is_a_Mesh%3F on July 24, 2015.

printable solid. To create a printable object, the terrain mesh must be given sidewalls and a base to stand on. The *sidewalls* and *base* are also mesh surfaces which join with the terrain mesh to form a shell. If the shell is not watertight, 3D printing software cannot process and will not print the model.

Up to this stage, the digital model may be created in a variety of file formats. For printing, however, it requires *conversion* to STL format. STL (for "stereolithography") appears to be the most widely accepted format for 3D models by printers, although it appears that some printers are able to take models in other formats such as OBJ. It is beyond the scope of this paper to consider the viability or desirability of non-STL formats for printing.

It is also prudent to double-check an STL model for watertightness before printing to ensure that it is properly handled by the printer and printer software. You may wish to do this with an application separate from the one used to create the STL to ensure that there is no glitch or idiosyncrasy in the STL conversion.

Finally, I consider *printing* to begin with importing an STL model into the printer software, and to end with the completion of the print. Scaling a model to the printer bed and orientation of the print are handled here.

CONVERTING CONTOUR LINES TO A PRINTABLE MODEL

On the basis of my research to date, I propose that there are three major alternative techniques for converting GIS data into a printable model:

1. Contour line to STL
2. DEM to STL
3. terrain2stl

I have found the first of these techniques – converting contour lines to a printable STL file – to be the most successful in creating a detailed representation of a landscape. I believe that the TIN best represents the sloping aspects of AoI at the scale requested by the faculty member who requested the prints. I also believe that this technique is the most novel contribution of this paper, although this novelty lies in linking pre-existing techniques in GIS and 3D modeling rather than in any net new innovation.

Contour line to STL

I chose OBM contour lines as my elevation data, sourced from the OGDE FTP server hosted by University of Toronto. The OBM provides contours at 10m intervals for the AoI. The AoI overlaps several OBM tiles, which were stitched together in ArcMap[4] using the Merge function. Then, a polygon shapefile was created for the bounds of the AoI and used to Clip the contour lines.

The terrain mesh was created in ArcScene. The clipped contour lines were imported and converted to TIN with following parameters:

- Height Field = Z_VALUES
- SF Type = Hard Line
- Constrained Delauney = checked

Z_VALUES is the name of the variable containing the contour lines' altitude in the OBM dataset; when using non-OBM datasets, choose the appropriate variable. The Hard Line designation is required to render the TIN properly. Checking the Constrained Delauney variable means that neighbouring triangles in the TIN share a single edge between them rather than two, parallel edges, which ensures that the resulting model will be watertight.

Creating the TIN may become more complicated where the AoI is bounded on one or more sides by water, as it is in the case of the AoI requested by the researcher. It may be desirable to extend a polyline outwards from land if one wishes to represent the water feature in the model. If this is not done, the edge of the TIN will more or less follow the shoreline (see figure 1). To retain a rectangular footprint, a polyline feature must be created from the edges of the shoreline into the water. It should follow the boundaries of the AoI polygon, completing the rectangular shape on the edges(s) bordered by water (see figure 2). Once the polyline is drawn, edit the Attribute Table for the feature and Add Field to create an altitude field where the value is equal to the altitude of the shoreline in the contour line dataset. This feature must then be merged with the contour lines and a new variable created which is equal to

[4]All ArcGIS operations performed with ArcGIS for Desktop 10.1.

Z_VALUES plus the height of the new water feature[5]. The Height Field of the TIN, then, should be this new variable instead of Z_VALUES. Before exporting the model, it is also possible to "cheat" part of the sidewall when creating the TIN. The benefit of this option is that it ensures that the output TIN has a fully rectangular shape, which is easier to match to a base in 3D modeling software. As was described above with respect to modeling AoIs bounded by water, edges of the TIN will not be perfectly squared if the contour lines do not extend right to the edge of AoI.

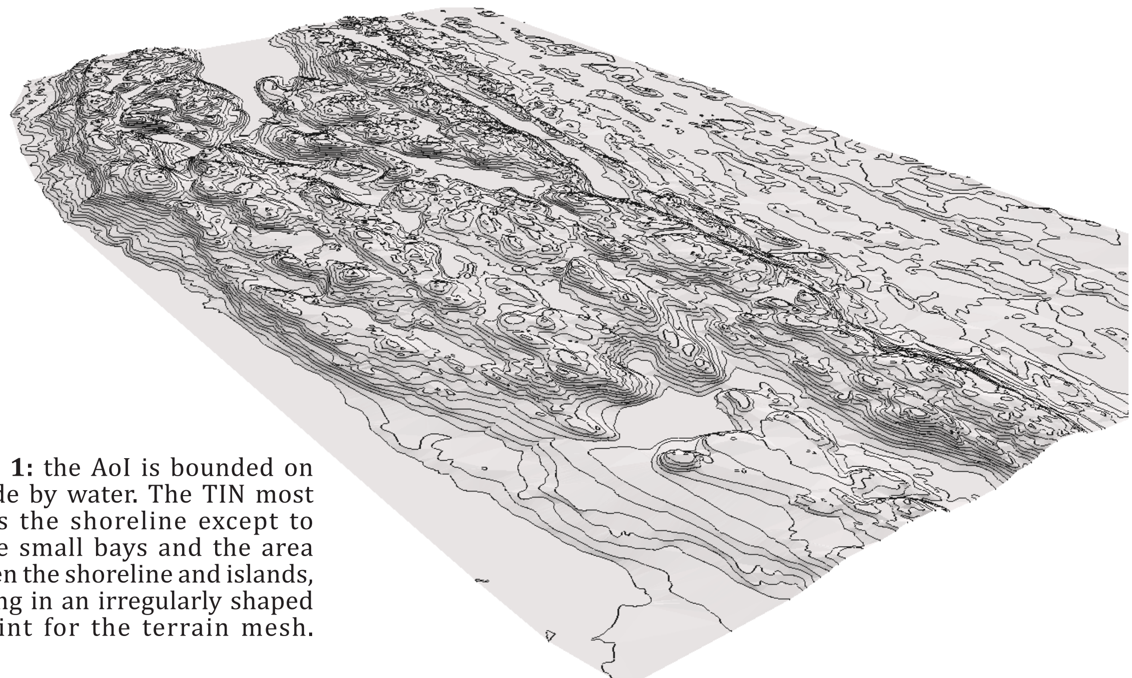


Figure 1: the AoI is bounded on one side by water. The TIN most follows the shoreline except to enclose small bays and the area between the shoreline and islands, resulting in an irregularly shaped footprint for the terrain mesh.

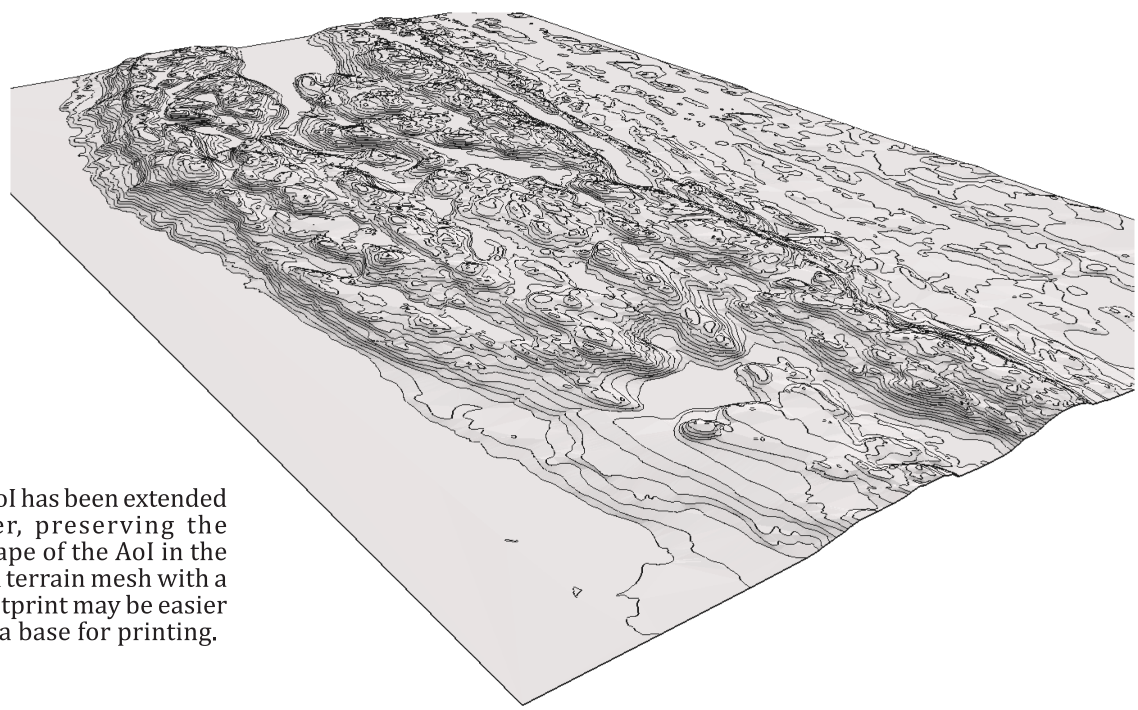


Figure 2: the AoI has been extended into the water, preserving the rectangular shape of the AoI in the terrain mesh. A terrain mesh with a rectangular footprint may be easier to mount onto a base for printing.

[5]For this new value to calculate properly, I found it necessary to export the merged feature class as a shapefile and then to calculate the final height field in the shapefile. The reason for this is that the output of the Merge function is a feature class in the geodatabase which place <null> values in each variable of the output feature class that is not shared by both input datasets. When attempting to calculate a new field by adding a number to a <null> value, the resulting value is also <null>. However, when the output feature class is exported as a shapefile, the <null> values are converted to 0. This allows the height fields of the contour lines and the water feature to be added in the new field without causing an error.

This will especially be a problem at the corners of the AoI, which will likely clip to the nearest contour line. To resolve this issue, create a polyline slightly larger than the AoI, which will become set the bounds of the output TIN. Assign a height value as low as or lower than the lowest contour line that meets the edge of AoI. The polyline feature will then be merged with the contour line dataset, as per the previous paragraph. The boundary polyline must be slightly larger than the AoI footprint to properly create the TIN because ArcScene's TIN creation function does not appear to be able to interpolate the vertical slope from the boundary polyline to the edges of the contour lines. The only downside I have found with this process is that the edges of the resulting model may show somewhat odd-looking sidewall artefacts.

Once a TIN is created, it can be exported as a VRML file using the Export Scene feature. At this point, the terrain mesh can be edited in 3D modeling software and given sidewalls and base.

The next step is to complete the shape of the model by adding sidewalls (if applicable), a base and converting to STL. These steps may be completed in 3D modeling software; for this project, I have chosen Rhinoceros software (also known as "Rhino"[6]. Note that 3D modeling software varies: everything from the mathematical modeling of the objects to the naturalism of the concepts to the names of the operations may vary from one to the next. I strongly recommend reading the documentation for your application of choice and completing tutorials on at least the most basic interactions.

In Rhino, the VRML TIN is treated as a mesh object. This is important because, by default, Rhino models 3D objects as NURBS (non-linear uniform rational b-splines)[7], so all manipulations to the model must be performed using the Mesh Tools toolset rather than the default toolset. Mesh objects cannot be converted to NURBs.

To create a base, use the Mesh Plane tool to draw a polygon that matches the footprint of the AoI, offset below it. Then, to create the sidewalls between the terrain mesh at the base, use the Single Mesh Plane to connect the corner vertices of the base with those of the terrain, or to connect the edges of the base with the edges of the terrain.

Although simple in principle, I found working in Rhino to be quite challenging in practice due to the specialized interface. Users with more experience in modeling or users of different software may find the process much simpler. For novices, I strongly recommending reading the manual and completing tutorials on basic interactions, if available, before attempting to manipulate models.

Once the sidewalls and base have been added, the model can be converted to STL by using Save As or Export Selected and selecting the file format; the two operations appear to be identical in Rhino.

Before printing the STL file, it is strongly recommended that the model be checked for watertightness. Holes in STL meshes may be undetectable to the naked eye, especially in large and complex models such as any landscape is bound to be. They may also be caused by reversed mesh faces, which may occur with software such as SketchUp. Alternatives include netFabb Basic (the free version of netFabb software that runs on desktop) and the Microsoft 3D Model Repair Service (a free, web-based service that runs netFabb software)[8]. Both netFabb Basic and the Model Repair Service will identify and automatically correct most holes in STL models.

Finally, the STL model can be imported into the 3D printer's native software. At this stage, the model may be scaled and oriented to the printer bed, if required. When modeling and printing terrain with relatively small changes in altitude, where low grade slopes challenge the minimum vertical resolution of the printer, it may be preferable to rotate the model 90° to print it standing on

[6]All Rhino operations performed with Rhinoceros 5 (64-bit) for PC.

[7]*Rhinoceros 5: User's Guide For Windows*. Robert McNeel & Associates, 2014. Retrieved from http://www.rhino3d.com/download/rhino/5.0/UsersGuide/ on July 24, 2015.

[8]3D Model Repair Service: https://netfabb.azurewebsites.net/ (retrieved on July 24, 2015).

the sidewall edge, rather than flat on the base[9].

Other methods: Working from DEMs and Terrain2stl
DEMs may also be used as source elevation data. A 2D DEM may be converted into a 3D shape by using ArcScene, exported and then treated according to the technique described above. Some 3D modeling software can directly convert a 2D DEM; Rhino, for example, has a tool called Heightfield from Image which will convert a DEM into a mesh[10]. Similarly, Global Mapper[11] GIS software can convert a DEM into an STL file. It has been beyond the scope of this project thus far to investigate any of these methods in detail.

Another interesting and convenient method for creating STL models is the Terrain2stl web app[12] and script[13] developed by Thatcher Chamberlain. Terrain2stl uses a Google Maps interface and a movable, sizable focal box to select an AoI. Once the AoI is selected, the user clicks Create STL File and then Download, which provides a fully watertight and printable model for printing. Terrain2stl works by querying the SRTM DEM dataset corresponding to the AoI, creating a vertex for every square in the DEM, joining each vertex with its neighbour on four sides and filling the space with a mesh surface, and then creating the base and sidewalls.

Despite its ease of use, Terrain2stl is not ideal for more precise work. Since is uses 3 arcsecond SRTM data, the resolution is significantly lower than with many openly accessible data sets, such as OBM contour lines and DEMs. The predefined shape of the AoI means that the output STL file may need to be trimmed in modeling software. There is also a built-in 300% vertical exaggeration in the script that may need to be scaled down if required. However, for lower-fidelity projects the application may be ideal.

Printing and results

I successfully created prints of my AoI by using the contour to STL conversion procedure described above and with Terrain2stl. I created test prints from both techniques in base-down and in sidewall-down orientations for comparison's sake. I found that using the contour to STL technique and printing on edge produced the most highly detailed. Unfortunately for purposes of this publication, it is difficult to photograph the monochromatic plastic prints in sufficient detail to warrant inclusion of illustrations.

I printed models on a commercial-grade Stratasys Dimension 1200 and a consumer-grade MakerBot Replicator Mini. Printers may vary in print size, consistency, resolution, and filling algorithm. Comparing prints of the same size from the same model from the Dimension 1200 and the Replicator Mini, it appears that the two printers handle long, gradual slopes differently. However, due the small size and small number of comparable prints, it is difficult to be more specific or to generalize.

As noted above, printing the model on its end rather than on its base resulted in a better rendering of the terrain. However, it also resulted in small blips in places where it appears that an extra blob of extruded filament had accumulated.

At time of writing, the printed models have yet to be presented to the faculty member who commissioned them. Should he decide to use them as learning objects, follow-up will be required to determine how useful the prints are and whether or not any novel forms of knowledge discovery have emerged.

Software choices

GIS
I used ArcGIS software for this project because of its accessibility through the university's Esri site license. Although ArcGIS is widely used easily accessible in many universities, I am interested in exploring the use of free GIS software – namely, QGIS – to develop a procedure accessible outside of the university context.

3D modeling
I chose Rhino for several reasons. It is a full-featured modeling platform, sufficiently powerful to handle the complexity of the terrain mesh, well-documented

[9]Credit is due to Greg Lakanen, Engineering technologist at Laurentian University, for suggesting this solution.

[10]I have found this to be only intermittently successful; however, I have not systematically investigated the reason for this or the parameters required for successful conversion.

[11]Global Mapper 16 for PC.

[12]Terrain2stl: http://jthatch.com/terrain2stl/ (retrieved on July 23, 2015).

[13]Code available on Github: https://github.com/ThatcherC/Terrain2STL (retrieved on July 23, 2015).

with good customer service, and is available through an affordable and flexible single-seat academic license with a 90-day trial period. The quality of documentation is especially important for users like myself with virtually no experience of 3D modeling. Unfortunately, the learning curve is fairly steep and, outside of the trial period, the software is not free.

I chose Rhino after failures to successfully create the digital models with SketchUp and Blender, both of which are free. SketchUp is a popular modeling program that is very easy to use due its more naturalistic – and, therefore, easier to learn – toolsets. It was designed for a broad audience and was owned by Google from 2006 to 2012[14], which may have contributed to its popularity. However, it suffered from major flaws when handling complex terrain models: it was slow and underpowered, sometimes requiring hours to complete certain processes or crashing entirely; user interface issues made it impossible to determine whether the application was processing or had crashed; STL output was often seriously flawed beyond the repair of netFabb or the Model Repair Service. I was unable to overcome these issues with the help of the fantastic SketchUp user community[15]. I encountered these issues using both the trial Pro editions and the free Make editions of the software[16].

The free, open-source Blender software proved to have difficulty handling the scale of TINs output from ArcScene and has an extremely high learning curve, so I abandoned it early in the research process. However, I was able to successfully convert TINs from VRML into SketchUp-compatible formats using Blender, even while being unable to properly display them. If the display and scaling issue could be addressed, I believe that Blender would be the best candidate for modeling in a completely free environment in conjunction with QGIS.

Future directions

My first priority is to develop techniques and step-by-step procedures for creating 3D models using entirely free datasets and software such as QGIS and Blender. I believe that opening the process up to a general public will be the surest way of discovering applications.

While the idea of 3D printing GIS data is novel and interesting, I do have doubts about its widespread utility. It is currently unclear to me that there are many situations in which the printed model is clearly more useful than a digital 3D model or even a topographic map. Due to the relatively low resolution of openly accessible elevation datasets, it is difficult to precisely model small areas. This limits its usefulness for purposes such as site planning, although this could be addressed by acquiring higher resolution terrain data.

A faculty member from the Laurentian School of Architecture has expressed interest using the technique I have developed to have students create models of the Sudbury Basin. For a sufficiently large printed model we will need to experiment with tiling the digital model – most printers have bed around 10” by 10” by 10” – and fitting the printed tiles together. It will be interesting to see how consistent printer output is and how well the tiles fit together. I suspect that architectural site modeling will also be one of the major applications of the conversion and printing technique described in this paper.

Several mining researchers and professionals with whom I have spoken expressed interest in creating models of mine shafts from 3D point clouds to aid high-level decision making, their belief being that the physical object may inspire knowledge discovery and discussion. In this case, it will be necessary to develop a new techniques for converting point cloud or structure from motion (SfM) data into a 3D model; in principle, this should not be difficult.

Conclusion

This research project, though not yet complete, has demonstrated that it is possible to convert contour line data into a 3D printable model of terrain. It also seeks to create a series of step-by-step instructions for doing so, using entirely free software if possible; this has yet to be accomplished. Finally, this project continues to seek and evaluate uses for the printing techniques in academic and other environments.

[14]“A Little SketchUp History.” Retrieved from https://www.sketchupschool.com/sketchup on July 23, 2015.

[15]Most notably on Reddit (https://www.reddit.com/r/Sketchup/) and SketchUcation (http://sketchucation.com/).

[16]Versions used throughout the project include SketchUp Pro 2014 and 2015, and SketchUp Make 2014 and 2015; no significant differences were encountered between any of these.

MEMORIES OF MCMASTER'S MAP COLLECTION

For the 50th Anniversary of the Lloyd Reeds Map Collection
17 November 2015

Cathy Moulder

The Map Collection came into my life in 1986. I had been working for 15 years in a little special library in the Geography Department, the Urban Documentation Centre, under the direction of Les King. That collection was to be amalgamated with the University Library and at the same time Kate Donkin and her library assistant Betty Kellett were scheduled to retire. I can remember my joy and excitement at being offered the assignment. I didn't know anything about maps. But I was young and believed that a good special librarian should be able to manage any format of information.

Kate Donkin was a remarkable individual. She smoked heavily, wrote clever comic songs, and liked a little scotch for her lunch. She was probably the most completely 'right brain dominant' person I've ever met – creative, artistic, intuitive. Her botanical paintings in watercolour are precise and beautiful, and I treasure two of them. And she was passionate about maps. We spent six rich months as teacher and student, while she patiently indoctrinated a hopelessly left brain newbie. She drew little pictures to explain the wonders of geomorphology and map-making. She explained the politics of many things in the worlds of academia, librarianship, cartography and employment. She was a remarkably generous mentor and taught me far more than she realized. As the years passed and her foundations stayed strong, I came to respect her ever more. McMaster owes her resounding thanks for the depth and strengths of its Map Collection – the excellent Canadian historical collections and the thorough world map and atlas coverages are the direct result of Kate's expertise and good stewardship.

One of the perennially fascinating challenges in the world of map libraries is the struggle to achieve access and bibliographic control – the catalogue. McMaster enjoyed its moment of glory in this area very early in the history of the Map Collection. In the late sixties, Kate worked with Michael Goodchild to develop the very first automated map retrieval system. Mike went on to become quite a famous geography professor, respected for his work with geographic information systems, but at that time he was still just a grad student interested in computers. Their innovative map catalogue was based on 90 character IBM punchcards and unfortunately never survived the eventual migration from mainframe computers to modern databases. But it is renowned in the library literature as the precursor to MARC for Maps, the Anglo-American cataloging rules still in use today.

McMaster's Map Collection had many other moments of innovation and leadership over the years. It was one of the first map libraries to embrace geographic information systems and develop library services to accommodate this new way of storing and delivering geographic information. It was one of the first to use markup language and Google Maps as tools to provide access to our collections. It was on the leading edge in the evolving role of the university library in teaching partnerships with faculty, a precursor to the eventual liaison librarian model. It was always an early adopter with new technologies: the earliest desktop computer, illustrated and eventually animated and automated instructions, wikis for student assignments, web-based databases for rare and military maps, digitization. It was an emulated model in other areas of librarianship too: expectation- and task-based training for our student assistants, pro-active (rather than service desk based) reference service, collocation of both map and atlas resources by geographic area despite the vagaries of the Library of Congress classification.

But what I remember even more vividly than the innovations and accomplishments are the people. McMaster's Map Collection has been blessed with individuals who have stretched themselves, overcome funding, staffing, technological challenges and administrative hurdles, dealt cheerfully with endlessly repetitive student needs, faced bravely a seemingly insurmountable workload. And somehow the team still managed to maintain a solid reputation for good public service and accomplish projects way above and beyond the ordinary.

During my 25 years in the Map Collection, I worked with two remarkable library assistants: Afton Beaton and Gord Beck. Afton was a soft-spoken Wonder Woman, an iron hand in a velvet glove. I admired her enormously for her resilience and determination, her capable management of all office tasks, her easy way of relating with students. The Map Collection benefited from her interest in historical maps and her efforts to organize and inventory these.

In the early years, there were also some part-timers in the Map Collection. I remember Marion West for her sense of humour, especially as she learned to use our first computer and struggled to tattle-tape the oversized atlas collection. I remember Alexandra Grobelna for her gifts of language; she organized all the Polish and Russian maps. I remember Josie Picone; she was a too brief godsend when we moved the Map Collection from General Sciences to Mills Library. Occasionally, we would be fortunate enough to have the loan of a staff member from another department for a special project. I remember Peggy Findlay who painstakingly organized and classified all the American geology maps. I remember Diane Wales and Lorna Turcotte who worked diligently on the rare map descriptions. I remember the amazing display they presented on their favourite rare map treasures for the audience of a Lager Lecture. I remember Lorna's bloodhound research skills and her excitement when she found any tidbit on our elusive map collector and spy, Robert Clifford. And of course we had many many great student assistants who helped their peers and also helped us to accomplish so many worthy projects.

In the Trzeciak years, the Map Collection was blessed with a new and wonderful category of staff members, the catalogers: Silvia Halfon, Doris Forget and Margaret Rutten. Sadly I didn't get to work nearly long enough with any one of them. Each was unique and special, and yet every one was devoted to providing the best access possible to our collections and the best catalogue possible for our researchers. They were a godsend after years of limited access and bibliographic control, and the cataloging of the Map Collection finally surged forward. I sincerely hope that they could feel how greatly their work was valued and respected in this department.

And finally my dear library assistant, now titled Map Specialist, who is Gord. Words are not enough to express my admiration for Gord and his achievements. He also came to the Map Collection with little preparation. He has grown and stretched and learned beyond all measure, and is a most remarkable self-made man. Gord has a deep public service ethic and loves teaching others what he has learned. He morphed his personal interest in military history into a special database project for a small collection of World War I trench maps. He persisted at that access tool for years when the prospects for any online exposure or digitization money were dim. All the while, he added to his personal knowledge until he has developed a nationally acknowledged expertise in the area of WWI cartography. When Gord first started in the Map Collection, our supervisor Dave Cook came in once to warn him that I had High Expectations. I was always puzzled by that. Obviously Gord is capable of achieving far more than I ever would or could dream of expecting. He has never been limited by High Expectations!

I remember moving the Map Collection three times, each move a masterpiece of logistics and teamwork. I remember a beautiful rare map display created in pretty short order for a library donor event, another superb piece of teamwork, and Mr. Hill's incredulity when he heard that our colleague at New York Public Library had been working on a rare map display for four years. I remember working with some wonderful faculty members, always learning as well as teaching. I choose to forget the grueling hours of repetitive instruction, but am happy to remember the collaborations, the perennial concern for our students' learning experiences and even the cheesy music for the bell-ringer assignments. I am proud to remember the dedication and public service ethic of the Map Collection team and am so blessed to have been a part of this great group of people.

Please give my regards to all who also remember the Map Collection fondly.

Cathy Moulder

Curator, Lloyd Reeds Map Library and Urban Documentation Centre (1986-1992)
Curator, Lloyd Reeds Map Collection (1993-2006)
Director of Library Services, Maps, Data and GIS (2007-2011)

THE CENTRE FOR RUPERT'S LAND STUDIES : COLLOQUIUM AND MAP WORKSHOP

David Malaher

Centre for Rupert's Land Studies

The Centre for Rupert's Land Studies at the University of Winnipeg facilitates scholarly research and publishing concerning the human history of the Hudson Bay watershed, known in the period from 1670-1870 as Rupert's Land.

"Rupert's Land" was the name given to the Hudson Bay watershed by King Charles II of Great Britain and Ireland in 1670. At the time, he had no idea that this encompassed about 3,861,400 square kilometers (1,490,900 square miles). English merchants and explorers only had a sketchy knowledge of the Hudson Bay coastline and almost no concrete data on the areas draining into that body of water. In terms of modern geo-political boundaries, Rupert's Land covered northern Quebec, northern Ontario, much of the three prairie provinces, and most of southern Nunavut. It also included parts of Montana, Minnesota, and North and South Dakota.

The Centre hosts biennial colloquiums, publishes The Rupert's Land Newsletter, promotes awareness of the Hudson's Bay Company Archives in Winnipeg, and co-publishes, with McGill-Queen's University Press, a series of documentary volumes on aspects of the history of Rupert's Land. The Centre for Rupert's Land Studies also functions as a clearinghouse to assist researchers with similar interests to be in touch with each other, to communicate about their research projects and findings, and to assist researchers from out of town by putting them in touch with qualified local assistants or by providing a congenial meeting spot when visiting Winnipeg.

Cartography of the Hudson's Bay Company

The Governor and Committee of the Company of Adventurers of England trading into Hudsons Bay" were major contributors to the mapping of Canada and the Northwest Pacific region of the United States. In two centuries, 1670 to 1870, they geographically defined and measured, and cartographically depicted the larger share of the territory of our nation.

In effect, the Hudson's Bay Company was our first national mapping agency. Exploration, surveying, and mapping became vital elements of the company's trading enterprise. These basic "tools of the trade" were part of the training and daily life of many of its servants, significant cost entries in its financial ledgers, and fundamental requirements for the successful capture and management of its market area.*

** Opening lines in the foreword by Richard I. Ruggles in his outstanding work, A Country So Interesting. McGill Queens University Press, 1991.*

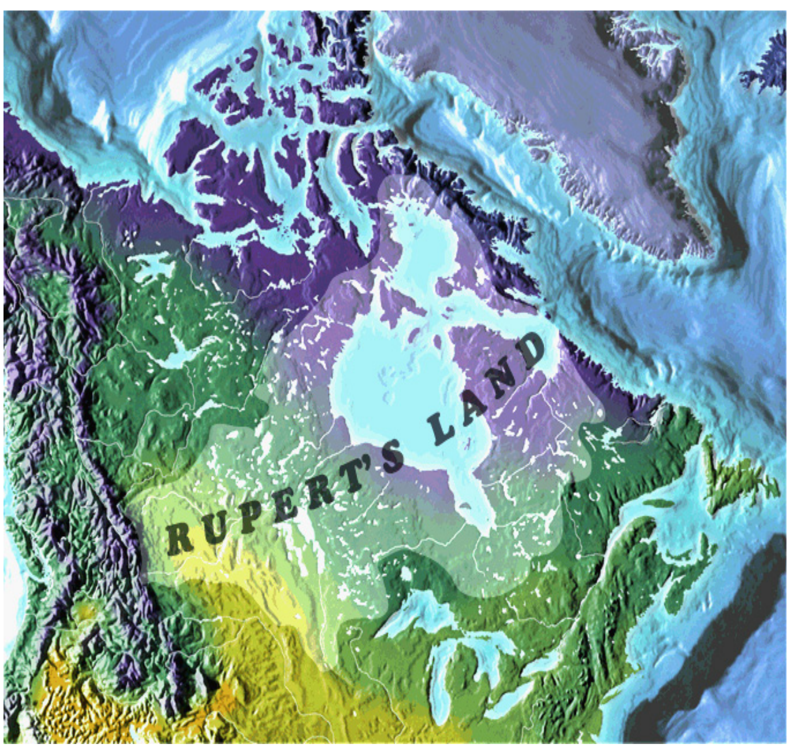


Image by Weldon Hiebert, Geography Department, University of Winnipeg
Map Base by Mountain High Maps

"A Country So Interesting"

In his book of this tile, Richard Ruggles discusses the HBCA map collection in general and several hundred maps in detail as well as presenting plates of 66 selected maps. He reports that there are, in the Hudson Bay Company Archives in Winnipeg, 581 manuscript maps originating between 1670 and 1870. There are also 557 segmental sketches in the HBCA of a similar origin. The list goes on to account for additional plans, charts, printed products, post-1870 manuscript maps, uncatalogued maps and recorded but lost maps amounting to 5,390 documents.

Altogether this is a remarkable collection of Canadian history in graphical format. The work was accomplished by 206 people, at least, including 34 Natives Persons by Ruggles' count. Naturally, the styles of mapping were varied and the quality of drafting ranges from free-hand sketches to very fine. Sizes ranged from as small as 6 cm square upward to a grand 9 sheet map 93 cm x 259 cm by Philip Turnor in 1794. Typical examples are around 30 to 60 cm.

These maps and their related journals, letters and other documents provide researchers at the HBCA with a wonderful resource. The opportunity is there to see different projections of map, different art styles in the drafting, and different geographical features that interested each map maker at the time of creating their cartography.

Map Analysis Workshop for the Historian, May 18, 2016

History projects involving territory within Rupert's Land, on topics that may have little direct bearing on the fur trade, can make use of the HBCA collection. The results can be illuminating and unexpected. To help with recording information from HBCA maps, the Workshop attached to the Colloquium in May, 2016, will use examples from the HBCA collection, actually from Ruggle's book, to demonstrate various characteristics that are present not only in the collection but also in maps made by other surveyors and map makers in that time period. In these historical maps it is good to have certain known landmarks in mind for comparison.

The Centre for Rupert's Land Studies recognizes that the term "Rupert's Land" is a colonial term, imposed by outsiders who at the time had little knowledge of the area or its people. However, Rupert's Land was a more complex political and social entity than may at first appear, and the term highlights the potential flexibility of seemingly straightforward geographical and political labels. The power that individuals and communities have for adapting old uses and meanings, and for creating new ones, strongly suggest that the Hudson Bay watershed – however labeled – can be viewed from multiple perspectives.

Why was King Charles interested in this territory?

He was granting a royal charter to a new company of socially well-connected merchants: the Governor and Company of Adventurers of England Trading into Hudson's Bay, or the Hudson's Bay Company for short. He named them "true and absolute Lords and Proprietors" of the land, and granted them "the sole Trade and Commerce" within Rupert's Land. The Company's territories were named after their first Governor, the King's cousin, Prince Rupert.

The royal charter did not apply to any parts of Rupert's Land "actually possessed" by "any other Christian Prince or State," but made no mention of the many First Nations who actually held sovereignty within the territory. At the time, the Hudson's Bay Company's actual claim to the land was limited to small sites for trading posts and safe passage between those posts. Nearly two centuries later, however, in the 1860s, the issue became more contentious as the HBC negotiated the sale of this territory to the emerging Dominion of Canada without consulting the First Nations or Metis communities who held Aboriginal land title.

Rupert's Land Record Society

One of the Centre's most important activities is publishing, in affiliation with McGill-Queen's University Press, the Rupert's Land Record Society volumes, a series of documentary publications on the fur trade and Native history of Rupert's Land. Some volumes are available in limited quantities from the Centre for Rupert's Land Studies, at a special price to Centre members.

We also hold for sale a small stock of Hudson's Bay Record Society and Rupert's Land Research Centre publications. We also make accessible papers from past Colloquiums, including the Papers of the 1994 Rupert's Land Colloquium, edited by Ian MacLaren, Michael Payne and Heather Rollason. See our book order page for details.

- Algonquian Conference Papers
- Member Publications
- Sample Books Available
- Publications & Hudson's Bay Record Society Books Order Form [PDF]

Fur Trade History Sources

Canadiana.org is a membership alliance dedicated to building Canada's digital preservation infrastructure and providing the broadest possible access to Canadian documentary heritage. The organizations works closely with major memory institutions to identify, catalogue, digitize and store documentary heritage—books, newspapers, periodicals, images and nationally-significant archival materials—in specialized research databases. There are a number of online collections currently available including Department of Foreign Affairs, Early Canadian Periodicals, and Health and Medicine. Their website also has several links to other resources and institutions.

Nametau innu: Memory and knowledge of Nitassinan is a website dedicated to the Innu nation in which elders pass on their skills and knowledge to younger generations.

Statistics Canada: Canada Year Book Historical Collection

CBC Archives

The Champlain Society Digital Collection contains almost 50,000 digitized pages of original documents dealing with early white explorers in Canada.

France in America is a bilingual digital library of documents from the Library of Congress and the Bibliothèque nationale de France which explores the history of the French in North America from the 17thto the 19th century.

Fur Trade Family History is Nancy Marguerite Anderson's blog about her family's fur trade history.

Fur Trade Stories is a unique presentation of primary and secondary resources found in the collections of Canada's National History Society, HBCA - Archives of Manitoba, The Manitoba Museum, Parks Canada and several First Nations communities.

Library of Western Fur Trade Historical Source Documents: Diaries, Narratives, and Letters of the Mountain Men. This website contains accounts of the Rocky Mountain fur trade during the first half of the 19th century. Most of these are either primary or secondary historical sources that were transcribed from printed or manuscript form.

Hudson's Bay Company Archives: Winnipeg, MB

Centre du patrimoine - Voyageurs Contracts Database – claims to be the single largest collection of data regarding the contracts signed by men of the Montreal fur trade.

17th Rupert's Land Colloquium

The University of Winnipeg, 18-21 May 2016
On the campus of the University of Winnipeg.

The Centre for Rupert's Land Studies is pleased to announce the call for papers, poster presentations and displays for the Colloquium in 2016. We welcome any submissions related to Aboriginal and fur trade history, legal histories, treaty histories, science and geography, material culture, and gender studies in the vast region of land surrounding all sides of Hudson's Bay once known as Rupert's Land.

The Rupert's Colloquium is a long standing event for researchers and authors to meet for updates on current work-in-process and learn first-hand of the latest topics being studied across Canada and the USA. Visitors and presenters come from Britain, Europe, USA and Canada.

Submissions will be accepted until 1 March 2016.

For more information on the Colloquium, please contact Josephine Sallis
j.sallis-ra@uwinnipeg.ca
Phone 204-786-9003

Map Analysis Workshop for the Historian

Immediately preceding this year's colloquium is a Map Analysis Workshop for the Historian (particularly maps of Rupert's Land from 1670 - 1870), which is being held at the University of Manitoba, Wednesday, 18 May 2016 between 8:15 - 4:15 pm. Topics of the Workshop will include analysis processes for older maps, capabilities of ArcGIS on-line tools, a hands-on study of David Thompson's 1826 map of NW Canada, and aboriginal perspectives on map making.

For more information on the Workshop, please contact Kyle Feenstra
kyle.feenstra@umanitoba.ca

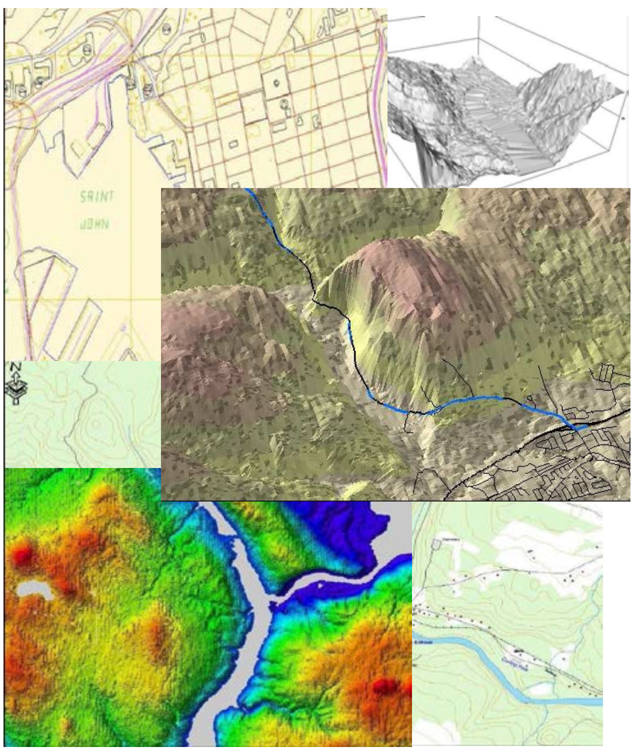
Winnipeg is home to the Hudson's Bay Company Archives, The Manitoba Museum, and the Winnipeg Art Gallery, as well as the Canadian Museum for Human Rights located at the Forks, The National Research Centre for the Truth and Reconciliation commission located at the University of Manitoba, and the new Upper Fort Garry Heritage Park located downtown. Parks Canada welcomes visitors to Lower Fort Garry 35 km north of Winnipeg on the Red River, built under George Simpson's orders in 1830.

Association of Canadian Map Libraries and Archives

Twelfth Annual

ACMLA Student Paper Award

The Association of Canadian Map Libraries and Archives (ACMLA) announces its annual student paper contest. Essays may deal with access to and information about geospatial data, cartography, cartographic materials, map information, map data, GIS data and geo-referenced information.



Eligibility
A student from Canada or studying in Canada currently enrolled in a post-secondary institution (college or university) is eligible to apply to enter the contest. All papers shall be prepared during the 2015-2016 school year.

Essay
The essay shall be original and unpublished, and of no more than 3,000 words. Judging of the papers will give primary consideration to the essay's originality and its contribution to new knowledge and insights. Other considerations will be the author's demonstration of the relevance of the subject, the quality of presentation and documentation, and the literary merits of the essay.

Award
$250.00 and free membership in the Association for one year. The award includes an invitation to present the paper at the ACMLA annual conference, normally held at the end of May/early June. If the winner chooses to attend the conference, the Association will waive registration fees and provide a travel stipend of $250.00.

Deadline: 15 April 2016

Eva Dodsworth, ACMLA Awards Committee,

Geospatial Centre, University of Waterloo Library,

Waterloo, ON N2L 3G1

edodsworth@uwaterloo.ca

Submit a paper to the Contest!

ACMLA AWARDS

The ACMLA Awards Committee is responsible for three awards given by the Association. We invite nominations for these awards and encourage members to participate in the selection of the awards for outstanding accomplishments in our field.

ACMLA Honours Award

The Awards Committee invites nominations for the ACMLA Honours Award. According to the guidelines for the award, the nominee should be a person who has made an outstanding contribution in the field of map/GIS librarianship. The contribution may either be for a specific activity or for general services and contributions such as continued membership in the Association with active participation either as an executive officer, committee chairperson, or committee member. Normally, membership in ACMLA is a prerequisite, however that does not preclude considering outstanding non-members.

- **Deadline : April 15th, 2016**

ACMLA Cathy Moulder Paper Award

To be nominated for the Paper Award, which carries a $200 monetary prize, a feature article by one or more authors consisting of at least three pages in length must have appeared in issues 149-151 of the ACMLA Bulletin.

- **Deadline : April 15th, 2016**

ACMLA Student Paper Award

The Student Paper Award will consist of a prize of $250 and free membership in the Association for one year. The award includes an invitation to present the winning paper at the Annual Conference. The Association will waive registration fees and provide a travel stipent of $250. The award will normally be given on an annual basis to a student from Canada or studying in Canada currently enrolled in a post-secondary institution (college or university). The essay shall be original and unpublished and of no more than 3000 words. Priimary consideration for the award will be given to the essay's originality and its contribution to new knowledge and inight. Other considerations include the author's demonstration of the relevance of the subject, the quality of the presentation and documentation, and the literary merits of the essay.

- **Deadline: April 15th, 2016**

For more information on ACMLA Awards, contact:

Eva Dodsworth
Chair, ACMLA Awards Committee
edodsworth@uwaterloo.ca

GEOSPATIAL DATA AND SOFTWARE REVIEWS

Andrew Nicholson

EarthWorks

Reviewed by Andrew Nicholson
Coordinator of GIS and Research Data Services
University of Toronto Mississauga

https://earthworks.stanford.edu/

In September 2015, this reviewer took the opportunity to attend the annual conference of the Western Association of Map Libraries (WAML), which took place at the ESRI World Headquarters in Redlands, California.

Although several ESRI products and initiatives were featured and discussed at the conference, it was actually a presentation on a non-ESRI resource in particular that stood out for this reviewer. Stace Maples, the Geospatial Manager at Stanford University Libraries presented on "Earthworks", a geospatial data discovery application launched in the spring of 2015 by Stanford University.

With a focus on geospatial data collections housed at Stanford University and other American university and government agency partners, EarthWorks allows access to thousands of datasets, many of which are in the public domain and are available for free download to anyone who visits this new federated geospatial search tool.

Description and Metadata
Earthworks is a web resource made available to the academic community by Stanford University Libraries. Built using Geoblacklight, an open source collaboration platform for disseminating geospatial data, EarthWorks includes a easy to navigate search interface allowing users to do searches by browsing by specific institutional collections, data types, place names, as well as subjects.

Users can also limit their searches by several different facets including Institution, Author, Publisher, Subject, Place, Year, Data Type (Point, Polygon, Line, Raster), and Format. As a Canadian user unaffiliated with an American school, the most important limiter for this reviewer was "Access". For example, a search for Pakistan geospatial data can be performed, and the results limited to "Public" and "Available" which then only displays the data that is available for direct download. Also of note is the map preview window on the right side of the screen, which highlights the geographic extent of geospatial data selected.

Along with geospatial datasets available through Stanford University Library, a visitor to the EarthWorks search interface will also find collection metadata from Harvard University, Tufts University, Columbia University, University of Minnesota, Massachusetts Institute of Technology, University of California-Berkeley, and University of California-Los Angeles. Interestingly, some government agencies have also provided metadata to the EarthWorks project, including the Massachusetts Office of GIS (MassGIS).

At this time, no Canadian partners are included, and the actual Canadian content publicly available is disappointing, although not surprising given the newness of EarthWorks and its focus on assisting American students and researchers. Nevertheless, the EarthWorks collection of international datasets, raster images, and scanned geotiffs still makes it worth a look, especially as the system continues to expand in numbers of data files and data providers.

Although locating geospatial data for direct download is one of the most attractive aspects of EarthWorks, being able to pull up metadata for geospatial collections not available is still a valuable part of the resource. The metadata tells the users which institution holds the data, as well as its publisher and year of creation, allowing the user to contact that institution or publisher directly for possible access (and/or) purchase.

Currency and Formats

EarthWorks features geospatial data in many incarnations from geotiff to shapefiles. Although still a new resource coming online only in the Spring of 2015, EarthWorks holds almost 24,000 files, the earliest of which is from 1750 (a scanned Geotiff map of Tibet, Western China, and Nepal), and the latest includes United States government shapefiles from 2015.

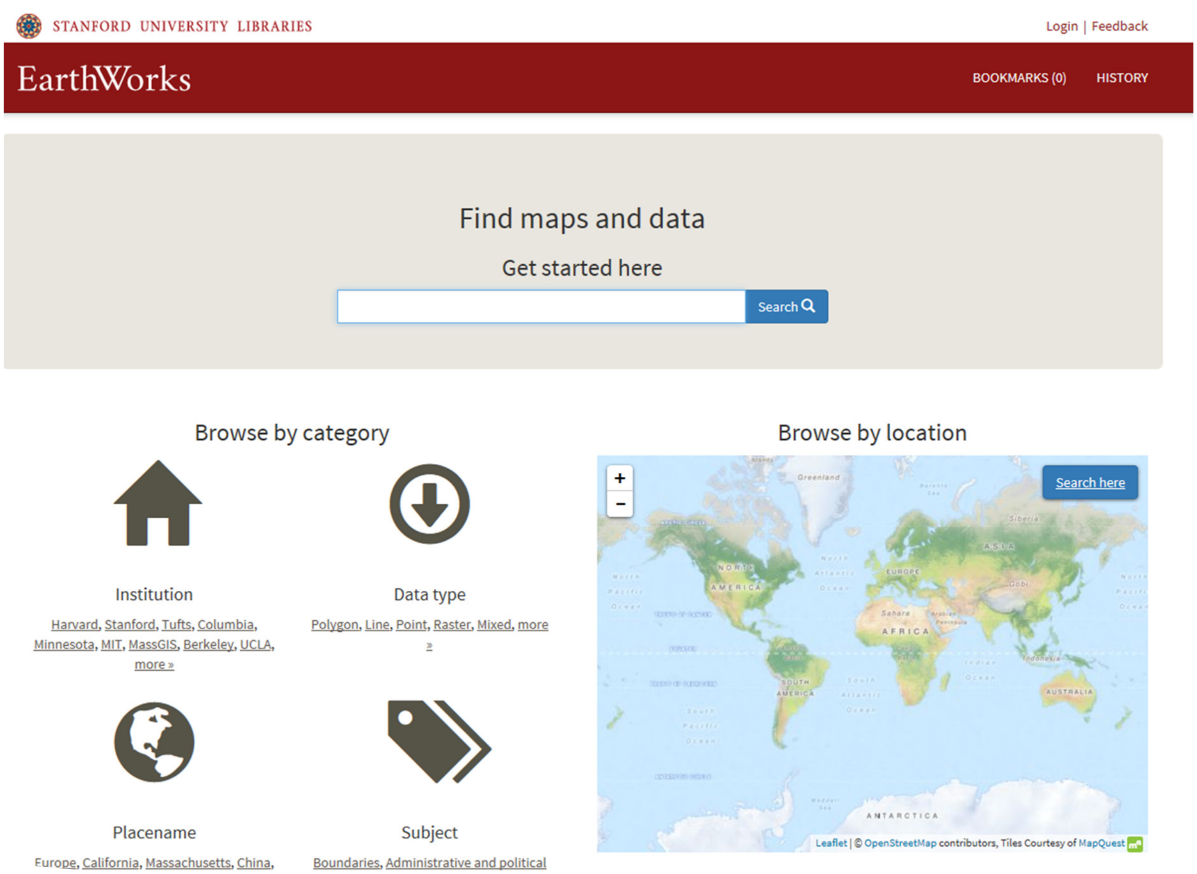
Licensing

Geospatial data found in EarthWorks is subject to the specific licence requirements documented for each record. Fortunately, this information is easily found in the "Use and Reproduction" section on the file collection page and written in layperson's terms rather than legalese. When it comes to the publically available data such as scanned maps, many of the files appear to have Creative Commons licensing permitting reuse and modification as long as credit is given. For other files that are licensed the terms are provided and indicate which institution holds the access and terms.

Conclusion

Although an American resource for American researchers, EarthWorks can nevertheless be a useful resource for Canadians looking for international geospatial data that is in the public domain. As it is still new with datasets and new institutional partners being added regularly, the reviewer recommends EarthWorks as another data resource to be aware of when hunting for hard to find data. If the data you find is not available for download in EarthWorks, information about acquiring the data is provided.

Perhaps the best part of EarthWorks is that the search interface and code are also built on open source code, allowing other Libraries to build their own data catalogues that can be just as easy to use as EarthWorks. The EarthWorks code and other materials can be found here in Github: https://github.com/sul-dlss/earthworks



https://earthworks.stanford.edu/

Dear ACMLA members and colleagues,

On behalf of the ACMLA Executive Group, we are very pleased to announce that the 50th Annual Conference of the Association of Canadian Map Libraries and Archives (ACMLA) will be held from 14-17 June at the University of New Brunswick in Fredericton, NB.

At this time, we invite you to participate in the planning process by becoming a member of either the Program Committee or the Local Arrangements Committee. Members of the Program Committee will work together to plan the theme, sessions and guest speakers for the event, while the Local Arrangements Committee team will organize local preparations and logistics. Both committees will work collaboratively to produce a successful event.

If either (or both) of these groups interests you, we would love to have you as a part of the team. For more information or to join a committee, please contact:
Program Committee: programme@acmla-acacc.ca
Local Arrangements Committee: carto2016@acmla-acacc.ca

Sincerely,

Siobhan Hanratty, President, ACMLA
Jay Brodeur, Vice President Professional Development, ACMLA

****

Chers membres de l'ACACC et collègues,

Au nom du groupe de l'exécutif ACACC, nous sommes très heureux d'annoncer que le 50e colloque annuel de l'Association des cartothèques et archives cartographiques du Canada (ACACC) aura lieu du 14 au 17 juin à l'Université du Nouveau-Brunswick à Fredericton, au Nouveau-Brunswick.

A ce moment, nous vous invitons à participer au processus de planification en devenant un membre du Comité de Programme ou du Comité d'Organisation. Les membres du comité de programme travailleront ensemble pour planifier le thème, les sessions et les conférenciers invités pour l'événement, tandis que les membres du comité d'organisation organiseront les logistiques et les préparations locales. Les deux comités collaboreront afin de produire un événement réussi.

Si un (ou les deux) de ces groupes vous intéressent, nous serions ravis que vous faite partie de l'équipe. Pour plus d'informations ou pour se joindre à un comité, veuillez communiquer avec:
Comité de programme: programme@acmla-acacc.ca
Comité d'organisation: carto2016@acmla-acacc.ca

Cordialement,

Siobhan Hanratty, Président, ACACC
Jay Brodeur, Vice-Président au Développement Professionnel, ACACC

REGIONAL NEWS

Compiled by Tomasz Mrozewski

Alberta

Edmonton Map Society
David Jones

The Edmonton Map Society held its Fall Meeting on November 19, 2015 with 17 members in attendance. We received two presentations.

Larry Laliberte, GIS Librarian, U. of A. spoke of: "The power of GIS, geovisualization and metadatadata for online historical collections." Over the past fifteen years many collections (textual, numerical, photo, maps) have been digitized and are made available online. However, they often exist as either standalone platforms, isolated from other digital collections, or as databases that can be queried but not expressed spatially. By highlighting various #HGIS examples, the presentation touched upon how thinking spatially and combining the power of GIS, geovisualization and metadata open up interesting ways of spatially linking, querying, and mapping online collections. Presentation link: http://bit.ly/1T4Fys8

Ian MacLaren, Dept. of History & Classics, spoke about "Edward Weller's *Map to Illustrate Mr. Kane's Travels in the Territory of the Hudson's Bay Company (1859)*." He discussed this map that accompanied Paul Kane's *Wanderings of an Artist* (1859). He has found that cartographer Edward Weller (1819–1884) received £12 for drawing and engraving the map that accompanied the first edition. This appears to be a well-known name among cartographic historians. We discussed various discrepancies in the map, how it does, and doesn't, relate to the narrative and why it may have been included in the published volume.

University of Alberta
Larry Laliberte

The William C. Wonders Map Library recently completed an index to all of the 1:50,000 National Topographic System (NTS) maps that cover the Province of Alberta. The index is available as a .shp file so that one can determine, for any area within Alberta, which NTS sheet, year and edition the WCW map collection has. The ideal next step - digitize and georeference all of the earlier editions. The Index can be found here: http://dx.doi.org/10.7939/DVN/10523.

University of Calgary
Susan McKee

Spatial and Numeric Data Services has started to digitize some older western Canadian maps from our collection. They are available through our Digital Historic Maps guide (http://bit.ly/1QW8VO7). Thanks to our Maps & GIS Specialist Iris Morgan for all the work on this project. Please try it out and let SANDS know if you have any comments.

SANDS is looking forward to hosting the annual western Canada ACCOLEDS (A COPPUL Consortium of Library Electronic Data Services) workshops in the first week of December. We have an interesting program lined up, including a full day with data visualization tools, techniques, and practice: http://accoleds.org/

University of Lethbridge
Rhys Stevens

Alberta Historical Air Photo Mosaics: Here at the U. of Lethbridge Library, we had a cabinet of air photo mosaics that I discovered which we then had digitized and added to our CONTENTdm digital collections in early 2015; U. of Calgary & U. of Alberta provided guidance about the content itself and copies of some missing mosaics. The Alberta Historical Air Photo Mosaics LibGuide page (http://bit.ly/1O9b3Bf) provides links to the 700+ items. Users can "zoom in" on the images using the CONTENTdm viewer interface. More recently, the ABMI Data Portal (http://bit.ly/1XhpdRp) made available for public FTP downloadable georeferenced TIFF versions of this same mosaic collection which, unlike ours, seems to be 100% complete. The collections complement each other quite nicely I think. Several U. of Lethbridge faculty members have been making use of both resources.

British Columbia

University of British Columbia
Kelly Schultz

UBC Digital Initiatives has just finished digitizing old Vancouver land use maps. This digital collection has also been integrated into our new Open Collections portal (http://bit.ly/1Xhq6Ju) so the landing page has some interesting visualizations surrounding the collection. In the future we also hope to georeference these maps.

Manitoba

Centre for Rupert's Land Studies (University of Winnipeg)
David Malaher

Rupert's Colloquium 2016: the Centre for Rupert's Land Studies is pleased to announce the call for papers, poster presentations and displays for the Colloquium in 2016. We welcome any submissions related to Aboriginal and fur trade history, legal histories, treaty histories, science and geography, material culture, and gender studies in the vast region of land surrounding all sides of Hudson's Bay once known as Rupert's Land.

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Ontario

University of Ottawa
Sarah Simpkin

It has been another busy fall at the GSG Centre! William Gautier joined our team as a contract cartographic support specialist in September, filling in for Pierre Leblanc. We also recently welcomed a new interim head, Lindsey Sikora, who is joining us from our Health Sciences Library for the next year. We're continuing work on two digitization projects. The first, a collaboration with other Ontario universities, is an OCUL-funded map digitization project focussing on public domain topographic maps covering Ontario at 1:25000 and 1:63360 scales. The second are air photos of the Ottawa-Gatineau region covering several years between 1928 and 1945.

University of Waterloo
Eva Dodsworth

The Geospatial Centre is pleased to announce that Markus Wieland has accepted the position of GIS Specialist. Markus' main responsibilities include providing advanced geospatial technical information services, providing library instruction and developing geospatial digital projects. He will also be helping out with this year's GIS Day event on November 18th. GIS Day will include a series of student presentations, Lightening Talks, and a Geospatial Centre open house with postcard creations, cake and coffee. This term we have offered three workshops: Getting Started with GIS, Editing with GIS, and Introduction to ArcGIS Online. We hope to offer an introductory cartography course next term. We have also gone into several courses and lab sessions to teach how to read maps, how to work with census information, and demonstrations on both the Scholar's Portal and SimplyMap.

Quebec

Université Laval
Stéfano Biondo

Le Gouvernement du Québec et les universités québécoises, sous la coordination du Bureau de coopération interuniversitaire (BCI), sont fiers d'annoncer une importante entente portant sur une accessibilité accrue aux données géospatiales gouvernementales. Cette entente a pour but de soutenir et de stimuler l'enseignement et la recherche appliquée sur le territoire québécois ainsi que de développer l'expertise québécoise en la matière.

À l'initiative des bibliothèques universitaires, le gouvernement vient de conclure une entente de deux ans avec les universités québécoises afin de rendre plus accessibles ses données géospatiales actuellement diffusées par Géoboutique Québec, sous la responsabilité du ministère de l'Énergie et des Ressources naturelles (MERN).

Grâce à cette entente, 18 partenaires membres des établissements universitaires pourront accéder à pas moins de 34 jeux de données géospatiales produites par le Secteur du territoire du MERN, mais aussi par d'autres ministères (le ministère des Forêts, de la Faune et des Parcs, Transport Québec, le Directeur général des élections, le ministère des Affaires municipales et de l'Occupation du territoire ainsi que le ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques). Parmi ces jeux, pensons notamment aux données d'Adresses Québec, à des orthophotographies, aux données géodésiques, à différents produits cartographiques et cadastraux, aux produits et données d'inventaire écoforestier, etc.

Université du Québec à Montréal
Sylvie St-Pierre

Le 13 octobre 2015, le Service des bibliothèques de l'Université du Québec à Montréal a procédé au lancement officiel de Géoindex+ UQAM (http://geoindex.uqam.ca/), notre portail de données géospatiales. Grâce à la collaboration entre l'Université Laval et l'Université du Québec à Montréal, nos usagers peuvent désormais découvrir et utiliser nos collections par l'entremise de cette formidable plateforme créée par Stéfano Biondo et Martin Ouellet de l'Université Laval. Communiqué de presse : http://bit.ly/1hobbPi

On October 19th, 2015 the Service des bibliothèques de l'Université du Québec à Montréal has officially launched Géoindex+ UQAM (http://geoindex.uqam.ca/), our geospatial portal. Through collaboration between the Université Laval and the Université du Québec à Montréal, our users can now discover and utilize our collections with this great platform created by Stéfano Biondo and Martin Ouellet of Université Laval. Press release: http://bit.ly/1hobbPi

NEW MAPS

Compiled by Cheryl Woods

Map of Djbouti
Scale: 1:300,000
Publisher: Ing. Houssein Ahmed Hersi
Year of Publication: 2015

The Map. Kigali.
Scale: 1:9,300 & 1:13,000
Publisher: Living in Kigali
Year of Publication: 2015

Massachusetts and Rhode Island Lighthouses
Scale: NA
Publisher: Bella Terra Publishing
Year of Publication: 2015

Northwest Lighthouses
Scale: NA
Publisher: Bella Terra Publishing
Year of Publication: 2015

The Age of Pirates (Map/Poster)
Scale: NA
Publisher: Bella Terra Publishing
Year of Publication: NA

Best of Lake Louise Hiking
Scale: 1:35,000
Publisher: Gem Trek
Year of Publication: [2015]

Italy Vino di Eta Wine of Ages
Scale: NA
Publisher: Vinmaps
Year of Publication: 2015

South Vietnam
Scale: 1:600,000
Publisher: Reise Know-How Verlag
Year of Publication: 2015

Australia, West
Scale: 1:1,800,000
Publisher: Reise Know-How Verlag
Year of Publication: 2015
Haunted Savannah Illustrated Map
Scale: NA
Publisher: Karpovage Creative, Inc.
Year of Publication: 2015

Dalmatian Coast
Scale: 1:150,000
Publisher: Freytag-Berndt
Year of Publication: 2015

Poland
Scale: 1:700,000
Publisher: Freytag-Berndt
Year of Publication: 2015

British Columbia
Scale: 1:1,400,000
Publisher: GM Johnson Maps
Year of Publication: 2015

Toronto
Scale: NA
Publisher: Canadian Cartographics Corp.
Year of Publication: 2015

Greater Victoria
Scale: NA
Publisher: Canadian Cartographics Corp.
Year of Publication: 2015

Vancouver & Area
Scale: NA
Publisher: Canadian Cartographics Corp.
Year of Publication: 2015

Edmonton, Jasper & Environs
Scale: NA
Publisher: Canadian Cartographics Corp.
Year of Publication: 2015

Romania
Scale: 1:750,000
Publisher: Cartographia
Year of Publication: 2015

Hungary
Scale: 1:400,000
Publisher: Cartographia
Year of Publication: 2015

Northeastern Pennsylvania
Scale: NA
Publisher: Jimapco
Year of Publication: 2015

Bar Harbor/Acadia National Park
Scale: NA
Publisher: Jimapco
Year of Publication: 2015

Canada
Scale: 1:8,600,000
Publisher: GM Johnson Maps
Year of Publication: 2015

Miami
Scale: NA
Publisher: PopOut Maps
Year of Publication: 2015

Paris
Scale: NA
Publisher: PopOut Maps
Year of Publication: 2015

Chicago-Great Places to Eat
Scale: NA
Publisher: Michelin
Year of Publication: 2015

San Francisco
Scale: NA
Publisher: Michelin
Year of Publication: 2015

New Mexico
Scale: NAPublisher: Butler Motorcycle Maps
Year of Publication: 2015

Washington
Scale: NA
Publisher: Butler Motorcycle Maps
Year of Publication: 2015

Oregon
Scale: NA
Publisher: Butler Motorcycle Maps
Year of Publication: 2015

Perth and Region
Scale: 1:12,500/1:115,000
Publisher: Hema Maps
Year of Publication: 2015

Melbourne and Region
Scale: 1:12,500/1:115,000
Publisher: Hema Maps
Year of Publication: 2015

South East Queensland
Scale: 1:500,000
Publisher: Hema Maps
Year of Publication: 2015

Rhodes
Scale: 1:50,000
Publisher: Freytag-Berndt
Year of Publication: 2015

Germany, West
Scale: 1:500,000
Publisher: Freytag-Berndt
Year of Publication: 2015

Germany, East
Scale: 1:500,000
Publisher: Freytag-Berndt
Year of Publication: 2015

Albania
Scale: 1:150,000
Publisher: Freytag-Berndt
Year of Publication: 2015

GIS TRENDS

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ONTARIO FLOW ASSESSMENT TOOL (OFAT)

Introduction

In this issue we examine the Ontario Flow Assessment Tool (OFAT), an open source web application for watershed delineation and analysis produced by the Ontario Ministry of Natural Resources and Forestry. OFAT automates complex hydrological and spatial processing tasks, drawing on various spatial and attribute databases to generate outputs useful to researchers, managers and others interested in watersheds.

The Ontario Flow Assessment tool was initially released by the Ministry of Natural Resources in 2002, as a customized add-on to proprietary software.[i] The current version operates as a stand-alone web-based product that requires only a browser to use. The Ministry announced the release of a number of enhancements in October 2015. This article discusses Ontario Flow Assessment Tools III, as evaluated from the web in November 2015.

OFAT web application: http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html

Functions

Ontario Flow Assessment Tools III is used to calculate information about Ontario's watersheds (defined as areas of land where surface water converges to a single point).[ii]

The web interface includes five main tabs (Navigation, Map Layers, OFAT III, Find Information and Markup and Printing) each of which have a set of associated tools. The main functions for watershed analysis are found under the "OFAT III" tab. Key functions include: creating a watershed, extracting the watershed's physiographic characteristics, and executing hydrological models to determine flow regimes for the watershed. These functions are outlined further below.

1. Create Watershed

The "Create Watershed" tool delineates watersheds using a pour point method. First steps involve designating a pour point (outlet for watershed). This can be achieved through selecting "Create from a Map Point", and clicking on the application's base map to assign a point (Figure 1). The corresponding watershed associated to this pour point is generated through a series of automated processes (Figure 2). A pour point must be designated on a mapped hydrological feature (i.e., a lake or stream). Alternatively, instead of a mouse click, a pour point can be designated by entering its coordinates (either in Lat/long, UTM or MNR Lambert). The coordinates entered must be within 90 meters of a mapped hydrology feature. One or more watersheds can be generated during one session, and will be listed separately in search results. Each watershed is independent of any other watershed generated, permitting overlapping or nested sub-watersheds. Figures 1 through 5 show the progressive steps involved in running tools to delineate, characterize and model flow of one watershed. In this example the watershed was named "Jackson Creek".[iii]

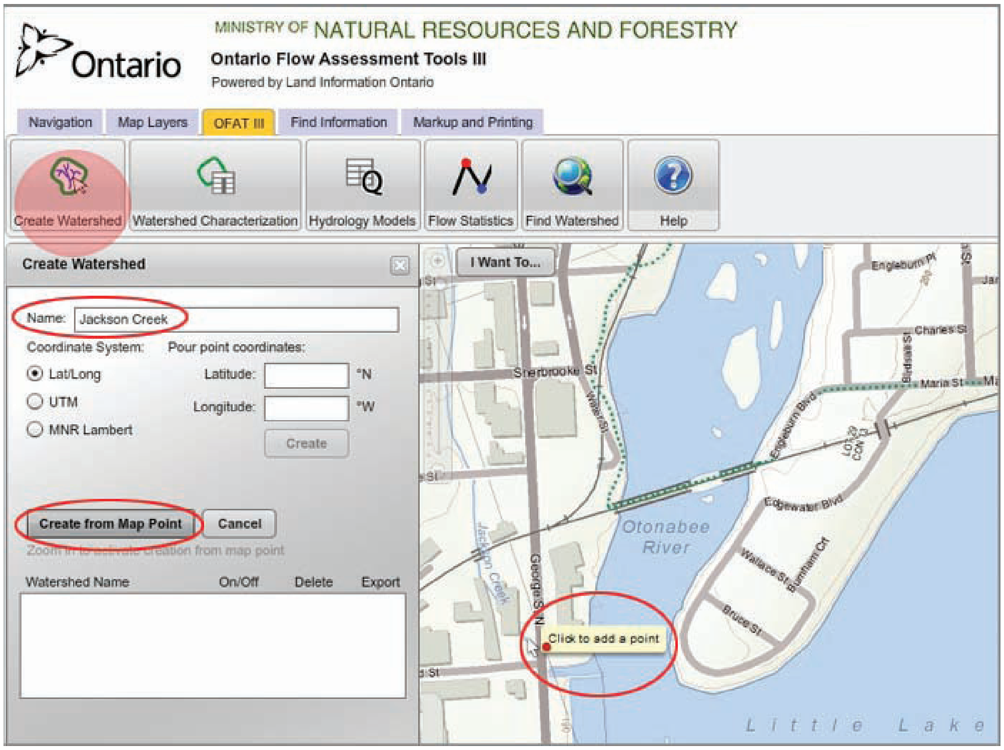

Figure 1. Create watershed tool; user clicks on map to designate a pour point for watershed delineation (Snapshot from: Ontario Ministry of Natural Resources and Forestry, *Ontario Flow Assessment Tools III*, Powered by Land Information Ontario, ©Queen's Printer for Ontario, 2013. Taken on, November 24, 2015, from: http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html)

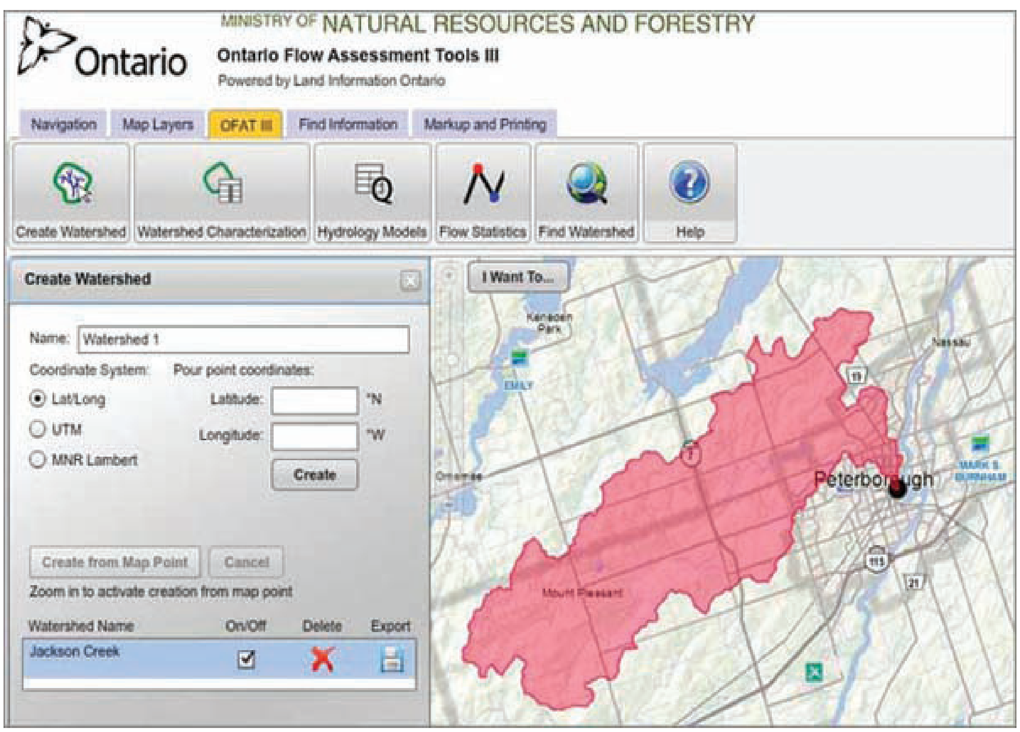

Figure 2: Create watershed result for Jackson Creek watershed as generated from pour point designated in Figure 1(Snapshot from: Ontario Ministry of Natural Resources and Forestry, *Ontario Flow Assessment Tools III*, Powered by Land Information Ontario, ©Queen's Printer for Ontario, 2013. Taken on, November 24, 2015, from: http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html)

2. Characterize the Watershed

After generating a watershed the Watershed Characterization tool can be run to calculate features of the watershed including: Drainage Area, Shape Factor, Mean Elevation, Maximum Elevation, Mean Slope, Length of Main Channel, Maximum Channel Elevation, Minimum Channel Elevation, Slope of Main Channel (m/km), Slope of Main Channel (%), Annual Mean Temperature, Annual Precipitation, Area – Lakes/Wetlands, Area – Lakes, and Area – Wetlands.

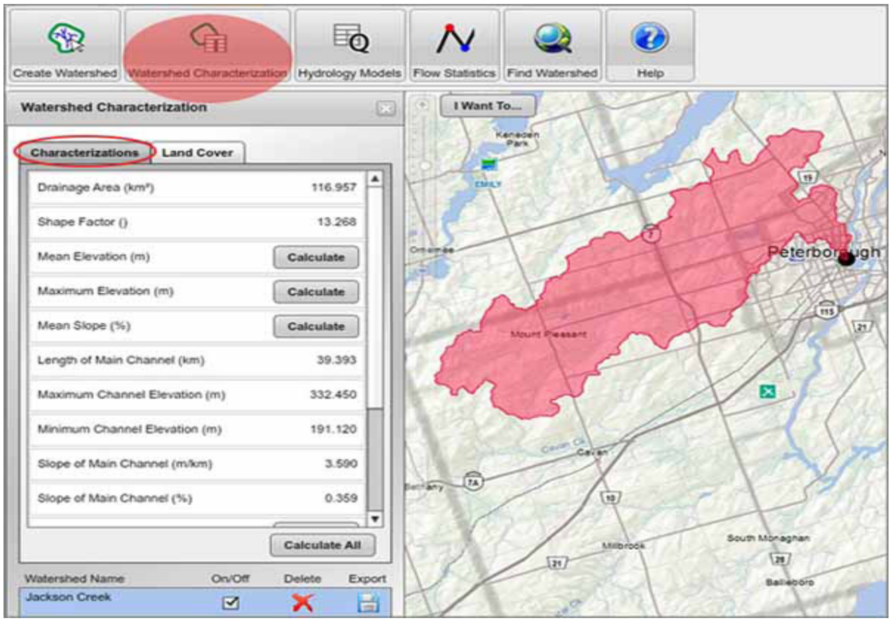

Figure 3:
Watershed Characterization of Jackson Creek watershed (Snapshot from: Ontario Ministry of Natural Resources and Forestry, *Ontario Flow Assessment Tools III*, Powered by Land Information Ontario, ©Queen's Printer for Ontario, 2013. Taken on, November 24, 2015, from: http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html)

In addition, it is possible to add 30 land cover types to the map, with, for each type, the area (in km2) and percent coverage within the watershed listed (Figure 4). The land cover types can also be viewed on the map. This viewable layer is for the entire province, not just the watershed.[iv]

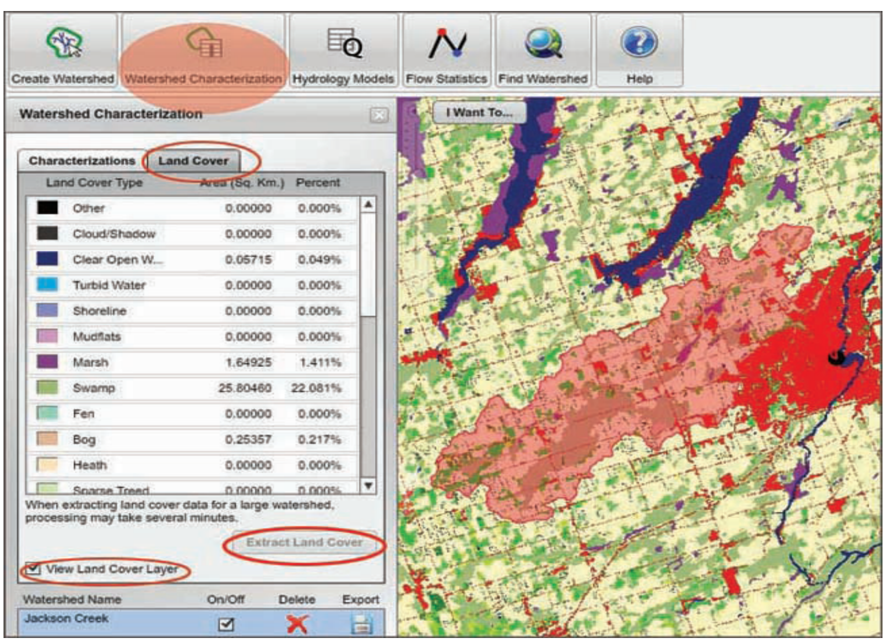

Figure 4.
Land Cover Characterization of Jackson Creek watershed (Snapshot from: Ontario Ministry of Natural Resources and Forestry, *Ontario Flow Assessment Tools III,* Powered by Land Information Ontario, ©Queen's Printer for Ontario, 2013. Taken on, November 24, 2015, from: http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html)

3. Execute hydrological models to generate water flow information

The hydrology models tool has been created by automating a number of existing regional hydrologic models. Currently, OFAT includes three flow model categories (Low Flow Prediction Model, Flood Prediction Model and Mean Annual Flow Prediction Model), each of which contains one or more models (five models in total) which can be applied to each generated watershed, after the required characterizations have been completed (Figure 5). A detailed explanation of the models is included in the OFAT User Guide.[v]

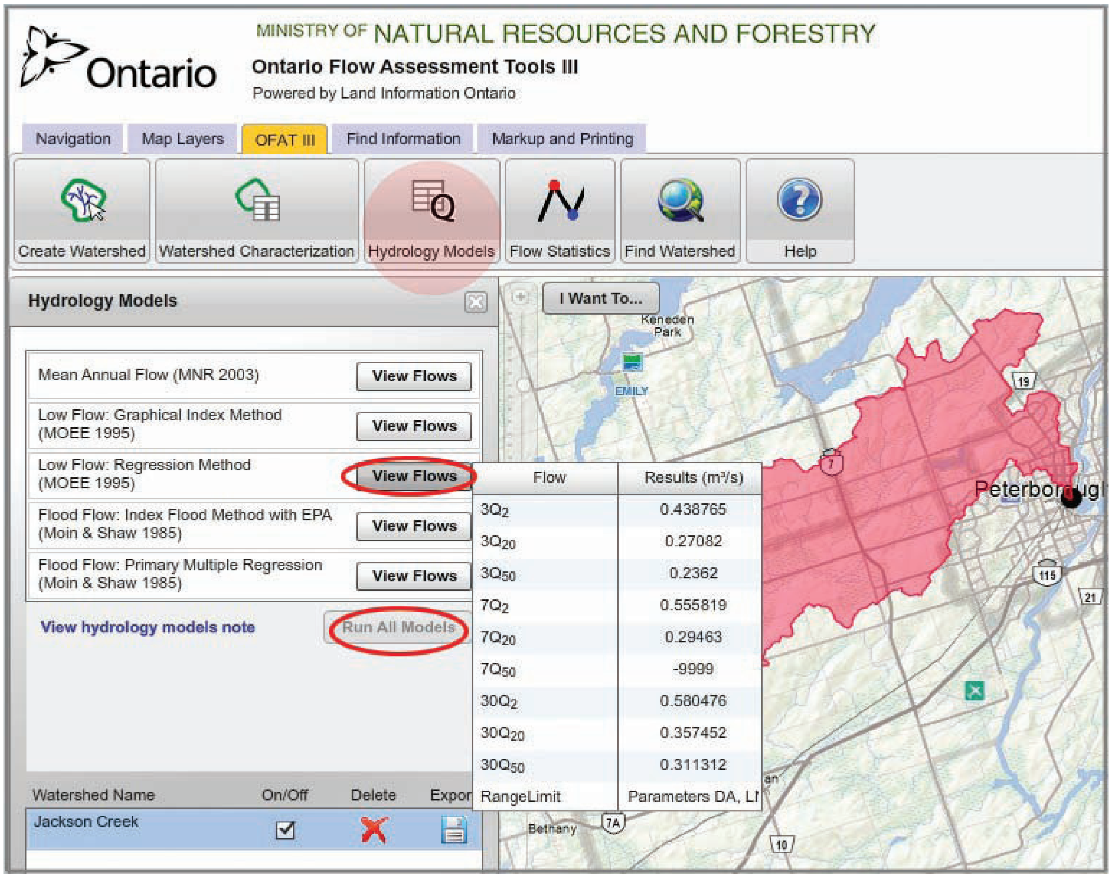

Figure 5: Hydrology Model run on Jackson Creek watershed (Snapshot from: Ontario Ministry of Natural Resources and Forestry, *Ontario Flow Assessment Tools III*, Powered by Land Information Ontario, ©Queen's Printer for Ontario, 2013. Taken on, November 24, 2015, from: http://www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html)

Other Features

The "Flow Statistics" tool within OFAT III estimates flow statistics for select Water Survey of Canada HYDAT gauges in the Southwestern Hudson Bay, Nelson River and Great Lakes-St Lawrence River watershed systems that lie within Ontario.[vi] These are useful for many reasons, including as comparators to ungauged flow statistics obtained through running OFAT processes. Using "Find Watersheds" it is also possible to add predefined Ontario tertiary watershed boundaries to a map by selecting a watershed name or ID from a list.

The Map Layers tab includes a range of background maps and imagery as well as Ontario dam inventory and diversion information.

The Markup and Printing tab, includes tools for customizing and exporting print-ready maps.

Export Options

Each tool includes options to download results, thereby permitting further analysis in GIS software and other applications. Supported formats include .shp, kmz, GRID, .lyr and .dbf.[vii]

Data Sources

OFAT tools draw on extensive databases. Some of the key data sets used within OFAT are listed below. See the "Metadata" section within the User Guide for further details.

For watershed creation: Ontario Integrated Hydrology (OIH) Stream Geometric Network; OIH Enhanced Flow Direction grid.

For watershed characterization: OIH Digital Elevation Model (DEM); OIH Enhanced Flow Direction grid; OIH Waterbody data; Land Information Ontario Wetland data; Environment Canada's Historical normal data 1981-2010.

For Watershed Land Cover summary: The Ontario Land Cover Compilation, which combines the Provincial Land Cover Database, Far North Land Cover, and the Southern Ontario Land Resource Information System.

F**or Hydrology Models**: Models use information from derived watershed characteristics. Source data to create grids for regression models was taken from Moin and Shaw "Regional Flood Frequency Analysis for Ontario Streams" 1985. Hard copy maps were digitized to create a mean annual runoff contour dataset, which were then interpolated into surface using TOPOGID.[viii]

For Streamflow: Estimates of streamflow statistics for select Environment Canada's Water Survey of Canada's HYDAT gauges in the Southwestern Hudson Bay, the Nelson River and the Great Lakes – St. Lawrence River watershed systems that lie within the Province of Ontario.[ix]

More Information

OFAT documentation includes the Ontario Flow Assessment Tool Guide (see: http://www.ontario.ca/page/ontario-flow-assessment-tool-guide) and a more detailed (78 page) User Guide, which contains procedures for use, metadata for data sets, and information on models and associated methodologies. Users are encouraged to consult the excellent full version of the user guide, found at:

https://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/CMID/OFAT%20-%20User%20Guide%20-%20eng.pdf

Evaluation

With a user-friendly and highly flexible interface that requires only a browser to use, Ontario Flow Assessment Tools III is an impressive web application, particularly because of its capacity to access diverse databases and to automate complex spatial tasks. The ability to delineate and characterize watersheds is of huge value to graduate students, researchers, scientists, planners and others. Similarly, the automated use of existing hydrological models, drawing on extensive database information, eases the time-consuming tasks of estimating different stream flow regimes and identifying their implications for watershed management. Furthermore, the ability to export generated output for further analysis adds the product's strength and versatility.

The tools are relevant to a broad range of tasks such as site evaluation, conservation assessment, water quantity risk assessment, storm water management, flood control, streambed mobilization, sewage assessments, study of sediment movement, monitoring of fish migration and spawning, habitat protection and wetlands study.

As with most automated procedures and models, the tools must be used critically, and models assessed for their suitability to a particular research project or question. The ability to delineate watersheds and their characteristics based on ungauged pour points and automated procedures is a powerful feature that should be evaluated in relation to research objectives and the unique characteristics of a particular research site or watershed. OFAT III is intended to support diverse applications, sometimes as a stand-alone product or in combination with other products, procedures (such as field verification), and information, as appropriate.

The growth of web technologies and the need to understand and manage watersheds effectively calls for a generation of new products that will hopefully be in the public domain. For example, readers may wish to explore the US Geological Survey's StreamStats Version 3 web application, now in Beta release at: http://streamstatsags.cr.usgs.gov/v3_beta/.

Ontario Flow Assessment Tools III is highly recommended for researchers, watershed managers and planners, and others interested in watersheds.

Disclaimer

All inaccuracies or omissions within this article are the responsibility of the author.

Barbara Znamirowski, Head, Maps, Data & Government Information Centre, Trent University Library

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[i] Ontario Ministry of Natural Resources and Forestry. User Guide for Ontario Flow Assessment Tool (OFAT) – 2015-09-23, https://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/CMID/OFAT%20-%20User%20Guide%20-%20eng.pdf, p. 11, accessed November 15, 2015

[ii] Ontario Flow Assessment Tool Guide, http://www.ontario.ca/page/ontario-flow-assessment-tool-guide#section-1, accessed November 15, 2015

[iii] User Guide for Ontario Flow Assessment Tool (OFAT), Spatial Data Infrastructure, Mapping and Information Resources Branch, Corporate Management and Information Division, Ministry of Natural Resources and Forestry, 2015-09-23, pp. 18-21, https://www.sse.gov.on.ca/sites/MNR-PublicDocs/EN/CMID/OFAT%20-%20User%20Guide%20-%20eng.pdf, Accessed in November 2015

[iv] Ibid. OFAT User Guide, pp. 22-23

[v] Ibid. OFAT User Guide, pp. 24-25

[vi] Ibid.OFAT User Guide, p. 27

[vii] Ibid.OFAT User Guide, p. 35

[viii] Ibid. OFAT User Guide, p.43

[ix] Ibid.OFAT User Guide, pp. 40-45